BOOK 3
DETAILED SPECIFICATIONS
PART 1 OF 3

STATE / LAKE LOOP ELEVATED STATION

CDOT PROJECT ID: D-1-209
SPECIFICATION NO.: 1269715

CITY OF CHICAGO

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Issued by the
DEPARTMENT OF PROCUREMENT SERVICES

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All Signatures To Be Sworn To Before A Notary Public

Any contract entered into as a result of this bid process is governed by the terms and conditions set forth in Book 1 "Terms and Conditions for Construction" for CDOT FTA, as amended and incorporated as if fully set forth here by this reference; and by Book 2, Book 3 (if applicable), plans, drawings, exhibits, and attachments as appropriate.

SECTION 00 01 10

TABLE OF CONTENTS

CHICAGO DEPARTMENT OF TRANSPORTATION

STATE/LAKE LOOP ELEVATED STATION

200 N STATE STREET
CHICAGO, ILLINOIS 60601

BOOK 3 – DETAILED SPECIFICATIONS

Specification section numbers with ".S" suffix apply only to subway scope of work, all other sections apply to all scope as appropriate.

* Appendices A, B, C, F, and H are FOR INFORMATION ONLY

E N D

ADDITIONAL SPECIAL CONDITIONS
DIVISION OF ENGINEERING

September, 2019

1. AUTHORITY OF THE COMMISSIONER

A. All work will be done under the supervision of the Commissioner or his or her authorized representative. The Commissioner will decide all questions that arise as to the quality and acceptability of materials furnished, work performed, manner of performance, rate of progress of the work, interpretation of the Contract and compensation and mutual rights between Contractor and all subcontractors. The Commissioner will determine the amount and quality of work performed and materials furnished and the estimates thereof. The estimate will be a condition precedent to the right of the Contractor to receive money due him or her under the Contract.

B. In case of failure on the part of the Contractor to execute work ordered by the Commissioner, the Commissioner may, at the expiration of a period of 48 hours, request the Chief Procurement Officer to give notice in writing to the Contractor, and proceed to execute such work as may be deemed necessary, and the cost thereof will be deducted from compensation due or which may become due the Contractor under the Contact.

2. REFERENCE SPECIFICATION

A. Reference made in these Specifications and Drawings to reference specifications, codes or test methods of ASTM, ACI, AISC, and other similar organizations and associations is intended to refer to the latest revision of such standard in effect 30 calendar days prior to the date of the ADVERTISEMENT FOR BIDS, unless specifically indicated to the contrary.

3. MATERIAL SPECIFICATIONS

A. Materials specified in the Specifications with an ASTM designation will meet all the requirements of the materials with the corresponding AASHTO designation as a tabulated in the "Standard Specifications for Highway Materials and Methods of Sampling and Testing", Latest Edition, Part 1, page WITHHOLDING and XVII. In case of any conflict between ASTM and AASHTO designations, the ASTM designations will govern.

4. QUALITY OF MATERIALS

A. This section supplements the provisions of Book 1 of the Contract Documents.

(1) Since the equipment specified herein is to be an integral part of an installation where external appearance is important, the equipment will be in accordance with design, workmanship and material, and have the same dimensions, as that of specified manufacturers. The Commissioner reserves the right to reject equipment if the design does not meet specifications or detail requirements. Standard shop practices for the purpose of improving fabrication, assembly, and finish, but not affecting the external design, will be given consideration.

5. MATERIAL AND WORKMANSHIP STANDARDS

A. All material and workmanship must meet or exceed the national and the Chicago construction codes. Where conflicts exist between the Chicago and other codes listed, the more stringent provisions must apply. In situations where doubt between codes exists, the Commissioner will determine which to follow.

B. All equipment and materials for which Underwriters' Laboratory labeling services is provided will be UL labeled.

C. Wherever applicable, the following list of codes must be obeyed:

(1) Chicago Construction and Electrical Code.
(2) Underwriter's Laboratories (UL).
(3) Insulated Power Cable Engineers Association (IPCEA).
(4) National Electrical Code (NEC).
(5) National Electrical Manufacturers Association (NEMA).
(6) American National Standards Institute (ANSI)
(7) Institute of Electrical and Electronic Engineers (IEEE).

D. Materials specified in the Detail Specifications with an ASTM Designation will meet all requirements of the materials with the corresponding AASHTO Designation as tabulated in the Standard Specifications for Highway Materials and Methods of Sampling and Testing, Latest Edition, Part 1, page XVII and XVIII. In case of any conflict between ASTM and AASHTO Specification, the AASHTO Specifications will govern.

6. TIME SCHEDULE AND PROSECUTION OF THE WORK

A. In addition to the requirements of Book 1 of the Contract Documents, the Contractor further understands and agrees that as soon as possible after being awarded the Contract, he or she will submit the Progress or Time Schedule to the Commissioner for approval, within a maximum of fourteen (14) days after Notice to Proceed is issued.

B. The Schedule will be in the form of a bar chart in sufficient detail or in such other form as approved by the Commissioner that clearly defines the contemplated progress of the work. The schedule will show the contemplated starting and completion dates for each trade, subcontract or major phase of the work, with all items so scheduled as to complete the entire project within the time specified.

C. The construction progress schedule will be used as a guide for verifying monthly estimates off work completed, for which payment is requested.

D. The Contractor will promptly notify the Commissioner of any difficulty in securing material or any other circumstance that could delay the progress of the work and the time of completion.

7. PRECONSTRUCTION MEETING

A. This section supplements the provisions of Book 1 of the Contract Documents:

(1) Prior to the Contractor starting work a joint conference will be held between all interested parties, at which time a final schedule of operations will be adopted. No deviations by the Contractor will be allowed without written approval of the Commissioner. However, as the job progresses the Commissioner may direct revisions to these requirements so as to expedite the project or as may be required by job conditions.

8. ADDITION TO CONTRACT FOR WORK - GENERAL CONDITIONS

A. This section supplements the provisions of Book 1 of the Contract Documents:

(1) The Contractor will keep himself/herself informed at all times as to the details and progress of the work, both at the premises and in shops where materials for the work are being manufactured and he or she will be responsible for all delays that may result from his or her failure to furnish and install his or her work or the work of any of his or her subcontractors at the proper time.

9. GENERAL SAFETY PROVISIONS

A. The Contractor will conduct his or her operations in a manner that will provide maximum protection from damage to adjacent structures, utilities or services, to traffic adjacent to his operations, and to adjoining and adjacent public or private properties utilized or otherwise involved in the prosecution of the work. The Contractor's plans to provide the aforementioned protection will be subject to approval of the Commissioner. Approval by the Commissioner will not relieve the Contractor from full responsibility for all damage resulting from his or her operations.

10. SITE CONDITIONS

A. This section supplements the provisions of Book 1 of the Contract Documents:

B. The Contractor will satisfy himself/herself prior to bidding, by such methods as he or she may prefer, as to the nature of conditions, including any obstructions, which may be encountered during the work. No allowance will be made to the Contractor for any extra labor and/or materials required because of site conditions of discrepancies which might have been foreseen by a thorough and proper inspection of the site.

11. OCCUPANCY INTERFERENCES

A. This section supplements the provisions of Book 1 of the Contract Documents:

B. Work will be carried on in such manner as to interfere as little as possible with the normal conduct of business in or around the portions of the station platform.

C. The Contractor will serve written notification to the Commissioner of any anticipated interruption in facilities at least two (2) weeks prior to disruption of services, allowing for temporary relocation of personnel, operations and equipment during the program of the work, and will be for such periods, as designated and approved by the Commissioner.

D. At no time will vehicle, pedestrian, or CTA train traffic be interrupted or blocked by the Contractor without the prior written consent of the Commissioner.

E. Storage of all material and/or equipment will be located in areas as designated and approved by the Commissioner, with protective metal and concrete barriers and gates as required by the Commissioner.

12. CARE OF EXISTING STRUCTURES AND PROPERTY AND CONTRACTOR'S LIABILITY

A. This section supplements the provisions of Book 1 of the Contract Documents:

(1) Liability for Damages to City-Owned Property: The extent of the liability of the Contractor for damages to City owned property is dependent upon the kind of city-owned structure and the character of the work to be performed under the Contract as follows:

a. The Contractor will not be permitted to perform work on City-owned water mains, connections and appurtenances or on any City-owned electrical conduit, cables vaults and appurtenances unless any such structure has been abandoned by the City and work on such abandoned structure is required by the Contract or ordered by the Commissioner.

b. Wherever in the performance of the work under the Contract, it will be necessary because of the nature of the work required by the Contract or because of the Contractor's method of performing the work to support, remove, replace, relocate, rearrange, adjust or repair such City owned structures located entirely outside of said excavations. The Contractor will notify the appropriate City Department to perform such work, and will cooperate with such department in preserving service in or through the same. The Contractor will reimburse the appropriate City Department for the cost of performing such work, and such cost will be included in the various Contract prices.

13. EXISTING UTILITIES. SPECIAL PROVISIONS

A. This section supplements the provisions of Book 1 of the Contract Documents:

B. In the event that existing utilities are not shown on the Drawings and are encountered within the site of the work to be done under this Contract, it is suggested that the bidder consult the Board of Underground Work of Public Utilities of Chicago, the City of Chicago, and the Illinois Department of Transportation, and determine for himself/herself whether or not the utility owners plan to abandon or maintain the utilities in service during the work. It is to be understood, however, that there is no expressed implied guarantee by the City of Chicago, or by the Board of Underground Work of Public Utilities of Chicago or their respective representatives, as to the accuracy or completeness of any such information.

C. The following utility companies or agencies are known to have facilities within the limits of this improvement:

- ComEd
- AT&T
- Comcast
- Ameritech
- RCN
- CTA

- Negative Street Car Rails
- Level 3
- Adesta
- Peoples Gas Light & Coke Co.
- City of Chicago Department of Streets and Sanitation, Bureau of Electricity
- City of Chicago Department of Water Management
- City of Chicago, Office of Emergency Management and Communication

D. The Contractor will make his or her own investigation to determine the existence, nature and exact location of all utility lines and appurtenances within the limits of this improvement. The cost of this work will be considered incidental to the Contract.

E. Due care should be exercised by the Contractor to avoid damaging any power, telephone, gas, water or sewer lines near the construction operations. Any utility damaged by the Contractor during construction of the improvement will be repaired at the Contractor's expense and to the satisfaction of the utility company(s) and the Commissioner.

14. FIELD CHECK OF DIMENSIONS, CUTTING AND PATCHING

A. This section supplements the provisions of Book 1 of the Contract Documents:

(1) "Unless shown or specified to the contrary, new work will match corresponding existing work in all respects. New work which engages with existing work will be joined therewith in a careful and workmanlike manner, properly aligned with existing work, and finished so as to leave no evidence of patching. Execute removals, replacement, and repairs in existing work that are required or necessary to make such engagements in a manner satisfactory to the Commissioner."

15. TEMPORARY SERVICES AND UTILITIES

A. This section supplements the provisions of Book 1 of the Contract Documents:

(1) General:

a. The Contractor will be responsible for arranging and providing all general services and temporary facilities as specified herein and as required for the proper and expeditious prosecution of the work. The Contractor will pay all costs for such general services and temporary facilities, until date of occupancy by the City.

b. Temporary connections for water, electricity and heat including installation, maintenance and removal of such facilities will be at the Contractor's expense. The Contractor will pay the cost of all water, gas, telephone, and electricity service during the construction period.

(2) Temporary Toilets:

a. The Contractor will provide chemical toilet facilities for all workmen employed on the project as soon as operations commence. Toilet facilities will be serviced twice weekly, which will include draining the tank and refilling and disinfecting the interior of each unit, and keeping each unit stocked with toilet paper. Toilet facilities will be maintained during the term of the construction period and removed upon completion of the work. The chemical toilets will be located in an area approved by the Commissioner.

(3) Electrical Services:

a. In addition to the requirements under Book 1 of the Contract Documents, the Contractor will be permitted to use the existing electrical service for power and lighting as required by all workmen. Using trades will furnish their own extension cords, lights, generators, or pumps where other current characteristics are required. The Contractor will pay all energy costs generated, for power and lighting, when using existing service.

b. If subcontractors, or separate contractors, require special electric power for facilities beyond that provided for herein for such items as large pumps, welding machines, special hoists, etc., they will arrange and pay for the installation of such facilities and arrange with the Contractor for the payment of any additional cost thereof.

c. It is understood that when the permanent electric power and lighting systems are used for temporary power and lighting for construction purposes, the Contractor will (1) obtain the approval of the Commissioner; (2) assume full responsibility for the power and lighting systems used and (3) pay all costs for restoring electrical facilities to existing condition upon completion of the work.

d. At the completion of the construction work all temporary wiring, lighting and other temporary electrical equipment and devices will be removed by the Contractor and those of his subcontractors. Any damage to existing facilities will be restored as required.

(4) Temporary Heat:

a. The Contractor will be responsible for temporary heating as required during construction to protect the work from frost damage; also to ensure suitable working conditions for the construction operations of all trades. In areas of the station where work is being conducted, the temperature will be maintained as specified in various Sections of the Specifications but not less the 45º F.

b. The Contractor will provide adequate ventilation to prevent the accumulation of excess moisture in the area of work.

c. It is understood that when the permanent heating system is used for temporary heat for construction purposes, the Contractor will (1) obtain the approval of the Commissioner; (2) assume responsibility for the use of the existing system and (3) pay all costs for restoring heating system to existing condition upon completion of the work.

d. Upon conclusion of the temporary heating period, the Contractor will remove all temporary piping and facilities, and recondition those parts of the permanent heating system used for temporary service.

(5) Water:

a. The Contractor will provide temporary water connections as required for drinking and construction purposes. It is understood that the Contractor will be fully responsible for the parts of the permanent water system used as temporary facilities and that such facilities will be maintained in working order during the construction period and cleaned and restored to original condition upon completion of the Work.

b. The Contractor will note that the Commissioner reserves the right to regulate the use of water and may impose restrictions on the use in the event water is being used carelessly by the Contractor.

16. TEMPORARY CONSTRUCTION FACILITIES

A. This section supplements the provisions of Book 1 of the Contract Documents:

B. Temporary Field Office:

It is hereby understood and agreed to that the Contractor will furnish and maintain a heated and air conditioned space for the duration of the project starting thirty (30) days after Construction Notice to Proceed is issued to thirty (30) calendar days after the completion of the "Punch List" (including all time extensions) the following equipment for the sole use of City personnel. All equipment is to be installed and fully operational at least seven (7) days prior to the start of construction at the site. Submit catalogue cuts for approvals.

(1) Office Trailer:

The Contractor will provide a temporary field office for the sole use of City personnel (see section C for size requirements).

(2) Office Equipment:

The Contractor is to provide all labor, material, and equipment necessary to install and operate the following equipment in locations as directed by the City representative. Catalogue cuts are to be submitted for all items for Commissioners approval prior to purchase and installation.

a. Copying Machine (rented with service contract):

The copier will be acceptable to *Canon Image Runner 550 or approved equal.* An independent copier stand will also be provided. The Contractor will provide legal letter and tabloid size paper and cartridges as required throughout the duration of construction up to 30 calendar days after the completion of "Punch List". Legal and letter trays are to be provided. A maintenance contract will be provided for the machine and will include monthly servicing and repair as required. In the event the copier is not operational for a period of more than three days it will be replaced with an equal unit.

b. Computer and Printer(s):

A service contract will be provided for all computers and will include installation (including software) and repair/replacement as required. In the event a computer or peripheral equipment is not operational for a period of more than three days it will be replaced with an equal unit. The Contractor will supply all computer paper and/or cartridges in sizes as required. The Contractor will pay for 4-year extended service plan. All cell phones, computer

and camera hardware and software will become the property of the City of Chicago.

1.) (2) Laptop computer(s):

Lenovo ThinkPad X1 Carbon Gen 7 (14”) laptop or approved equal. Provide product data for approval prior to purchase

2.) Printer(s):

(1)HP Color LaserJet 5000 Printer or approved equal. Provide product data for approval prior to purchase

3.) (1) Double Printer Stand(s):

Holds two printers
Two separate heavy gauge steel paper catch baskets
Paper Feed Trays Included
Overall Dimensions 22" W X 41-3/4" H X 35" D
Color: Putty, Bretford E4-UNI5-PB.

4.) Software (latest version available):

Provide product data for approval prior to purchase
All software licenses must be of the individual stand-alone user type.

(2) Adobe Creative Suite (latest version)

5.) Provide broadband Internet with Wi-Fi and minimum download speed of 500 Mbps for field office with local provider for project duration up to 30 calendar days after completion of all ‘Punch List’ work.

6.) Miscellaneous:

a.) Provide all cables and connections as required to provide an operational system.

b.) Provide heavy vinyl dust covers for all equipment.

c.) Provide security cables for all equipment.

d.) All computers are to be networked together using an ethernet switching box. The Contractor is to provide all labor, material

and equipment as required for a complete installation.

e.) (150) CD-R Disks w/ covers
(50) CD-RW Disks w/ covers
(50) DVD-R Disks w/ covers

c. (1) Plan Table:

3'-6" X 6'-0" minimum; all surfaces are to be laminate finished. Make-shift plywood tables will not be accepted.

d. Modular Work Station and Office Equipment:

1.) Basic Construction:

10" tubular web angle bases with 1" X 1" tubular reinforcements.
20 gauge web and full width steel modesty panels.
1-3/8" radius corners.
1-1/4" non-glare, high pressure laminated tops.
Adjustable leveling guides.
Color: Putty with oak laminate.
Global "Premium Series,".

2.) Units to be Provided:

a.) (1) Drafting Table(s):

14 Tilt positions from 0^{o} - 60^{o}
Automatically lock in place
48" Lower Shelf with 48" Parallel Rule
Overall Dimensions
48" W X 30" D X 27- 30" H

b.) (2) Corner Workstation(s):

Roll-out Keyboard Platform
Overall Dimensions
26-1/2" W X 39-3/4" D X 27-30" H

c.) (2) Studio Workstation Type #1:

[Components for Each Workstation]
(1) Workstation (Overall Dimensions 60" x 30")
(1) Box-Drawer Pedestal (Dimensions 15" W x 19" D x 17 " H)
(1) File/Pencil Pedestal (Dimensions 15" W x 19" D x 17 " H)
(1) Workstation Organizer (Dimensions 60" x 15" x 31-1/2" H)

d.) (1) Studio Workstation Type #2:

[Components for Each Workstation]
(1) Workstation (Overall Dimensions 48" x 30")
(1) File/Pencil Pedestal (Dimensions 15" W x 19" D x 17 " H)
(1) 48" Shelf

e.) Fire-rated File Cabinets:

(2) 6-drawer fire-rated legal size lateral file cabinets with locks.
Overall Dimensions
36" W X 75-7/8" H X 16-3/4" D
Locking doors.
Color: Putty
Six (6) sets hanging file racks
Three (3) sets shelf dividers
Fire-rated equivalent of HON E4-626CN-Q.

f.) Plan Racks:

1.) (30) Hanging Clamps:
Extruded aluminum clamps allowing 1" minimum opening.
20 lb. minimum holding weight.
Clear plastic label holders and black end caps. 36" length. Safco E4-5004-6.

2.) (3) Wall Racks:

Bolts to wall and extends 12".
Holds up to 12 hanging clamps.
Color: Sand. Safco E4-5030.

g.) (1) Water Cooler(s) with Integral Refrigerator:

The Contractor will rent a combined water cooler and refrigerator with a minimum usable space of 2 cubic feet, and a separate hot and cold water tap. The Contractor will have a service contract with a bottled water supplier to provide water as needed. In the event the cooler becomes nonoperational for more than three (3) days it will be replaced with an equal unit.

h.) (1) Storage Cabinet(s):

Overall Dimensions
78" H X 36" W X 24" D. Color: Putty
Lock included. HARPERS E4-7824 GY.

i.) Wall Clock(s):

1.) (3) Standard:

Quartz movement / battery operated
Overall Dimensions:
12-3/4" DIA X 2-1/4" D.
Color: Black case, white face with black numerals. Howard Miller K4-622-819.

j.) Bulletin Board(s):

1.) (3) 24" X 36"
Aluminum framed.
1/16" cork facing
Quartet.

2.) (0) 48" X 96"
Aluminum framed.
1/16" cork facing.
Quartet.

k.) (1) Mark and Wipe Board(s):

6' W x 4' H.
Aluminum Frame.
(1) Dry erase kit per board (including 4 fine point markers, 4 chisel point markers, eraser, and cleaner).
Quartet J4-S537.

l.) (3) Adjustable Lamp(s):

Adjustable arm with 9-1/2" diameter shade, inner reflector and porcelain socket.
Combination lamp with 22 watt fluorescent tube and 60 watt incandescent bulb.
Clamp on bracket. (1) floor stand for lamp & (2) replacement fluorescent lamps for each fixture. Color: Black
Luxo Ledu K4-LC1A-BK.

m.) Conference Table and Chairs:

1.) (10) Chairs:
Scuff resistant color molded polypropylene seat and back with anti-static additive.
5/8" steel tube framing, stackable.
Overall Dimensions 21" W X 30-3/4" H X 17" D. Color: Blue Samsonite E4-2306-02-95.

2.) (1) Table(s):
Pedestal leg folding table. 5/8" thick abrasion resistant laminated top. Plastic Floor Guides.
Overall Dimensions 36"W X 96" L.
Color: Brown Samsonite 4-7211-01-66.

n.) (4) Desk Chair(s):

High Back Swivel-Tilt Chairs:
Overall Dimensions: Seat 20" W X 18"D; Back 20-1/2" W X 19" H. Color: Black frame with Gray fabric.
HON E4-4001-GG16T.

o.) (1) Drafting Stool(s):

Mid-Back Swivel Stool
Overall Dimensions:
Seat 19"W X 18"D; Back 15-3/4"X15"H
Seat Height: 19" to 27"
Color: Gray
Vogel Peterson VOG-55234.

p.) (5) Waste Basket(s):

Molded in-color plastic.
Overall Dimensions:
14-1/4" W X 15" H X 10-1/4" D
Color: Putty
Rubbermaid K6-R2956-82.

q.) Telephones:

The Contractor is to provide the following telephone equipment and services. The Contractor will pay for all billings. Cellular type telephones will become property of the City

1.) (4) Telephone for Three Line installation:

Panasonic KX-T3170.

2.) Telephone Services:
a.) touch tone service
b.) conference calling
c.) Voicemail for (4) persons
d.) Broadband connection (DSL)

3.) Phone Lines:
(3) Independent phone lines; one line is to be a dedicated fax line.

r.) (1) Fax Machine:

The Contractor is to provide an *HP Office Jet* plain paper fax machine. The Contractor will supply all paper in sizes as requested and toner cartridges as required. The Contractor will pay for all rental and maintenance fees. In the event the fax machine is not operational for a period of more than three days it will be replaced with an equal unit.

s.) (2) External Hard Drives

The Contractor is to provide two external Hard-drives of type Western Digital 4TB Elements Portable External Hard Drive or approved equal for project file storage Contractor to provide product data for approval prior to purchase. Hard drives will become property of the City.

t.) (0) Plan Files and (0) Bases

Flat File. Steel five-drawer with dust covers for 36" x 48" sheets. Steel flush bases for 36" x 48" size files. Mayline MA7869D-1 Files and MA7869W-1 Bases.
Plan files and bases will become the property of the City of Chicago

(3) Security/Fire Alarm System:

The Contractor will provide an independent security/fire alarm system for the City representative's trailer. Local sensing devices will be installed at all doors and windows and motion detectors will be installed in each main room of the trailer. In addition, smoke and heat detectors will be

installed in each main room. In the event of a break-in or fire, a local alarm will sound and, at the same time, a central security station (police or independent) will be notified via an independent phone line. All keys for the system will be transmitted to the City's representative. The Contractor will have a service/maintenance contract with the installer and pay for all billings.

C. Office Trailer Space Requirements:

The space requirement of the city's field office use is to be a minimum of 1200 Sq. Ft.. The City has final approval as to the size, location and quality of the field office space to be provided. Office equipment and space is to be provided for the exclusive use of City personnel as noted herein.

D. Parking:

The Contractor will provide for (2) reserved parking spaces for the exclusive use of City's representatives. The spaces will be conveniently located in the vicinity of the City representative's office. The Contractor will provide a total of (2) leased parking spaces in a parking garage. The parking spaces must be approved by the resident engineer before renting. The space(s) will be leased for the time beginning seven (7) days prior to the start of construction at the site until thirty (30) days after the completion of the "Punch List" (including all time extensions). The City will have final approval as to the location and quality of the leased parking spaces.

E. Moving of City Equipment:

The Contractor will provide labor to pick up, load, transport, and unload City personnel files and equipment at the start and completion of the project. Pick up and drop off locations and dates will be determined by the City.

17. TEMPORARY STAIRS, LADDERS, ETC.

A. This section supplements the provisions of Book 1 of the Contract Documents, no hoist, scaffolding or other equipment will be erected at such location as will interfere with or affect street or pedestrian traffic, CTA trains or passengers unless previously approved by the Commissioner.

18. TEMPORARY BARRICADES, ENCLOSURES, ETC.

A. This section supplements the provisions of Book 1 of the Contract Documents, the Contractor will provide temporary barricades or enclosures as required during the progress of the work to protect the

public and Contractor's personnel as directed or deemed necessary, at street level and/or track level. Barricades must be maintained in “new” condition.

B. Temporary work screens or enclosures will be provided, erected and maintained by the Contractor, to separate pedestrian and vehicle traffic, building areas, CTA passengers and trains free of debris, dirt, etc. resulting from this work, including provisions of all required covered canopy protection for passerby and station occupant against all danger of injury, as approved by the Commissioner, especially from falling objects.

C. All protective measures will be erected and maintained in accordance with the requirements of City, State, and Federal authorities and as directed by the Commissioner. All lumber will be AC grade and fire rated.

D. Existing building entrances in the area of work will be secured and protected by temporary barricades with canopies in accordance with IDOT Standards.

E. All graffiti that appears on any portion of the project exposed to the public will be removed immediately upon discovering of such graffiti. Failure to remove graffiti within 24 hours of written notice by the City, the City will take action to remove graffiti and all costs will be borne by the Contractor.

F. The Contractor will be responsible for graffiti removal and maintenance within contract limit lines from the time of Notice to Proceed to completion of Final Punch List.

19. WELDING

A. This section supplements the provisions of Book 1 of the Contract Documents:

B. No welding, flame cutting, or other operations involving use of flame, arcs, or sparking devices, will be allowed without adequate protection, subject to approval of the Commissioner, and without prior notification to CDOT and CTA.

C. All combustible or flammable material will be removed from immediate working area. If removal is impossible all flammable or combustible materials will be protected with an asbestos fire blanket or suitable non-combustible shield to prevent sparks, flames, or hot metal from reaching flammable or combustible materials.

D. The Contractor will provide necessary personnel and equipment to control incipient fires resulting from welding, flames cutting, or other sources involving use of flame, arcs, or sparking devices.

E. The Contractor will protect the public and vehicular traffic from any overhead welding being performed.

20. WELDER'S CERTIFICATIONS

A. This section supplements the provisions of Book 1 of the Contract Documents:

B. All welders for any portion of the project, whether field or shop, will be recertified specifically for this project. There will be no exceptions to this requirement unless so authorized by the City.

21. PAYMENT FOR CONTRACT CHANGES

A. Any proposed changes in this Construction Contract will be submitted to the Commissioner for his/her prior written approval. Additional work on this contract will be performed either on a proposal, unit price or force account basis.

B. All claims for contract changes in this Construction Contract will be submitted to the Commissioner within thirty (30) days of the Contract Completion date as defined in the Time of Completion section in the Proposal Pages. Claims not submitted within thirty (30) days will not be accepted.

22. CERTIFIED PAYROLLS - CONSTRUCTION PROJECTS

A. The Commissioner will obtain for each Contractor and subcontractor a certified copy of each weekly payroll within seven days after the regular payroll date. Following a review by the Commissioner for compliance with State and Federal labor laws, the payroll copy will be retained at the project site for later review. A Contractor may use the Department of Labor Form WH-347, "Optional Payroll Form", which provides for all the necessary payroll information and certifications. This Department of Labor form may be purchased at nominal cost from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. However, the Contractor may use his own payroll form provided it includes the same information and certifications as the Department of Labor Form WH-348, "Statement of Compliance".

23. SAMPLES

A. The Contractor will submit, to the Commissioner, samples of all materials, equipment, fixtures, appliances and other fittings, as required in the various sections of the specifications, with such promptness as to cause no delay in the work, allowing sufficient time for review and approval. The Commissioner will review and check such samples, but only for conformance with the design concept of the project. The Commissioner's determination will be final and binding.

B. Unless otherwise specified, all samples will be submitted in triplicate, of adequate size showing quality, type, color range, finish, texture, etc. The contractor will label each sample with material name and other pertinent data.

C. Where specifications require manufacturer's printed installation directions, the Contractor will submit to the Commissioner four (4) copies of such directions submitted with samples for approval. Duplicate signed transmittal letter requesting approval off samples will be submitted with all samples.

D. All transactions with manufacturers, material providers, dealers will be only through the Contractor and the Contractor will secure the Commissioner's written approval prior to ordering any materials. All materials furnished for the project must be as represented by the approved samples. All

delivery or other charges will be prepaid before acceptance by the Commissioner for approval.

24. ADJUSTMENT OF EQUIPMENT

A. Before the work is turned over to the City, the Contractor will furnish necessary instruments, test equipment, services and personnel required to adjust and balance each piece of equipment in order to leave the work as a smoothly functioning, well integrated system complying with the letter and intent of the Contract Documents.

25. OPERATION AND MAINTENANCE INSTRUCTION

A. The Contractor will provide the service of competent engineers or certified trained installation and maintenance personnel to adequately train the City and CTA's employees in proper operation and maintenance of all systems.

B. Instructors will devote their full time to a training program as required. Observation of construction by the City or CTA personnel will not be construed as instruction time. Ratio of time involved will be approximately 25% classroom and 75% on-the-job instruction, except that ratio may be reversed for control systems. Manufacturer's literature and copies of approved posted instructions will be used as a basis for training.

C. The Contractor will submit proposed scope of material and instruction schedule to the Commissioner for review and approval approximately 90 days before completion of the work. Mutually agreeable dates for receiving this training by employees will be arranged through the Commissioner.

26. OPERATION AND MAINTENANCE MANUALS

A. Not less than 30 days before completion of the work, the Contractor will furnish a complete list of equipment actually installed, especially of the type having nameplate data. List will include a copy of pertinent nameplate data, name and address of local representative who stocks or furnishes repair or replacement parts, and name, address, and telephone number of the subcontractor responsible for the equipment under the

guarantee.

B. The Contractor will submit suitable operating instructions for each major component of equipment and its controls. Instructions will include a schematic system or riser diagram accurately showing equipment and controls as installed. Included with diagram will be a set of simple operating instructions stating how system will be stopped and started, what adjustments are to be made by the operator, and what to do in case of emergency. Sequence of operation designated in the Contract Documents will be used as basis for operating instructions. Valves, switches, operators, and control points will be clearly numbered or labeled and these numbers or labels reflected in the instructions. Two copies of proposed instructions will be submitted to the Commissioner for approval. Upon approval, the Contractor will post applicable instructions.

C. The Contractor will submit maintenance data prepared by the manufacturer of each major component of equipment and its controls.

Data will include complete parts listed, itemized list of common purchase items of materials, such as bearings, packing, connectors, sealing devices, and other standard items indicated by their standard trade designation, recommended routine and inspection maintenance, including testing recommendations to evaluate efficiency of performance, list of special tools and gauges, lubricating instructions, and recommended spare parts list, important tolerances and clearances required for maintenance, and troubleshooting guides prepared in a simple format to indicate complaint or problem, probable cause and remedy.

D. The Contractor will submit 12 copies of approved operating instructions and maintenance data to the Commissioner. Material will be bound neatly in identical vinyl-covered loose-leaf binders with appropriate index tabs.

27. PROJECT SIGN

A. The Contractor will provide, erect and maintain a sign satisfactory to the Commissioner identifying the project (photo image provided by CDOT) and indicating federal, state and/or city participation.

B. One sign will be erected at each major entrance to the project (minimum of 2 locations) for maximum public identification of the work and will be maintained in good condition until completion of the project. Upon project completion, the signs will be removed.

C. Signs are to be cut from standard 4' x 8' waterproof plywood sheets, or other suitable material with Plexiglas protective cover.

D. No information will be included on the project signs except that approved.

E. The Contractor will also provide and erect and maintain City of Chicago, Department of Transportation signs satisfactory to the Commissioner of Transportation which meets all the requirements in paragraphs B thru D (inclusive) above. Examples are at current CDOT Transit construction sites.

F. The Contractor to remove any graffiti within 24 hours.

28. SOILS AND SUBSURFACE INFORMATION

A. Where soil borings, test pits, or other sub surfaces information are included in the Contract documents, the information pertaining thereto is believed to be reasonably correct, but the City does not guarantee the accuracy of completeness of such information. Additional information or data on the subsurface conditions may subsequently become available. Upon the request of the Contractor, such information which may be on file will be made available for inspection at the CDOT; however, while the information pertaining thereto is believed to be reasonably correct, the City does not guarantee the accuracy or completeness of such information.

B. The subsurface information represents only that encountered within the relatively small area of subsurface actually investigated and may not be indicative of the subsurface conditions which will be encountered during construction. This information was prepared as an aid to the designers of the project and is only included or made available for the convenience of the Contractor. This information is not intended to reflect subsurface conditions as they may affect actual construction procedures. The Contractor will interpret this information according to his/her own judgement and not rely upon it as accurately descriptive of subsurface conditions as they are and/or which may be found to exist.

C. The City does not take any responsibility in regard to the nature of the subsurface conditions which may be encountered during construction. The Contractor will satisfy himself prior to bidding, by such methods as he or she may prefer, as to the nature of the subsurface conditions, including any obstructions, which may be encountered during construction.

29. SALVAGED MATERIAL

A. Prior to demolition, the Contractor will inventory all items to be removed. From this inventory, CDOT will list all items the Contractor will salvage and deliver to CTA West Shop. Care will be taken by the Contractor to prevent damage in his/her handling of these items and appurtenances.

30. PUBLIC CONVENIENCE

A. The Contractor will be required to notify the Commissioner in writing a minimum of four working days before beginning any construction stage that will require a change in street traffic patterns. This notification is necessary to allow sufficient time for the City to notify the public

B. Copies of all notifications to the various agencies not submitted directly to the Commissioner will be forwarded to the Commissioner.

31. WEEKLY CONSTRUCTION PROGRESS MEETING

A. There will be a weekly construction progress meeting at the Contractor's

temporary field office to review the project's progress and to discuss any problems or concerns. The Contractor will submit and explain his/her two week work schedule. There will be in attendance on regular basis appropriate representatives from the public sector, Contractor, CDOT and its Consultant, and other representatives, and on an as-needed basis others, including Design Engineers and Construction assistance personnel when requested by CDOT.

32. CONTRACTOR'S RESPONSIBILITY FOR WORK

A. The Contractor's responsibility for the work prior to final acceptance by the Commissioner. Since the roadway; are open to traffic, it will be the Contractor's responsibility to restore, rebuild, or repair any damage to his or her work caused by such traffic without additional cost to the Commissioner. No extra compensation will be allowed for these provisions and any work performed hereunder will be considered incidental to the Contract.

B. All materials or plant used in the construction of the work will be so placed as to safeguard traffic on streets and alleys adjacent to the site of the work, and so as to allow free access to all fire hydrants, water valves, manholes that are a part of electric, telegraph and telephone conduit lines, and all fire alarm and police call boxes in the vicinity.

33. FINAL ACCEPTANCE

A. This section supplements the provisions of Book 1 of the Contract Documents:

B. At substantial completion, completion of punch list, and prior to final acceptance the Contractor will clean (3) three times all areas within the contract limits. This will include removal of graffiti, debris, and stains.

C. Final acceptance by CDOT will be contingent on the work (including punchlist items) and record documentation (As-Built Drawings) being completed in every respect. In addition to the normal contract closeout documents required as stated in the Contract Documents, the Contractor will employ must submit record documentation (As-Built Drawings) of the project as described below:

1. The As-Built Drawings must be a complete set of drawings in the same format of the Bid Drawings with all disciplines and sheets represented. The As- Built Drawings must be entirely generated by the contractor and subcontractors depicting exactly how the project was built. Markup’s on bid drawings will NOT be accepted as part of an As-Built drawing.

2. Contractor must submit One (1) set of full size print outs As-Built Drawings.

3. Contractor must submit Two (2) flash drives containing CAD (AutoCAD) files of each sheet of the As-Built Drawing set. Each sheet of

the set must be an individual CAD file with all external references and attachments included such that the sheet can be printed directly from the disc.

4. Contractor must submit Two (2) flash drives containing PDF (Adobe) files of each sheet of the As-Built Drawing set. Each sheet of the set must be an individual PDF. The disc should also contain a file which is contains all sheets combined in a single file.

5. The Contractor is required to submit monthly in-progress as-built drawings to the Commissioner for review depicting work completed in that calendar month.

34. TIME SCHEDULE PROSECUTION OF THE WORK

A. The Contractor will submit a progress schedule in the form commonly known as the "Critical Path Method".

B. General Factors in the Preparation of the "Critical Path Method" (CPM):

(1) The activities noted on the CPM will be the same as those items noted on the payment breakdown. The schedule will be used in conjunction to determine status of payment.

(2) J Node Numbers will correspond to the succeeding I Node Numbers.

(3) The schedule will take into account all official union holidays which pertain to the trades performing the work.

(4) The Contractor will incorporate into the schedule all utility relocations which may be performed by other contractors or utilities. The Contractor is responsible for verifying the duration required for each utility relocation.

(5) The Contractor will take into account the seasonal availability of a product and/or the temperature and humidity restrictions of a product when preparing the schedule.

(6) It is further understood and agreed to that no work is to begin at the site until a schedule has been submitted and approved by the City.

C. Submittals:

(1) For all submittals, the Contractor will take into account all scheduled City of Chicago holidays. A list of these holidays may be obtained from the Commissioner.

(2) Submittals will be reviewed by the City in a timely fashion but the time frames for each review will vary depending on the complexity

of the submittal.

(3) The Contractor will allocate time for each submittal to allow for the possibility of rejection and resubmittal.

D. CPM Chart:

The Contractor will submit a Critical Path Schedule in a bar chart format with time frames delineated. The chart will be color delineated (using different colors for each) to show "Critical" activities, "Next-to-Critical" activities, and "Normal" activities. The following information is to be visually noted on the CPM chart.

(1) Activity Name.

(2) I Node Numbers for Each Activity or Predecessors for Each Activity.

(3) J Node Numbers for Each Activity or Successors for Each Activity
(4) Critical Activities.

(5) Next-to-Critical Activities.

(6) Dependent Activities Connected by "Dependency Lines".

(7) Manpower for Each Activity (Including Trade Designation).

E. CPM Spreadsheet:

The Contractor will submit a Critical Path Schedule Spreadsheet indicating the following information for each activity. The spreadsheet will be color delineated (using different colors for each) to show "Critical" activities, "Next-to-Critical" activities, and "Normal" activities.

(1) I Node Number.

(2) J Node Number.

(3) Activity Description.

(4) Percent Completed.

(5) Duration.

(6) Early Start Date.

(7) Early Finish Date.

(8) Late Start Date.

(9) Late Finish Date

(10) Manpower for (Including Trade Designation).

(11) Preceding Activities.

(12) Succeeding Activities.

F. Submittal of CPM Chart and Spreadsheet:

(1) The CPM Chart and Spreadsheet will be submitted to the Commissioner within 14 calendar days AFTER NOTICE TO PROCEED. The Contractor will not be allowed to commence site operations until an acceptable CPM chart and spreadsheet have been submitted.

(2) The Contractor is to submit an updated CPM Chart and Spreadsheet to the Commissioner as follows:

a. For Projects with Contract Durations of 90 Calendar/Working Days or Less: Submit an updated CPM Chart and Spreadsheet at 40% completion and 80% completion (based on the payment voucher).

b. For Projects with Contract Durations of More than 90 Calendar/Working Days but Less than 180 Calendar/Working Days:

Submit an updated CPM Chart and Spreadsheet at 25% completion, 50% completion and 75% completion (based on the payment voucher).

c. For Projects with Contract Durations of More than 180 Calendar/Working Days:

Submit an updated CPM Chart and Spreadsheet monthly.

d. With each "Request for Time Extension" as noted below.

e. As requested by the City of Chicago.

f. Partial payment may be withheld at the discretion of the Commissioner if the updated CPM Chart and Spreadsheet has not been submitted as specified in (2) above.

G. Request for Time Extensions:

In the event the Contractor considers that the project has been delayed due to actions initiated by the City of Chicago then a "Request for Time Extension" is to be submitted in writing to the Commissioner. The request is to specifically indicate the activities which the Contractor considers to have delayed the project and indicate all preceding and succeeding events for each activity which was affected. In addition, the Contractor is

to submit a revised and updated CPM Chart and Spreadsheet including any new activities which the Contractor considers to have caused the delay. If the Contractor considers a duration of an existing activity to have been extended due to the City of Chicago then the delay is to be indicated on the chart and the spreadsheet as a new activity. Submittal of a time extension request after the ten (10) day period as noted in the contract will result in the request being waived and voided.

35. PUNCH LIST TIME OF COMPLETION

It is also understood and agreed that TIME IS OF THE ESSENCE IN CLOSING OUT THE JOB SITE WORK OF THIS CONTRACT, and the Contractor agrees to begin work immediately after receipt of formal comprehensive list of minor miscellaneous or finishing work also known as "Punch List" work.

A. Request for "Substantial Completion":

Upon completion of the contract work, the Contractor will submit a written notice to the City requesting "Inspection for Substantial Completion". If the City considers the project to be at an acceptable state of completion a "Substantial Completion" review will be scheduled and conducted. The City will compile and issue a formal Punch List and a "Date of Substantial Completion" letter to the Contractor. From the day of receipt of the Punch List the Contractor will have five (5) calendar days (excluding Saturday and Sunday) to issue the Punch List to the subcontractors and to respond to the City regarding any disputed items as noted in Paragraph D.2 below.

B. Time of Completion:

It is further understood and agreed to that the Contractor has (30) calendar days to complete the Punch List. Failure to complete the designated Punch List work within the thirty day calendar day time frame will result in the assessment of liquidated damages as herein stated. The thirty calendar day time frame will begin after the third day after the issuance of the Punch List to the Contractor

For the Punch List time frame, "calendar days" are to be defined as noted in the Contract. It will be noted that Saturdays, Sundays, and Holidays will be charged as calendar days.

C. Deficient Work Found After Issuance of Punch List:

It is further understood and agreed that the issuance of the Punch List in no way relieves the Contractor from guarantee/warranty work or from incomplete or deficient contract work which may be found after the issuance of the Punch List.

D. Exceptions to Thirty Calendar Days:

1. Revision Work:

In the event the City issues revision work and the time to complete

said work, due to delivery times or duration of the work, exceeds the established thirty calendar days an independent "Time of Completion" is to be determined for that specific work. If the Contractor fails to meet the independent completion date, then liquidated damages will be assessed as herein stated.

2. Disputes:

In the event the Contractor interprets work indicated on the Punch List as "change work" the City is to be so notified in writing and no later than five (5) calendar days after the issuance of the Punch List. If the City acknowledges that the work in question is "change work" then an independent completion date will be determined as noted in Paragraph 1 above. If the City considered the work in question to be "Punch List" work, then the Contractor is to complete the work within the established thirty calendar day time frame.

3. Completion of Construction Prior to Completion Date:

If the Contractor completes all construction and requests a "Substantial Completion Review" and can complete the issued Punch List and, if issued, revision work, within the originally established "Time of Completion" or formally extended completion dates (time extensions) then the thirty calendar day time frames and associated liquidated damages as noted in Paragraph A above will be voided.

E. Submittal of Documentation:

It is further understood and agreed to that all warranties, guaranties, operating and maintenance manuals, final certified payrolls, and all as-built drawings will be submitted within sixty (60) calendar days from the date of substantial completion (Saturdays and Sundays included). Failure to submit all the documentation within the specified time frame will result in the assessment of liquidated damages as herein stated.

36. SUBSTITUTIONS OF MATERIALS, EQUIPMENT OR PROCESS

A. The Contract executed here under requires the use of the materials, equipment or processes specifically named in the Contract Documents except as otherwise provided herein. The word "processes" as used herein includes methods or systems of construction.

(1) When two or more products are specified for an item of work, anyone thereof is acceptable and the choice is left up to the Contractor.

(2) When only one product is specified, the Contractor may offer for approval a substitute product which will completely accomplish the

purpose of the Contract Documents.

(3) When a specific process is specified as well as a guarantee of the results, the Contractor will, if in the Contractor's judgment the process may not produce the required result, submit for approval an alternative process which can be guaranteed. All such materials, equipment or processes substitutions will be made in writing in accordance with the following procedures:

a. Where several materials are specified by name for one use, select for use any of those specified.

b. Whenever an item or class of material are specified exclusively by trade name, manufacturers name, or by catalogue reference, use only such item, unless written approval for a substitution is secured.

c. Should the Contractor desire to substitute a product for one or more specified by name, the Contractor will request the substitution in writing with supporting data and, as required, samples. If the substitution affects other products or trades the Contractor will pay any and all direct or indirect additional costs (or submit a credit) to the City. The request will clearly state if there are additional costs or a credit involved with the substitution. The Commissioner reserves the right to approve or reject substitution requests.

d. Requests for approval of substitutions of materials, equipment or processes other than those specified will be accompanied by proof satisfactory to the City that:

1.) They are equal in quality and serviceability to the specified products.

2.) Their use will not entail changes in details and construction of related work.

3.) They are acceptable in consideration of the required design and the aesthetic appearance.

4.) There will be a cost and/or time advantage to the City.

B. The Contractor will furnish in writing with the substitution submittal all pertinent technical and cost data. Including complete data on the proposed substitution substantiating compliance with the Contract Documents, such as product identification and description, performance and test data, references and samples where applicable, and an itemized comparison of the proposed substitution with the products specified, with

data relating to contract time schedule, design and artistic effect where applicable and other information as may be required to assist the City in determining whether the proposed substitution is acceptable. The burden of proof will be solely the Contractor's responsibility.

C. All proposed substitutions will be submitted to the City in ample time to permit proper consideration by the City. Failure to submit the substitution as noted above will result in its automatic rejection.

37. SUBMITTAL OF COST AND CREDIT PROPOSALS

In additional to the 10 day notification period as described in the Contract, the Contractor is to submit all cost and credit proposals in accordance with the following time frames:

A. Proposals:

(1) Force Account Basis (Time and Material):

Proposals will be submitted in full within 30 calendar days after the completion of the work (last signed Time and Material). If the proposal has not been submitted within the 30 calendar day time frame then the proposal will be considered waived and voided. Late submittal of a proposal after the 30 calendar day time frame will not be entertained.

(2) Proposal Basis:

Proposals will be submitted in full within 30 calendar days after the issuance of a revision. If the proposal has not been submitted within the 30 calendar day time frame then the proposal will be considered waived and voided. Late submittal of a proposal after the 30 calendar day time frame will not be entertained.

B. Claims:

Claims are hereby defined as costs which the Contractor has determined to have resulted from an action by the Commissioner which was not formally issued as a revision to the Contract. Claims will be submitted within 30 calendar days after the occurrence of the event on which the Contractor is basing the additional costs. If the proposal has not been submitted within the 30 calendar day time frame then the claim will be considered waived and voided. Late submittal of a claim after the 30 calendar day time frame will not be entertained.

C. Credit Proposals:

In the event the Commissioner requests a credit for a portion or portions of the work which have been deleted from the Contract, the Contractor will submit a credit proposal within 30 calendar days after the written request has been issued. Failure to submit the credit proposal within the

30 day time frame will result in an estimated amount determined by the Commissioner being withheld from the next issued pay request.

D. Extensions to Time Frames for Proposals and Credits:

The Commissioner may grant extensions to the submittal time frames as noted above if the complexity of a proposal or credit so merits. The Contractor will request the extension in writing within the first five days of the noted time frames (excluding Saturdays and Sundays). The decision made by the Commissioner as to the acceptance or rejection of an extension is final. Requests for extensions will not be entertained for claims against the Contract.

38. VALUE ENGINEERING INCENTIVE

A. This clause applies to those Value Engineering Change Proposals (VECPs) which are initiated and developed by the Contractor to change the drawings, specifications, or other requirements of this Contract. In order to be accepted under this Section each VECP will:

(1) Be identified by the Contractor at the time of submission to the Commissioner as submitted pursuant to this Section;

(2) Be an original proposal by the Contractor, not one that is equivalent to another proposal already under consideration by the City, obtained from a source other than the Contractor;

(3) Require a change to this Contract;

(4) Decrease the contract price; and

(5) Maintain the items required functions such as service life, reliability, economy of operation, ease of maintenance, and necessary standardized features and appearance, and not require an unacceptable extension of contract time.

B. Any VECP the Contractor submits will be in sufficient detail to clearly define the proposed change including:

(1) A description of the difference between the existing and the proposed contract requirements, and the comparative advantages and disadvantages of each;

(2) Contract requirements recommended to be changed if the proposal is accepted;

(3) A detailed estimate of the amount of the savings as defined in paragraph E that will result from acceptance of the proposal;

(4) A prediction of any effects the proposed change would have on costs of maintenance and operations; and

(5) A statement of the time by which the proposal must be accepted so as to obtain the maximum price reduction, noting any effect upon the contract completion time.

C. The Commissioner may accept or reject part or all of any VECP by giving the Contractor written notice thereof. Until such notice is issued the Contractor will remain obligated to perform in accordance with the terms of the Contract. VECPs will be processed expeditiously, however, the City will not be liable for any delay in action upon any proposal submitted pursuant to this Section. The decision of the Chief Procurement Officer as to acceptance or rejection of any such proposal will be final and will not be subject to the "Disputes" section of this Contract.

D. The Contractor has the right to withdraw past or all of any VECP at any time prior to final acceptance. Such withdrawal will be made in writing to the Commissioner and the Chief Procurement Officer. Each VECP submitted by the Contractor will remain valid for a period of 60 days from date submitted. If the Contractor desires to withdraw the proposal prior to the expiration of this period he will be liable for the cost incurred by the City in reviewing the proposal.

E. When a VECP submitted pursuant to this Section is accepted:

(1) An equitable adjustment in the Contract price and in any other affected provisions of the Contract will be made and the Contract modified in accordance with this Section and the "Changes" or other applicable sections of this Contract;

(2) The gross savings resulting from the change will be shared between the Contractor and the City on the basis of 50 percent for the Contractor and 50 percent for the City. Only the contract savings from this Contract will be subject to the 50 percent sharing, not the savings from any concurrent or future contracts, nor any savings from collateral costs such as operations or maintenance of the facility. Estimate gross savings will include Contractor's labor, material, equipment, overhead, profit and bond. The contract unit price will be reduced by the sum of the City's share of the gross savings;

(3) The Contractor is entitled to share in contract savings only to the full extent provided for in this Section, and will not include any supplemental agreements to or other modifications of this Contract, executed subsequent to acceptance of the particular VECP, by which the City increases or decreases the quantity of any item, or adds or deletes any item.

F. The Contractor will use his best efforts to include Value Engineering arrangements in any subcontract, which in his judgment, appears to offer sufficient value engineering potential.

G. The Contractor may restrict the City's right to use any VECP data by marking it with the following statement:

This data, furnished pursuant to the Value Engineering section of this Contract, will not be duplicated used or disclosed in whole or in part for any purpose except to evaluate the VECP, unless the proposal is accepted by the City. This restriction does not limit the City's right to use information contained in this data if it is or has been obtained or is otherwise available from the Contractor or from another source, without limitations. When this proposal is accepted by the City, the City will have the right to duplicate, use, and disclose any data in any manner and for any purpose whatsoever, and have others do so whether under this or any other City contract.

39. TRAFFIC CONTROL / TRAFFIC PLAN

A. This section supplements the provisions of Book 1 of the Contract Documents:

B. In the event the Contractor must close traffic lanes or sidewalks to complete the Contract work a "traffic plan" will be submitted indicating the following information:

1. Dates and times of intended closures.
2. A scale plan indicating where vehicular and pedestrian traffic is to be rerouted.
3. Locations and types of traffic control signage.
4. Locations and types of barricades to be used.
5. Positioning of Contractor flagperson(s).
6. Location and types of heavy equipment to be used during the closure.

C. It is further understood and agreed to that the Commissioner may instruct the Contractor to provide one or more of the additional items at no additional cost to the City:

1. Temporary handicapped ramps.
2. Flagperson(s) to direct pedestrian and/or vehicular traffic.
3. Traffic control signage of varying types and sizes.
4. Barricades of varying types and lengths.

D. Upon approval of the submitted traffic plan by the City the Contractor may apply for the appropriate lane closure permit. It is further understood and agreed to that the City may revoke the Contractor's closure permit if it is found that the approved traffic plan is not being adhered to. All traffic lanes are to be submitted at least fourteen calendar days before the intended date of closure.

1. Flagperson(s) for pedestrian traffic are to be provided whenever traffic is forced into the adjacent curb lane. At least one flagperson will be required at each end of the closure.

2. The use of plastic warning tape in lieu of barricades will not be permitted.

3. When the path of a pedestrian reroute is next to or under areas where equipment or material will be lifted, or where overhead work is occurring, then covered canopies (with approved lighting) will be provided. The Contractor will submit the design and configuration of the canopies to the City for review.

4. Temporary provisions will be made for disabled pedestrians as required.

40. ADMINISTRATION AND SUPERVISION OF THE WORK

A. This section supplements the provisions of Book 1 of the Contract Documents:

B. Project Manager and Office Support Staff

1. The Contractor will furnish a competent and adequate staff for the proper administration, coordination, and supervision of the work. Prior to the date of the Notice to Proceed, the Contractor will designate a Project Manager who will direct the project for the Contractor. A resume, including three references from the Project Manager's last three projects, will be submitted to the City for review and approval. The City reserves the right to reject any proposed personnel due to lack of experience and/or unfavorable past performances.

2. The Project Manager will be responsible for the prosecution of the work, with full authority to act in all matters as necessary for the proper coordination, direction and technical administration of the work. The Project Manager will attend all meetings at such place or places as will be decided by the City in order to render reports on the progress of the work.

C. Superintendent and Field Engineering Staff

1. The Contractor will keep on the job throughout its duration a competent Superintendent and any necessary field engineering staff, all of whom must be satisfactory to the City. Resumes, including references from their last three projects, of the Superintendent and any field engineering staff are to be submitted to the City for review and approval. The City reserves the right to reject any proposed personnel due to lack of experience and/or unfavorable past performances.

2. The Superintendent will not be changed without the consent of the City unless the Superintendent proves to be unsatisfactory to the Contractor. In the event the Superintendent is changed the Contractor will submit the resume of a replacement for approval by the City as noted above.

3. In the event the Superintendent or a member of the field engineering staff becomes unsatisfactory to the City during the course of the project the individual or individuals will be dismissed by the Contractor. The resumes of replacements will be submitted to the City for approval as noted above.

4. The Superintendent will represent the Contractor in his or her absence and all directions given to the Superintendent will be as binding as if given to the Contractor.

41. SITE AVAILABILITY

A. The City does not give any assurance to the Contractor that the entire work site will be available at one time, nor that any particular item or items of work, regardless of whether it is performed by the General Contractor or any of his subcontractors, can be performed in a continuous, optimum and efficient manner. The Contractor will assume that individual items of work may be interrupted, delayed or may have to be performed in several steps requiring his workmen and equipment, and workmen and equipment of any of his subcontractors, to leave and later return to the work site. The City will not honor any claims for inefficient performance of work. The Contractor will inform all of his/her subcontractors of this condition. The Contractor will also not be compensated for any delays caused by railroad companies.

42. CONFLICT BETWEEN DRAWINGS AND/OR SPECIFICATIONS

A. It is hereby understood and agreed to that in the event there is a conflict between the Contract Drawings or between the Contract Specifications, the Contractor will bid on the most expensive product or process and notify the City in writing that the conflict exists.

43. CHICAGO DEPARTMENT OF TRANSPORTATION GENERAL GUIDELINES FOR TRANSIT PROJECTS CONTRACTOR'S QUALITY PROGRAM

1.0 DEVELOPMENT, SUBMITTAL, AND APPROVAL OF CONTRACTOR'S QUALITY PROGRAM

1.1 SCOPE

Quality is the responsibility of the Contractor. This guide defines the roles and responsibilities of the Contractor in the management of quality in the construction of Chicago Department of Transportation (CDOT) Projects.

SECTION 01 11 00
SUMMARY OF WORK

PART 1 - GENERAL

1.01 SUMMARY

A. This section contains a general Scope of Work to be performed by the Contractor under this Contract.

B. Related Sections:

1. Drawings and general provisions of the Contract, including Book I Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.
2. Section 01 35 00 - Special Procedures

1.02 PROJECT DESCRIPTION

A. General Scope of Work: The Work to be performed includes but is not limited to Construction of an elevated rapid transit station on the Loop Elevated Line at State Street and Lake Street as well as accessibility improvements at the Lake Red Line Subway Station. The Work includes the following, which may or may not be a complete list:

1. Phased demolition of the existing State/Lake Station.
2. Foundation construction including micropiles, drilled shafts, earth retention, and excavation.
3. An eight-car platform with fare collection area with architectural finishes including four elevators, two escalators, flyover bridge and a canopy.
4. Mechanical, plumbing, electrical, lighting, communications, signage and fare collection systems will be installed.
5. Civil site work as it relates to utility connections, utility relocation, vaulted sidewalk modifications, pavement reconstruction, medians, sidewalks, roadway lighting, signaling and streetscaping.
6. Track and track structure modifications and replacements.
7. Train control signals system modification.
8. Phased partial demolition of the existing Lake/Randolph subway mezzanine.
9. Renovation of the existing Lake/Randolph subway mezzanine and platform to add two elevators.

B. This project also includes all appurtenant and collateral work necessary to complete the Work as shown on the plans, as specified in the Contract Documents and as directed by the Commissioner.

C. This project description is intended to be general in nature and is neither a complete description nor a limitation on the Work to be performed. The Contractor shall perform all Work described in the Contract Documents or reasonably inferred, as necessary, to produce the results specified therein, except to the extent specifically indicated in the Contract Documents to be the responsibility of others.

PART 2 - PRODUCTS (Not Used)

PART 3 – EXECUTION

3.01 AGENCY AUTHORITY

A. “The Authority”, “CTA”, and “Chicago Transit Authority”, when stated in the Specifications or in the Plans, shall mean the President of the Chicago Transit Authority or the President’s designee.

B. The contract shall be governed according to the provisions of Book 1 and Book 2 of the Specifications and shall be overseen by the Commissioner of the Chicago Department of Transportation and the Chief Procurement Officer.

C. In cases where the Detailed Specifications require submittal to or approval from the Chicago Transit Authority, this shall be interpreted to mean the Commissioner. The Commissioner may delegate review or approval to the Chicago Transit Authority in certain cases, when the Commissioner indicates. The Commissioner may direct the Contractor to submit certain materials directly to the Chicago Transit Authority, when the Commissioner indicates.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of SUMMARY OF WORK will not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of this section will be considered incidental to this contract.

END OF SECTION

SECTION 01 18 00
PROJECT UTILITY COORDINATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book I Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section specifies the requirements of the Contractor for utility coordination.

1.03 CONTRACTOR REQUIREMENTS:

A. The Commissioner does not guarantee the completeness or accuracy of the information shown in the Contract Documents regarding utilities, either public or privately owned. The Contractor must contact the City of Chicago Office of Underground Coordination in accordance with the Illinois Underground Utility Facilities Damage Prevention Act to determine the existence, nature and location of all utility lines and similar structures at the site. The Contractor must verify the exact location of all utilities or structures that may interfere with construction operations.

B. Investigate and positively identify by the means of field surveys, exploratory holes or probes, the vertical and horizontal locations of existing utilities requiring protection or relocation during excavations or construction operations. The number and locations of the field surveys and exploratory holes or probes are at the discretion of the Contractor but must be sufficient to determine what, if any, utilities require relocation or protection.

C. Where existing utilities are abandoned and it is necessary to remove these utilities in order to execute the Work, the utilities must be removed by the Contractor and be disposed of as directed by the Commissioner. The Contractor is responsible for contacting and coordinating with the utilities in determining the location and limits of the existing utilities which are to be abandoned and removed and utility-owned infrastructure to be returned to the utility, if any.

D. The Contractor has sole responsibility for the coordination of all utility relocations, modifications or improvements required to complete this Contract and must designate and appoint one of its staff as Utility/MOT Coordinator to coordinate and monitor all and maintenance of traffic (MOT) utility work.

E. Existing Utilities to Remain:

1. The Contractor is responsible to protect existing utilities which are to remain in operation during and after completion of the Project, and any new utilities installed by others during the construction period. The Contractor is responsible for providing adequate notice and coordinating with the utilities regarding protection of existing utilities in accordance with the Illinois Underground Utility Facilities Damage Prevention Act. The Contractor must coordinate through the Chicago Utility Alert Network (DIGGER) at (312) 744-7000. (https://ipi.cityofchicago.org/Digger).

2. The Contractor is responsible for any support or reconstruction of utilities required for the protection of utilities to remain in place. The Contractor will be held fully responsible for any damages resulting from their construction operations, and will be required to repair, replace or reconstruct any of the utilities damaged, or pay for having the work done, as required by the Commissioner, to the satisfaction of the Commissioner and Owner of such utility. The protection of the utilities as specified herein, including support or reconstruction work, will not be paid for separately from the Contractor's lump sum price for the Work but the cost thereof will be considered as incidental to the Contract.

F. Existing Utilities to be Relocated:

1. The Contractor must provide adequate notification to the utility providers to allow for the completion of utility relocation work to be performed by the utility provider's own forces during regular (straight-time rate) working hours.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of PROJECT UTILITY COORDINATION will not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for work specified in the PROJECT UTILITY COORDINATION article will be included in the contract lump sum price as shown in the Schedule of Prices for MOBILIZATION.

4.03 PAY ITEM ACCOUNT NUMBER

A. Mobilization: 017113

END OF SECTION

SECTION 01 25 00
SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions, and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Requirements:
1. Section 01 60 00 - Product Requirements

1.03 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
2. Substitutions for Convenience: Changes proposed by Contractor or Commissioner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Commissioner.

1.04 ACTION SUBNIITTALS

A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
1. Substitution Request Form: Use facsimile of form provided in Project Manual.
2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Commissioner and separate contractors, which will be necessary to accommodate proposed substitution.
c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. Certificates and qualification data, where applicable or requested.
g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
h. Material test reports from a qualified testing agency indicating and interpreting test

results for compliance with requirements indicated.

i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.

j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.

k. Cost information, including a proposal of change, if any, in the Contract Sum.

l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.

m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Commissioner's Action: If necessary, Commissioner will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Commissioner will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

1.05 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.06 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 - PRODUCTS

2.01 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.

1. Conditions: Commissioner will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Commissioner will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution is consistent with the Contract Documents and will produce indicated results.

b. Requested substitution provides sustainable design characteristics that specified product provided.

c. Substitution request is fully documented and properly submitted.

d. Requested substitution will not adversely affect Contractor's construction schedule.

e. Requested substitution has received necessary approvals of authorities having jurisdiction.

f. Requested substitution is compatible with other portions of the Work.

g. Requested substitution has been coordinated with other portions of the Work.

h. Requested substitution provides specified warranty.
i. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Commissioner will consider requests for substitution if received within 60 days after the Notice to Proceed or the Notice of Award. Requests received after that time may be considered or rejected at discretion of Commissioner.
1. Conditions: Commissioner will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Commissioner will return requests without action, except to record noncompliance with these requirements:
a. Requested substitution offers Commissioner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Commissioner must assume. Commissioner's additional responsibilities may include compensation to architect for redesign and evaluation services, increased cost of other construction by Commissioner, and similar considerations.
b. Requested substitution does not require extensive revisions to the Contract Documents.
c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
d. Requested substitution provides sustainable design characteristics that specified product provided.
e. Substitution request is fully documented and properly submitted.
f. Requested substitution will not adversely affect Contractor's construction schedule.
g. Requested substitution has received necessary approvals of authorities having jurisdiction.
h. Requested substitution is compatible with other portions of the Work.
i. Requested substitution has been coordinated with other portions of the Work.
j. Requested substitution provides specified warranty.
k. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION (Not Used)

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of SUBSTITUTION PROCEDURES will not be measured for payment.

4.02 PAYMENT

A. No separate payment will be made for the Work covered in this section. Payment for the Work of SUBSTITUTION PROCEDURES will be included in the applicable Line Item contract lump sum price as shown in the Schedule of Prices.

REQUEST FOR SUBSTITUTION

TO:

FROM: _____
Name of manufacturer

_____
Street address

_____
City and state

_____
Phone number and name of person to contact

PROJECT: STATE/LAKE ELEVATED STATION
Chicago, Illinois
CDOT PROJECT CO. D-1-209

1. Specification Section and Paragraph numbers of product specified

   _____

2. Proposed Substitute

   A. Name and Model No.:

   B. Description:

   C. Attach applicable Submittals as required by the referenced Specification Section, i.e., Product Data, Materials List, Shop Drawings, Samples, Design Data, Test Reports, and Certificates. Attach Shop Drawings to the effect of the proposed substitution on adjacent components of the Work.

   D. Insert Numbers of applicable reference standards:

   E. Attach a color chart, if applicable.

   F. Attach installation instructions.

3. Manufacturer's Reputation: Attach the following:

   A. Evidence of reputation for prompt delivery.
   B. Evidence of reputation for efficiency in servicing products.

4. Comparison: Attach an itemized comparison of the proposed substitution with product specified. Significant qualities may include elements such as size, weight, durability, performance, and visual effects.

5. Changes in Work: Attach data relating to changes required in other work to permit use of proposed substitution and changes required in construction schedule and overall contract time. Coordinate changes or modifications needed to other parts of the Work and to construction performed by the Commissioner and separate Contractors that will be necessary to accommodate the proposed substitution.

6. Cost Data: Attach accurate cost data on proposed substitution in comparison with product specified.

7. Previous Installation: Provide the following information on similar projects on which proposed substitution was used, list projects in the locale of the project primarily and then in other areas that best represent its application on this project:

   Name and Address of Project

   A.

   B.

   C.

   D.

   Date of Installation
   Name, Address, and Phone # of Architect

8. In making a request for substitution, the Manufacturer represents that:

   A. The Manufacturer has examined the Drawings and Specifications and has determined that, to the best of the Manufacturer's knowledge, the proposed substitution is appropriate for the use intended in the Drawings and Specifications.

   B. The Manufacturer will provide the same or better warranty for substitution as for product or method specified.

   C. The product is equal or better in quality and serviceability to the specified item.

_____

Name of Manufacturer and signature of Manufacturer's Rep. Date

_____

Name of Contractor and signature Date

END OF SECTION

SECTION 01 31 00
PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions, and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Work included: Schedule and administer project meetings throughout progress of the work.

B. Contractor's Responsibility: Excepting the General Conference to be conducted by the Commissioner, the Contractor shall prepare the agenda, conduct meetings, record proceedings, distribute recorded proceedings and decisions to participants in meeting and to parties affected by decisions made at meeting.

C. Notification: For meetings not regularly scheduled, give participants not less than three days prior notice.

D. Attendance: The Contractor shall have persons of authority in attendance to represent the Contractors' and the subcontractors' interests.

E. Related Sections:
1. Contract Closeout: Section 01 70 00.

1.03 DEFINITIONS

A. BIM: Building Information Modeling.

B. RFI: Request from Contractor seeking information or clarification of the Contract Documents.

1.04 INFORMATIONAL SUBf1ITTALS

A. Key Personnel Names: Within 10 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including office and cellular telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.
1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone. Keep list current.

1.05 COORDINATION

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.
1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.

2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled or required for later installation.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
1. Prepare similar memoranda for Commissioner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of Contractor's Construction Schedule.
2. Preparation of the Schedule of Values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Startup and adjustment of systems.
8. Project closeout activities.

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

1.06 Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as Commissioner's property.

1.07 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings in accordance with requirements in individual Sections, where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
b. Coordinate the addition of trade-specific information to the coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
f. Indicate required installation sequences.

g. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Commissioner indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Coordination Drawing Organization: Organize coordination drawings as follows:
1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire alarm, and electrical equipment.
4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
6. Mechanical and Plumbing Work: Show the following:
   a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
   b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
   c. Fire-rated enclosures around ductwork.
7. Electrical Work: Show the following:
   a. Runs of vertical and horizontal conduit 1-1/4 inch diameter and larger.
   b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire alarm locations.
   c. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
   d. Location of pull boxes and junction boxes, dimensioned from column center lines.
8. Review: Commissioner will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are the Contractor's responsibility. If the Commissioner determines that the coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, the Commissioner will so inform the Contractor, who shall make changes as directed and resubmit.
9. Coordination Drawing Prints: Prepare coordination drawing prints in accordance with requirements of Section 01 33 00 Submittal Procedures.

C. Refer to individual Sections for additional Coordination Drawing requirements for Work in those Sections.

1.08 KEY PERSONNEL

A. Administrative And Supervisory Personnel: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.
1. Include special personnel required for coordination of operations with other contractors.

1.09 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise

indicated.

2. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Commissioner of scheduled meeting dates and times.
3. Agenda: Prepare the meeting agenda. Distribute the agenda to invited attendees.

B. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Commissioner, within three days of the meeting.

C. General Conference: After award of the contract and prior to performance of any work, the Commissioner shall schedule Pre-Construction Conference to be held among Commissioner, the Contractor, and sub-contractors to review and discuss, though not limited to, the following items:

1. Construction procedures, coordination with public use and traffic.
2. Construction schedule submitted at Pre-Construction Conference and updating.
3. Cost breakdowns.
4. Bonds and certificates of insurance.
5. Pay application procedures and documentation required with the payment requests.
6. Submittal procedures.
7. Introduction of Contractor's and Commissioner's key personnel assigned to the project.
8. Scheduling time and dates for Field Progress Meetings.
9. Critical work sequencing and long-lead items.
10. Procedures for processing field decisions and Change Orders.
11. Procedures for RFIs.
12. Procedures for testing and inspecting.
13. Distribution of the Contract Documents.
14. Submittal procedures.
15. Preparation of Record Documents.
16. Responsibility for temporary facilities and controls.
17. Construction waste management and recycling.
18. Parking availability.
19. Office, work, and storage areas.
20. Equipment deliveries and priorities.
21. First aid.
22. Security.
23. Progress cleaning.
24. Working hours.
25. Minutes: Record and distribute meeting minutes.

D. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Commissioner of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
    a. The Contract Documents.
    b. Related RFIs.
    c. Related Change Orders.
    d. Purchases.
    e. Deliveries.
    f. Submittals.
    g. Review of mockups.

h. Possible conflicts.
i. Compatibility problems.
j. Time schedules.
k. Weather limitations.
l. Manufacturer's written recommendations.
m. Warranty requirements.
n. Compatibility of materials.
o. Acceptability of substrates.
p. Temporary facilities and controls.
q. Space and access limitations.
r. Regulations of authorities having jurisdiction.
s. Testing and inspecting requirements.
t. Installation procedures.
u. Coordination with other work.
v. Required performance results.
vv. Protection of adjacent work.
x. Protection of construction and personnel.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Make a record of each conference and the Contractor's Quality Control Program as required by Section 01 40 00, QUALITY REQUIREMENTS.
5. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
6. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

E. Progress Meetings:
1. General: Schedule progress meetings on a weekly basis for coordinating, expediting, and scheduling of Work. Contractors, sub-subcontractors, and suppliers whose presence is necessary must attend when requested by the Commissioner.
2. Conduct separate coordination meetings with subcontractors. Commissioner will not be present at such meetings.
3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
   a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
      1) Review schedule for next period.
   b. Review present and future needs of each entity present, including the following:
      1) Interface requirements.
      2) Sequence of operations.
      3) Status of submittals.
      4) Off-site fabrication.
      5) Access.
      6) Temporary facilities and controls.
      7) Quality and work standards.
      8) Status of correction of deficient items.
      9) Field observations.
      10) RFIs.
      11) Status of proposal requests.

12) Pending changes.
13) Status of Change Orders.
14) Pending claims and disputes.
15) Documentation of information for payment requests.

4. Minutes: Record the meeting minutes.
5. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
   a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

F. Special Meetings: Called by the Commissioner when warranted and with frequency necessary. Place and time as mutually agreed by the Commissioner.

G. Project Closeout Conference: schedule and conduct a Project closeout conference, at a time convenient to Contractor and Commissioner, but no later than 90 days prior to the scheduled date of Substantial Completion.
1. Conduct the conference to review requirements and responsibilities related to Project closeout.
2. Attendees: Authorized representatives of Commissioner and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
   a. Preparation of record documents.
   b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
   c. Submittal of written warranties.
   d. Requirements for preparing operations and maintenance data.
   e. Requirements for demonstration and training.
   f. Preparation of Contractor's punch list.
   g. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
   h. Submittal procedures.
   i. Installation of Commissioner's furniture, fixtures, and equipment.
   j. Responsibility for removing temporary facilities and controls.
4. Minutes: Record and distribute meeting minutes.

1.09 REQUESTS FOR INTERPRETATION (RFIs)

A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in the form specified.
1. RFIs shall originate with Contractor. RFIs submitted by entities other than Contractor will be returned with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:
1. Project name.
2. Date.
3. Name of Contractor.
4. Name of Commissioner.

5. RFI number, numbered sequentially.
6. Specification Section number and title and related paragraphs, as appropriate.
7. Drawing number and detail references, as appropriate.
8. Field dimensions and conditions, as appropriate.
9. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
10. Contractor's signature.
11. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.
    a. Supplementary drawings prepared by Contractor shall include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments.

C. RFI Forms:
1. Software-generated form with substantially the same content as indicated above, acceptable to Commissioner.

D. Hard Copy RFIs: Identify each page of attachments with the RFI number and sequential page number.

E. Software Generated RFIs: Software generated form with substantially the same content as indicated above.
1. Provide attachments of electronic files in Adobe Acrobat PDF format.

F. Commissioner's Action: Commissioner will review each RFI, determine action required, and return it. Allow 15 working days for Commissioner's response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following workday.
1. The following RFIs will be returned without action:
    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for coordination information already indicated in the Contract Documents.
    d. Requests for adjustments in the Contract Time or the Contract Sum.
    e. Requests for information of Commissioner's actions on submittals.
    f. Incomplete RFIs or RFIs with numerous errors.

2. Commissioner's action may include a request for additional information, in which case Commissioner's time for response will start again.
3. Commissioner's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Special Conditions.
    a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Commissioner in writing within ten days of receipt of the RFI response.

G. On receipt of Commissioner's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Commissioner within seven working days if Contractor disagrees with response.

H. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly with not less than the following:
1. Project name.
2. Name and address of Contractor.
3. Name and address of Commissioner.

4. RFI number including RFIs that were dropped and not submitted.
5. RFI description.
6. Date the RFI was submitted.
7. Date Commissioner's response was received.
8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

1.10 DIGITAL PROJECT NIANAGEMENT PROCEDURES

A. Use of Commissioner's Digital Data Files: Digital data files will be provided by Commissioner for Contractor's use during construction.
   1. Digital data files may be used by Contractor in preparing coordination drawings, Shop Drawings, and Project record Drawings.
   2. Commissioner makes no representations as to the accuracy or completeness of digital data files as they relate to Contract Drawings.
   3. Digital Drawing Software Program: Contract Drawings are available.
   4. Contractor shall execute a data licensing agreement in the form of Agreement included in Project Manual.
      a. Subcontractors, and other parties granted access by Contractor to Commissioner's digital data files shall execute a data licensing agreement in the form of Agreement included in this Project Manual.

B. Upon completion of Project, provide one complete archive copy of Project files to Commissioner in a digital storage format acceptable to the Commissioner.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of PROJECT MANAGEMENT AND COORDINATION will not be measured for payment.

4.02 PAYMENT

B. No separate payment will be made for the Work covered in this section. Payment for the Work of PROJECT MANAGEMENT AND COORDINATION shall be considered incidental to the contract.

END OF SECTION

SECTION 01 32 36

TELEVISED INSPECTION OF SEWER MAINS

PART I - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book I Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes requirements for televising the interior of existing city sewers to document the physical condition of the pipe and structures.

1. Televise existing sewer(s) when new water mains are constructed parallel to the existing sewer. Existing sewer(s) should be televised for their entire length through the construction area, starting at a manhole closest to the beginning of the construction area, working upstream, to a manhole closest to the end of the construction area.

1.03 REFERENCES

A. U.S. Department of Transportation, Federal Highway Administration: Manual on Uniform Traffic Control Devices (MUTCD), Part 6, Temporary Traffic Control.

B. NASSCO: Pipeline Assessment Certification Program (PACP)

1.04 SUBMITTALS

A. The Contractor must provide two (2) DVDs of the televised inspections for documenting the condition of existing city sewers within the area of construction, or as directed by the Commissioner. The first televised inspection must be made before the start of any construction. The second televised inspection is to be made after the water main has been installed and street and parkway restoration has been completed. The location and narration of both the pre-construction and post construction televised inspections must be synchronized by means of narration and an on screen distance meter to enable a comparison to be made to judge the physical condition of the sewer(s) before and after construction.

B. Videotaped inspections must be recorded on a DVD, of such format to be viewed on a PC or multiple-format DVD player in a read only format. All recordings are to be in high quality color. Printed labels on DVD containers and cases must include the name of the water main project, contract number, and date of inspection(s).

1.05 QUALITY ASSURANCE

A. Submit DVDs with logs for quality review and comment to Owner and Engineer within 24 hours after the first days' work has been completed. Submit tapes and logs on a routine basis within seven (7) days after completing each tape. Picture quality and definition shall be to the satisfaction of Owner and Engineer. Inspection equipment that fails to produce

satisfactory inspection quality shall be removed.

PART 2 - PRODUCTS

2.01 EQUIPMENT

A. Inspection Equipment:

I. Monitoring Studio:
   a. Temperature controlled
   b. Size sufficient to allow seating for two people in addition to operating technician.
   c. Secure cable, chains, and other devices used with the camera so as not to obstruct camera view or otherwise interfere with proper documentation of sewer conditions.

2. Television Monitor:

   a. Locate in monitoring studio
   b. Color video picture
   c. Resolution capability of no less than 350 lines
   d. Continuous display during survey:
      1) Date of survey
      2) Number designation of manhole section being surveyed
      3) Continuous forward and reverse readout of camera distance from the manhole reference

3. Cables: 600 feet long, minimum
4. Power source
5. Lights
6. Television Camera:
   a. Explosion proof
   b. Resolution capability: Minimum of 460 lines of horizontal resolution and 400 lines of vertical resolution.
   c. 360-degree pan and tilt unit, with adjustable supports specifically designed and constructed for operation in connection with pipe inspection. Lights shall be mounted on and turn in the direction of the camera head.
   d. 65-degree viewing angle, minimum, and either automatic or remote focus and iris controls. Remote control adjustment for focus and iris shall be located in the monitoring studio.
   e. Operative in 100 percent humidity conditions.
   f. Mounted on a device, sized for each pipe diameter, that is capable of performing work as described in this section. (Unless some significant impassable condition arises, in which case the contractor must contact the Commissioner for direction on how to proceed.)
   g. Equip with tag line suitable for pulling camera backwards.
   h. Ability to achieve proper balance of tint and brightness.
   i. Equip with winch, power winch, TV cable, powered rewind, or other devices used to move camera through pipe.
   j. Focal Distance: Adjustable through range from 6 inches to infinity.
   k. Camera Lighting:
      1) Minimize reflective glare.
      2) Remote variable intensity control.
      3) Lighting quality to provide clear, in-focus picture of entire inside periphery of pipe.
      4) Sufficient for 6—inch through 72—inch diameters.
   m. Remote Reading Footage Counter:

I) Accuracy: two-tenths of one foot over length of section being inspected.
2) Mounted over television monitor.
3) Marking on cable will not be allowed.
4) Calibration: Each day prior to setup.

2.02 RECORDING OF DOCUMENTATION

A. Media:

1. DVD-R.
2. DVD disc must be recorded in format compatible with standard DVD video players.
3. Opening Screen:
   a. Date of inspection.
   b. Pipe structure identification number.
   c. Upstream and downstream node identification numbers.
   d. Street address.
   e. Pipe size.
   f. Normal (upstream to downstream) or reverse (downstream to upstream) pull.
4. Continuous View:
   g. Current distance along reach (tape counter footage).
   h. Do not include pipe structure identification number along active tape (only on opening screen).
5. Audio (voice over):
   i. Description of inspection setup, including related information from log form.
   j. Unusual conditions.
   k. Operation changes (e.g., remove roots and restart inspection at footage prior to root removal).
   l. Verbal (voice over) description and location of each defect.
   m. Verbal description and location of each service connection.
6. DVD Labeling:
   n. Provide printed label on the inside face of the actual diskette that indicates the following:
      1) Name of Owner.
      2) Project Title.
      3) Date of Inspection.
      4) Inspection Company.
      5) Tape Number.

PART 3 - EXECUTION

3.01 GENERAL

A. No additional working days will be allowed due to delays in securing the video inspection services of a private vendor.

B. The initial video of the sewer(s) must be made within one (I) month of the start of construction, unless directed otherwise by the Commissioner. A second video inspection of sewers must be conducted after all water mains and surface restoration is completed.

C. Any out of focus video or distorted audio on any portion of the video will be cause for rejection and require a new DVD of the inspection to be submitted at no additional cost to the City.

D. When non-remote powered and controlled winches are used to pull television camera

through line, telephones, radios, or other suitable means of communication shall be provided between the two manholes to ensure that adequate communications exist between crewmembers.

3.02 TELEVISING PROCEDURES

A. Set camera so axis is at centerline of pipe.

B. Show continuous footage reading on tape image. Place on screen where it is clearly visible (e.g., if black font, do not place on dark background, if white font, do not place on light background).

C. Keep camera lens clean, and clear. If material or debris obscures image or causes reduced visibility, clean or replace lens prior to proceeding with recording operation.

D. Camera lens shall remain above visible water level and may submerge only while passing through clearly identifiable line sags (or vertical misalignments).

E. Record inside of each lateral, and connection of lateral to pipeline.

F. Recordings shall clearly show cracks and fractures, and their severity, in addition to obvious features, i.e., laterals and joints.

G. Immediately report obstructions that restrict flow and cause inspection to be interrupted to Commissioner. Document condition with still photograph and begin inspections of other pipelines.

H. Camera Operation:
   1. Speed: 30 feet per minute, maximum, during inspection.
   2. Stop, for a minimum of 5 seconds, at every lateral, broken pipe, root intrusion, or other defect or adversity.
   3. Pan entire diameter or area of pipe at each defect.
   4. Lens, lighting, and focus shall be readjusted in order to ensure clear, distinct, and properly lighted image of defect.

I. Insert 5 second blank space between line segments to clearly mark end of one televised line and beginning of another.

J. Loss of color or severe red or green color will be cause for rejection of inspection.

K. Recordings shall be without distortion or outside interference.

L. Line segments shall be televised complete from structure-to-structure on same DVD in continuous run. Video must clearly show camera starting and ending at structure, unless defect does not allow it. Do not perform partial televising on one DVD and then complete run on another DVD. If line is partially televised, due to excusable condition, i.e., collapsed line, televised length shall be viewed by Commissioner for acceptability.

M. Record all measurements in English units.

N. Obtain pipe diameter by physical measurement in upstream (or downstream) access structure.

O. Verify pipe material (e.g., RCP, VCP, CMP) and surface lengths between manholes.

P. Use calipers or measuring rod to determine diameter of inlet and outlet pipe.

Q. Footage measurements shall begin at centerline of upstream manhole, unless Owner or Engineer approves otherwise.

R. Continuous Footage Readings:
1. Use to identify location of defects.
2. Accurate to within plus or minus 2 percent tolerance.
3. Defect identifications are to be called out and recorded to the nearest 1 foot.
4. Line segment recording will be unacceptable if continuous footage meter is inaccurate, or identified defects or features leave doubt as to accuracy of locations or total length.

S. For measurement of distance to defects, attach marker flag to top of camera yoke. Measurements recorded in log shall be zeroed in alignment with marker rather than camera itself. Measurement shall be zeroed after each segment inspected.

T. Check accuracy of measurement meters daily by use of walking meter, roll-a-tape, or other suitable device.

3.03 RECORDED INORMATION FOR SEWER INSPECTIONS

A. Audio and written documentation must accompany all DVD's submitted to the Commissioner.

B. The voice narrations on the recording must provide brief but informative comment on data of significance, i.e., the distance traveled within the sewer, location of any unusual conditions or damage, collapsed pipe or manhole sections, blockages, or other discernible features.

C. The DVD recording(s) must include the following information:
I. Data View:
a. Name of streets containing sewers being televised.
b. Report or videotape number.
c. Date of TV inspection.
d. Upstream and downstream manhole or station numbers.
e. Current distance of travel (tape counter distance).
2. Printed labels on DVD container must include location, date, format, and other descriptive reference information.

D. Work Product:
1. DVD diskettes and completed inspection log sheets,
2. Inspection Log Sheet:
a. A single and complete log for each manhole-to-manhole section of pipe will be submitted.
b. Provide separate logs for normal and reverse setups of same segment.
c. Other data of significance, including those defects listed on table at end of this section shall be recorded on videotape.
d. Subject to audits against tapes.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of TELEVISED INSPECTION OF SEWER MAINS shall not be measured for payment.

4.02 PAYMENT

A. No separate payment will be made for the work covered in this section. Payment for the Work of TELEVISED INSPECTION OF SEWER MAINS will be included in the contract lump sum price as shown in the Schedule of Prices for CIVIL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Civil Work: 020000.

END OF SECTION

SECTION 01 33 00
SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions, and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals in accordance with the requirements specified in the Special Conditions.

B. Make submittals to the Commissioner of the Chicago Department of Transportation (CDOT), unless otherwise directed by the Commissioner.

C. Conform to requirements specified in the Special Conditions.

D. Related Sections:
1. Project Management and Coordination: Section 01 31 00.
2. Construction Photographic Documentation: Section 01 38 00.
3. Quality Requirements: Section 01 40 00.
4. Contract Closeout: Section 01 70 00.
5. Record Documents: Section 01 78 39.
6. Divisions 02 through 49 Sections for specific requirements for submittals in those Sections.

1.03 DEFINITIONS

A. Action Submittals: Written and graphic information that requires Commissioner's responsive action.

B. Informational Submittals: Written information that does not require Commissioner’s responsive action. Submittals may be rejected for not complying with requirements.

1.04 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
    a. Commissioner reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

B. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for ma king corrections or modifications to submittals noted by the Commissioner and additional time for handling and reviewing submittals required by those corrections.
1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.

2. Initial Submittal: Submit concurrently with start-up construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
    a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
4. Format: Arrange the following information in a tabular format:
    a. Scheduled date for first submittal.
    b. Specification Section number and title.
    c. Submittal category: Action, Informational.
    d. Name of subcontractor.
    e. Description of the Work covered.
    f. Scheduled date for Commissioner's final release or approval.
    g. Scheduled dates for purchasing.
    h. Scheduled dates for installation.
    i. Activity or event number.

C. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Commissioner's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 15 working days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Commissioner will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 15 working days for review of each resubmittal.
4. Sequential Review: Where sequential review of submittals by Commissioner's consultants, or other parties is indicated, allow 21 working days for initial review of each submittal.
5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Commissioner and to Commissioner's consultants, allow 15 working days for review of each submittal. Submittal will be returned to Commissioner before being returned to Contractor.

D. Identification — Paper: Place a permanent label or title block on each submittal for identification.
1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Commissioner.
3. Include the following information on label for processing and recording action taken:
    a. Project name.
    b. Date.
    c. Name and address of Commissioner.
    d. Name and address of Contractor.
    e. Name and address of subcontractor.
    f. Name and address of supplier.
    g. Name of manufacturer.
    h. Submittal number or other unique identifier, including revision identifier.
        1) Number each submittal using the Specification Section number followed by a decimal point and then a sequential number (e.g., 06 10 00.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 06 10 00.01.A).
    i. Number and title of appropriate Specification Section.
    j. Drawing number and detail references, as appropriate.
    k. Location(s) where product is to be installed, as appropriate.
    1. Other necessary identification.

E. Identification — Electronic: Identify and incorporate information in each electronic submittal file as follows:
   1. Assemble complete submittal package into a single indexed file with links enabling navigation to each item.
   2. Name file with submittal number or other unique identifier, including revision identifier.
      a. Name each file using a project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., CDOT PROJECT NO. D-7- 135B -06 10 00.01). Name each resubmittal using an alphabetic suffix after another decimal point (e.g., CDOT PROJECT NO. D-7- I35B -06 10 00.01.A).

   3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Commissioner.
   4. Transmittal Form for Electronic Submittals: Use software-generated form from electronic project management software acceptable to Commissioner, containing the following information:
      a. Project name.
      b. Date.
      c. Name and address of Commissioner.
      d. Name of Contractor.
      e. Name of firm or entity that prepared submittal.
      f. Name of subcontractor.
      g. Name of supplier.
      h. Name of manufacturer.
      i. Number and title of appropriate Specification Section.
      j. Drawing number and detail references, as appropriate.
      k. Location(s) where product is to be installed, as appropriate.
      l. Related physical samples submitted directly.
      m. Other necessary identification.
   5. Include the following information as keywords in the electronic file metadata:
      a. Project name.
      b. Number and title of appropriate Specification Section.
      c. Manufacturer name.
      d. Product name.

F. Options: Identify options requiring selection by the Commissioner.

G. Deviations: Highlight, encircle, or otherwise specifically identify deviations from the Contract Documents on submittals.

H. Additional Copies: Unless additional copies are required for final submittal, and unless Commissioner observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
   1. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Commissioner.

I. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Commissioner will discard submittals received from sources other than Contractor.
   1. Transmittal Form: Provide locations on form for the following information:
      a. Project name.
      b. Date.
      c. Destination (To:).
      d. Source (From:).
      e. Names of subcontractor, manufacturer, and supplier.
      f. Category and type of submittal.
      g. Submittal purpose and description.

h. Specification Section number and title.
i. Drawing number and detail references, as appropriate.
j. Transmittal number, numbered consecutively.
k. Submittal and transmittal distribution record.
l. Remarks.
m. Signature of transmitter.

2. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Commissioner on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same label information as related submittal.

J. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked "No Exceptions or Exceptions as Noted.

K. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

L. Use for Construction: Use only final submittals with mark by Commissioner indicating "No Exceptions" or "Exceptions as Noted."

PART 2 - PRODUCTS

2.01 SUBMITTAL PROCEDURES

A. General Procedures: Prepare and submit Submittals required by individual Specification Sections.
1. Submit electronic submittals via email as PDF electronic files.
a. Commissioner will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
2. Action Submittals: Submit 3 paper copies of each submittal, unless otherwise indicated. Commissioner will return 2 copies.
3. Informational Submittals: Submit 2 paper copies of each submittal, unless otherwise indicated. Commissioner will not return copies unless it does not comply with specified requirements.
4. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 01 70 00 — Contract Closeout.
5. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Submit certificates and certifications signed by an officer or other individual authorized to sign documents on behalf of that entity.
6. Test and Inspection Reports Submittals: Comply with requirements specified in Section 01 40 00 - Quality Requirements.
7. Statement of Manufacturer's Review: Submit a completed Statement of Manufacturer's Review with each submittal.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:
a. Manufacturer's catalog cuts.
b. Manufacturer's product specifications.

c. Standard color charts.
d. Statement of compliance with specified referenced standards.
e. Testing by recognized testing agency.
f. Application of testing agency labels and seals.
g. Notation of coordination requirements.
h. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:
   a. Wiring diagrams showing factory-installed wiring.
   b. Printed performance curves.
   c. Operational range diagrams.
   d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
5. Submit Product Data before or concurrent with Samples.
6. Submit Product Data as PDF electronic files.
7. Number of Copies: Submit 3 copies of Product Data, unless otherwise indicated. Commissioner will return 2 copies. Mark up and retain one returned copy as a Project Record Document.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal is based on Commissioner's electronic drawings that is otherwise permitted.
   1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
      a. Identification of products.
      b. Schedules.
      c. Compliance with specified standards.
      d. Notation of coordination requirements.
      e. Notation of dimensions established by field measurement.
      f. Relationship and attachment to adjoining construction clearly indicated.
      g. Seal and signature of professional engineer if specified.
   2. Submit Shop Drawings in the following format
      a. PDF electronic file.
      b. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 40 inches.
      c. Number of Copies: Submit 3 opaque (bond) copies of each submittal. Commissioner will return 2 copies. Mark up and retain 1 returned copy as a Project Record Drawing.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
   1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
   2. Identification: Attach label on unexposed side of Samples that includes the following:
      a. Generic description of Sample.
      b. Product name and name of manufacturer.
      c. Sample source.
      d. Number and title of appropriate Specification Section.
   3. Disposition: Maintain sets of approved Samples at Project site, available for quality- control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
      a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
      b. Samples not incorporated into the Work, or otherwise designated as Commissioner's property, are the property of Contractor.
   4. Samples for Initial Selection: Submit manufacturer’s color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

a. Number of Samples: Submit 3 full sets of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Commissioner will return 2 sets with options selected.

5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
   a. Number of Samples: Submit 3 sets of Samples. Commissioner will return 2 Sample sets.
      1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
      2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least 4 sets of paired units that show approximate limits of variations.

E. Product Schedule or List: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
   1. Type of product. Include unique identifier for each product.
   2. Number and name of room or space.
   3. Location within room or space.
   4. Submit product schedule in the following format:
      a. PDF electronic file.
      b. Number of Copies: Submit 3 copies of product schedule or list, unless otherwise indicated. Commissioner will return 2 copies.
      c. Mark up and retain one returned copy as a Project Record Document.

F. Contractor's Construction Schedule: Comply with requirements specified in Section 01 31 00 — Project Management and Coordination.

G. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
   I. Name, address, and telephone number of entity performing subcontract or supplying products.
   2. Number and title of related Specification Section(s) covered by subcontract.
   3. Drawing number and detail references, as appropriate, covered by subcontract.
   4. Submit product schedule in the following format:
      a. PDF electronic file.
      b. Number of Copies: Submit 3 copies of subcontractor list, unless otherwise indicated. Commissioner will return 2 copies.
      c. Mark up and retain 1 returned copy as a Project Record Document.

H. Coordination Drawings: Comply with requirements specified in Section 01 31 00 -Project Management and Coordination.

I. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1. Welding Certificates: Prepare written certification that welding procedures and personnel comply

with requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.

K. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

L. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

M. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

N. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

O. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

P. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

Q. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
   I. Name of evaluation organization.
   2. Date of evaluation.
   3. Time period when report is in effect.
   4. Product and manufacturers' names.
   5. Description of product.
   6. Test procedures and results.
   7. Limitations of use.

R. Schedule of Tests and Inspections: Comply with requirements specified in Section 01 40 00 - Quality Requirements.

S. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

T. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

U. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

V. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements specified in Section 01 78 39 — Record Documents.

W. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.02 DELEGATED DESIGN

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
   1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Commissioner.

B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit four copies of a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
   1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.01 CONTRACTOR'S REVIEW

A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Commissioner.

B. Project Closeout and Maintenance/Material Submittals: Refer to requirements in Section 01 70 00 Contract Closeout.

C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.02 COMMISSIONER'S ACTION

A. General: Commissioner will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. Action Submittals: Commissioner will review each submittal, make marks to indicate corrections or modifications required, and return it. Commissioner will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:
   1. A — NO EXCEPTIONS: When the Commissioner marks a submittal "No Exceptions," the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents. Final payment depends on that compliance.
   2. B - EXCEPTIONS AS NOTED: When the Commissioner marks a submittal "Exceptions as Noted," the Work covered by the submittal may proceed provided it complies with notations

or corrections on the submittal and requirements of the Contract Documents. Final payment depends on that compliance.

3. C — REVISE AND RESUBMIT: When the Commissioner marks a submittal "Revise and Resubmit," do not proceed with Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal according to the notations; resubmit without delay. Repeat if necessary to obtain different action mark.
   a. Do not use, or allow others to use, submittals marked "Revise and Resubmit" at the Project Site or elsewhere where Work is in progress.

4. D - REJECTED: When the Commissioner marks a submittal "Rejected," do not proceed with Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. The submittal does not conform to the design concept or meet requirements of the Contract Documents.
   a. Do not use, or allow others to use, submittals marked "Rejected" at the Project Site or elsewhere where Work is in progress.
5. E — FOR INFORMATION ONLY: Where a submittal is marked “For Information Only”, the Commissioner will not return the submittal unless it does not comply with specified requirements.
6. F — NOT REVIEWED: Submittals not required by the Contract Documents will be marked “Not Reviewed”, the Commissioner will return the submittal without action.

C. Informational Submittals: Commissioner will review each submittal and will not return it or will return it if it does not comply with specified requirements. When returned the Commissioner will forward each submittal to appropriate party with comments.

D. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Commissioner.

E. Incomplete submittals are not acceptable, will be considered nonresponsive, and will be returned without review.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of SUBMITTAL PROCEDURES will not be measured for payment

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of this section will be considered incidental to this contract.

END OF SECTION

SECTION 01 35 00
SPECIAL PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes the requirements for safe construction operations on and adjacent to operating tracks of the CTA rail system. The Contractor is responsible for compliance with the CTA, *Safety Manual for Contract Construction On, Above, or Adjacent to the CTA Rail System* (in effect at such time).

B. The Contractor is to be aware that the following specific requirements and restrictions are noted herein. See the body of this specification for details of these and additional requirements and restrictions.

1.02 RELATED SECTIONS

A. Drawings and general provisions of the Contract, including Book I Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.
B. Section 01 11 00 Summary of Work
C. Section 01 33 00 Submittal Procedures

1.03 PROJECT CONDITIONS

A. The CTA is an operating transportation agency and must maintain rail and bus operations at all scheduled times for the benefit of the public. The Contractor must conduct operations in such a manner as not to cause damage to the CTA equipment, put the public or the CTA personnel in danger, cause inconvenience to the customers, interrupt train service (except as permitted herein) or cause avoidable inconvenience to the public and the surrounding communities.

B. Certain portions of the Work must be performed on sections of track where rail service is suspended in order to facilitate the work. Track outages may be requested by the Contractor as defined in the Project Requirements. For any work occurring within a section of track to be taken out of service, the Contractor must confirm with the CTA that track within the work limits has been taken out of service and the third rail de-energized, as required, prior to beginning the work.

C. If the CTA deems any of the Work or operations of the Contractor hazardous to the CTA's operations or to the public, the CTA will order the Contractor to immediately suspend work until reasonable remedial measures are taken satisfactory to the CTA. Such suspension and those remedial measures must be made at no extra contract time and no extra contract cost.

D. The CTA's review of any of the Contractor's procedures, methods, temporary structures, tools or equipment does not relieve the Contractor of responsibility for the safety, maintenance, and repairs of any temporary structure or work, or for the safety, construction, and maintenance of the work, or from any liability whatsoever on account of any procedure or method employed, or due to any failure or movement of any temporary structure, tools or equipment furnished.

E. A Rail Service Bulletin Request form must be submitted to the CTA, via the Project Website or by such other method as the CTA may direct, at least twenty-one (21)

calendar days in advance of the Contractor's proposed scheduled date and time to enter upon the CTA Right-of-Way for the performance of any work under this Contract. Bulletin requests will be required when performing work which impacts rail operations such as berth marker relocation, modifications to the track, prior to each phase of staged station construction, signal cutovers, Track Access Occurrences, signal modifications (temporary or permanent), track survey, etc.

F. The Contractor will be required to attend a weekly coordination meeting with CTA Operations and other CTA departments to review and coordinate proposed work activities of the Contractor(s). The Contractor will be required to provide a five week look ahead schedule, in a format acceptable to CTA, reflecting proposed work activities within the CTA Right-of-Way.

G. The Contractor must at all times observe all rules, safety regulations and other requirements of the CTA, including, but not limited to, the following Standard Operating Procedures (SOP's). Copies are included in the attached CTA, *Flagmen Requirements* manual.

1. No. 7037, "Flagging on the Right-of-Way".
2. No. 7038, "Train Operation Through Slow Zones".
3. No. 7041, "Slow Zones".
4. No. 8111, "Workers Ahead Warning System".
5. No. 8130, "Safety on Rapid Transit Tracks".
6. No. 8212, "Test Train Procedures"

1.04 RAIL SAFETY TRAINING

A. The Contractor's and Subcontractor's employees assigned to work on, over or near the CTA Right-of-Way are required to attend an all-day Rail Right-of-Way Safety Training Session in accordance with the CTA, *Safety Manual for Contract Construction On, Above, or Adjacent to the CTA Rail System*. The cost of this training is currently $200.00 per employee, paid by the Contractor in advance. The certification is good for one calendar year from the date of issuance. Rail safety training must be coordinated with the CTA Project Manager.

B. Rail Right-of-Way Safety Training for Contractor and Subcontractor personnel will be scheduled by CTA as training slots become available. The Contractor is advised that the Contractor's failure to request training sufficiently in advance of when the employee is required on the work site will not be cause for extending the Contract Time.

C. The $200.00 fee is non-refundable. If any individual fails to report for training or is rejected for training and must be rescheduled, an additional $200.00 will be required.

D. Upon successful completion of CTA Rail Safety Training, each trainee will be issued a non-transferable Rail Safety Tour Identification Card with the trainee's photo and a decal with pressure sensitive adhesive to be affixed on the hard hat. The Rail Safety Tour Identification Card and the decal are valid for one (1) year from the date of issue. The validity of the Card and the decal are in no way related to the length of the Contract.

E. Contractor and Subcontractor personnel must renew their Rail Safety Tour Identification Cards annually by successfully completing Rail Safety Training again. Contractor or Subcontractor personnel who fail to maintain a valid Rail Safety Training Identification Card are not permitted to work on, above or adjacent to the CTA Rail Right-of-Way and

CTA reserves the right to remove such personnel from the work site. The Contractor is advised that the Contractor's failure to employ personnel with valid Rail Safety Training Identification Cards will not be cause for extending the Contract Time.

F. Contractor must maintain an up-to-date log of all Contractor and Subcontractor employees working at the construction site including the most recent completion date of each employee's Rail Safety Training and must provide a copy of such log to the CTA upon the Project Manager's request.

1.05 MANDATORY ITEMS FOR EMPLOYEES

A. Contractor's and Subcontractor's employees assigned to work on CTA property will be given individual property permits. These permits must be carried by each employee at all times while on CTA property. All permits issued must be returned to CTA at the completion of the project, if the employee no longer works on this project, or on the date of expiration.

B. Each employee must carry a valid Rail Safety Tour Identification Card at all times while on CTA Right-of-Way.

C. All employees must wear proper personal protective equipment, which includes but not limited to, face coverings that protects employees mouth and nose, an undamaged hard hat with current rail safety sticker affixed, safety vest and eye protection at all times while on CTA Right-of-Way. Noise protection must be used when necessary. The Contractor must also comply with all OSHA requirements as required for the Work.

D. Contractor personnel must wear suitable work shoes with defined heel and non-slip soles. Steel toes or metal cleats on the sole or heel of shoes are prohibited. Shoelaces are to be kept short so they do not pose a tripping hazard. Athletic shoes, sandals, open-toed shoes, moccasins and/or shoes with heels higher than 1" are not permitted.

E. Contractor personnel must have a non-metallic, working flashlight after dark or when working in the subway.

1.06 WORK AREA AVAILABILITY

A. DEFINITIONS

1. RIGHT-OF-WAY WORK - Any work performed at, above, or below track level; or within fifty (50) feet of the centerline of track; or any work performed within the R.O.W.
2. IN-SERVICE TRACK - All CTA tracks are in service seven (7) days a week, 24 hours a day, unless specifically removed from service for specific times by a Rail Service Bulletin issued by the Vice President, Rail Operations. Copies of the CTA's current train schedule for the lines affected by this project is available on the CTA's website and are subject to changes at any time, before or during, the Contract.
3. OUT-OF-SERVICE TRACK - The CTA tracks within a defined limit temporarily removed from service for the purpose of completing specific work. Traction power will remain on at all times unless power removal is requested by the Contractor and approved by the CTA. In such cases, traction power will be removed and restored by CTA personnel. The Contractor may request the CTA to de-energize portions of the Line to perform the Work as Out-of-Service Track when no

revenue service is scheduled or as specified herein. Upon completion of the Out-of-Service Work, the Contract must maintain sufficient personnel on-site

to correct any deficiencies in the Contractor's Work discovered by the CTA during power and service restoration and testing.

4. TRACK ACCESS OCCURRENCE – A condition(s) which provides a modification to the normal operation of CTA service to facilitate access for a Contractor(s) to perform work on or near the CTA Right-of-Way as defined and limited in the Project Requirements.
5. RE-ROUTE – Modification to the normal routing of trains in order to remove rail traffic from a section of track to facilitate access for a Contractor(s) to perform work on or near the CTA Right-of-Way as defined and limited in the Project Requirements.
6. LINE CUT – A temporary cessation of all service on a transit line; meaning total stoppage of transit service on all tracks and at all stations within the closure zone to facilitate access for a Contractor(s) to perform work on or near the CTA Right-of-Way as defined and limited in the Project Requirements.
7. SINGLE-TRACK – A temporary operation established by operating trains bidirectionally on one track while the adjacent track is taken out-of-service. A single-track can only be established between track crossovers in the proper configuration for the required train movements. Only one single-track at a time can be set up on a line and only for very limited time periods. If CTA or a separate Contractor(s) request single track operations along the same line concurrently with the Contractor for this contract, CTA has exclusive authority to determine which request will be granted.
8. RUSH HOURS - Monday through Friday, from 0500 to 0900 hours and from 1500 to 1900 hours.
9. FLAGGER SHIFT- A flagger shift is defined as the services of a CTA Flagman up to, but no more than eight (8) hours including travel and required breaks. For example:

    a. A Contractor five (5) hour work shift which requires 3 flaggers will use 3 flagger shifts.
    b. A Contractor eight (8) hour work shift requiring 3 flaggers must use 6 flagger shifts (because travel & break time will increase the flaggers work hours beyond eight).
    c. A Contractor ten (10) hour work shift requiring 3 flaggers will use 6 flagger shifts.

10. INFRASTRUCTURE SHIFT- An infrastructure shift is defined as up to, but no more than eight (8) hours worked per CTA Infrastructure employee. For example:

    a. A Contractor five (5) hour work shift requiring 2 signal maintainers will use 2 infrastructure shifts.
    b. A ten (10) hour work shift requiring 2 traction power electricians will use 4 infrastructure shifts.

11. OPERATIONS SHIFT – An operation shift is defined as up to, but no more than eight (8) hours worked per CTA Operations employee. For example:

    a. A Contractor eight (8) hour work shift requiring 2 tower workers must use 2 operations shifts.

12. PERSON-IN-CHARGE (PIC)- A person or persons, specified in a CTA Rail Service Bulletin, who is solely in charge of a work zone and is the single point contact between CTA and all persons (Contractor's, CTA and others) working in a work zone. The Rail Service Bulletin may identify the PIC by name or by radio call number.
13. POWER & WAY SERVICE BULLETIN (PWS Bulletin): A document authorized by the CTA Infrastructure Division intended to supplement a CTA Rail Service Bulletin by defining power/signal removal and restoration procedures and other work zone protection measures required to safely perform construction and/or maintenance work on or adjacent to the CTA Right-of- Way (ROW).
14. No service disruptions will be allowed for the completion of this work, except as noted in the Project Requirements. If the CTA deems it necessary, the CTA will impact operations to avoid a hazardous condition to either the passengers or employees and charge the Contractor for all associated costs and damages incurred.

1.07 CTA OPERATING REQUIREMENTS

A. Strictly comply with operating requirements of the CTA while construction work is in progress, specifically as follows:

1. All work performed on the CTA Right-of-Way or adjacent to CTA operating tracks will be allowed during the Construction Period only in accordance with below "ALLOWABLE HOURS OF CONSTRUCTION". During most periods of construction, a "slow zone" must be established at the work site and flagging personnel must be deployed to facilitate safe and continuous train operations and to protect Contractor, CTA employees, passengers, the general public and property in the vicinity.
2. No one is permitted to enter the Right-of-Way or work on or over track level during Rush Hours.

1.08 ALLOWABLE HOURS OF CONSTRUCTION

A. Construction activities at track~~s~~, platform, station or above track level or adjacent to an active CTA Right-of-Way are not permitted during Rush Hours, except as noted below.

B. Construction activities at platform level, track level or adjacent to the CTA Right-of-Way may be permitted during other periods under flagging protection with the advance concurrence of the CTA as follows:

1 Monday thru Friday: From **0900** hours to **1500** hours.
2 Monday thru Friday: From **2000** hours to **0400** hours the next day.
3 Weekends: From **2000** hours Friday to **0400** hours Monday.

The power must remain on for these hours unless allowed otherwise by defined Track Access Occurrences.

C. Construction activities near the CTA Right-of-Way that have been approved by the CTA to be in compliance with the CTA, *Safety Manual for Contract Construction On, Above, or Adjacent to the CTA Rail System* will be allowed during Rush Hours provided the proper barricades are in place.

D. Track Access Occurrences:

1. The total number of Track Access Occurrences will be as specified in the Project Requirements.
2. The exact hours for all Track Access Occurrences are subject to change by the CTA depending on the nature of the work, access requirements of CTA personnel, work performed under separate contract or operational requirements of the CTA.

B. The CTA reserves the right to modify the allowable hours of track access occurrences based on service requirements for the subject route and manpower availability for the date and location requested.

C. The CTA reserves the right to deny or to cancel a previously approved request for a Track Access Occurrence based on service requirements for the time period requested. The CTA may notify the Contractor of such denial or cancellation no later than 1 day prior to a Track Access Occurrence. Service requirements may be affected by major events (e.g., festivals, White Sox and Cubs games, concerts), or by a Track Access Occurrence scheduled elsewhere on that route or the CTA System.

D. The Contractor will not be entitled any increase in Contract Time or Contract Price based on the CTA's denial of a Track Access Occurrence request or due to a minor reduction (1 hour or less) in the duration of a Track Access Occurrence.

E. The Contractor will not be permitted to perform work requiring a Track Access Occurrence or Flagging during the following special events:

N*OTE: Examples below are some events from past projects and are for guidance only.*

1. Taste of Chicago
2. Independence Day
3. Chicago Air and Water Show.
4. Chicago Marathon.
5. Chicago Blues Festival.
6. Lollapalooza.
7. Chicago St. Patrick's Day Parade.
8. Thanksgiving Day and the Friday after Thanksgiving.
9. Christmas Day.
10. New Year's Eve and New Year's Day.
11. Easter Sunday.
12. Bud Billiken Parade.
13. Pitchfork Music Festival.
14. Chicago Pride Parade.
15. NASCAR Road Race.

F. In addition, CTA reserves the right to limit or deny access to the system during other major special events that may develop and that may impact service needs, during emergencies, and during severe weather conditions.

1.09 CONSTRUCTION PROCESS PLAN

A. The Contractor must submit a Construction Process Plan whenever any work, in the opinion of the CTA, affects the safety or causes disruption of service or inconvenience to

transit users, CTA Operations, service to any business or residence, impact street, sidewalk or alley access or impacts the public. At a minimum, an individual Construction Process Plan must be submitted for each instance the Contractor requests that a section of track(s) be removed from revenue service and for any work that requires pre-activity meetings. The Contractor must include in the schedule the submission, review and approval of each Construction Process Plan in accordance with the submittal schedule requirements defined in Section 01 33 00, Submittal Procedures.

B. A draft Construction Process Plan must be uploaded to the Project Website at least twenty-one (21) calendar days in advance of work and at least fourteen (14) calendar days prior to a pre-activity meeting. The plan must include/address the following:

1. Applicable Contract Documents
2. Options
3. Related Change Orders
4. Purchases
5. Deliveries
6. Shop Drawings, Product Data and quality control samples
7. Possible conflicts
8. Compatibility problems
9. Time schedules
10. Weather limitations
11. Manufacturer's specifications
12. Compatibility of materials
13. Acceptability of substrates
14. Temporary facilities & signage
15. Space and access limitations
16. Governing regulations
17. Safe Work Plans (including Hazard Analysis, COVID plan, and nearest hospital and trauma center)
18. Inspection and testing requirements
19. Required performance results
20. Recording requirements
21. Protection
22. Quality assurance/quality control
23. Noise Control
24. Community Impact
25. CTA Operations Impact
26. Proposed Traffic Control & Staging Areas
27. Lift Plan

C. The draft plan must also include reference to all Contractor Requests for Information (RFI)'s and submittals that pertain to Work identified in the Construction Process Plan. All submittals must be approved prior to Work and all applicable RFI's must be completed.

D. The Construction Process Plan must clearly identify the number of Safety & Quality Inspectors to be deployed for each Track Access Occurrence and include a checklist of

tasks that these Inspectors will be responsible for monitoring and documenting during each work period.

E. In addition, for any Work to be performed during a Track Access Occurrence, the Contractor must provide the following to the CTA:

1. A track access plan submitted to and approved by the CTA specifically identifying the area(s) of power removal and work zone protection methods being requested by the Contractor.
2. Work zone protection methods to be performed by the Contractor
3. Name, title, contact information, and work hours for Contractor's on-site supervision.
4. Work zone protection requested by the Contractor for implementation by the CTA (subject to CTA approval).
5. Pre-approved Safety and Quality Control Checklist for completion by the Contractor and submission to the Person-In-Charge during Track Access Occurrence. Checklists to be applicable to the work elements being performed during the specific Track Access Occurrence.
6. A general schedule reflecting proposed work to be performed within the requested Track Access Occurrence.

F. After pre-activity meeting minutes have been agreed to, all comments from the meeting must be incorporated into a final Construction Process Plan. This plan must be submitted and approved by the CTA prior to the start of related work.

G. The Contractor shall provide the CTA with a written request for flagmen and other personnel on the Wednesday prior to the work week being requested, by 1100. In addition, all flagger requests shall be confirmed at least forty-eight (48) hours (two normal working days and before noon) prior to the date. The time the work will be performed and the CTA personnel being requested shall be included in the request(s). Prior to the CTA implementing an authorized Track Access Occurrence, the Contractor must provide, at least 48 hours in advance, an hourly schedule broken into tasks with a defined critical path that clearly establishes milestones that may be monitored. The hourly schedule must also include, but not be limited to:

1. Name, title, contact information, and work hours for Contractor's on-site supervision.
2. Power removal **(min 1 hour).**
3. Proposed work activities.
4. Activities for inspection and completion of safety & quality checklists by Contractor.
5. Submission of safety & quality checklists to the CTA's Person-In- Charge (PIC) during Track Access Occurrence. The checklists must be submitted to the PIC prior to commencing power restoration activities.
6. Power, Signal Restoration **(min 1 hour).**
7. Test train **(min ½ hour).**

H. The CTA intends to issue Power & Way Service Bulletins to supplement CTA Rail Service Bulletins. The Power & Way Service Bulletins are intended to provide procedural guidelines for safely removing and restoring the CTA's power & way systems (primarily traction power & signal) within the limits defined by the contract and Contractors specific track outage plan(s).

I. CTA labor will be required to de-energize and re-energize traction power and perform such other work as may be deemed by the CTA to be required pursuant to the Contractor's work activities and authorized Track Access Occurrences, etc. CTA signal maintainer will also be required to observe and witness the Contractor disconnection and reconnection of temporary signal work at each location where modifications are performed to support construction activities. One signal maintainer will be required to witness testing at each location or housing where it is taking place. CTA signal maintainer will also be required to witness the Contractor restoration safety testing, prior to the line being returned to the CTA.

J. Two traction power electricians will be required at each location where traction power is energized or de-energized. The Contractor's schedule must include travel time for the CTA Electrician's (min ½ hour) if they are to energize or de-energize traction power at more than one location.

K. Failure of the Contractor to provide the CTA the minimum specified time required for the removal and restoration of all Power & Way systems within an authorized Track Access Occurrence will not be grounds for additional contract time or monies and will not waive the assessment of specified liquidated damages for failure to return track(s) to service in accordance with the contract requirements.

1.10 HAZARDOUS WORKING CONDITIONS

A. The Contractor must caution all employees of the presence of electric third rail (600 volts DC), live cables and moving trains on CTA tracks. The Contractor must take all necessary precautions to prevent damage to life or property through contact with the electrical or operations systems. The Contractor must caution all employees that any contact with live electric third rail or "live" portions of train undercarriage may result in a severe burn or death.

B. The Contractor must establish third-rail safety precautions in accordance with CTA regulations, such as using insulating hoods or covers for live third rail or cables adjacent to the work. On every day and at every work site where a live third rail hazard exists, the Contractor must instruct all employees of the emergency procedures. Knowledge of the disconnect switch locations or manner of disconnection must be available at all times to the personnel on the job. Unless otherwise noted, only CTA Electricians are allowed to disconnect power.

C. The third rail may be de-energized during authorized Track Access Occurrences. The planning and implementation of the de-energizing must be listed in the Contractor's process plan and include documenting checklist requirements.

1.11 TRACK SAFETY

A. The Contractor must, at all times, take special care to conduct operations over, on, under, adjacent to, or adjoining, the CTA Rail Right-of-Way in such a manner as not to cause damage, settlement or displacement of any structures, tracks or any portion thereof. The Contractor must suspend such work until reasonable remedial measures, satisfactory to the CTA, have been taken.

B. Any damages to the CTA tracks, supporting structures or other existing facilities and properties caused by the Contractor's operations must be replaced or repaired by the Contractor to the satisfaction of the CTA without additional cost. Contractor must obtain photo documentation of damaged property to the CTA prior to performing any repair or replacement work.

C. The CTA will have the right to perform any work it deems to be of an emergency nature and/or necessary to permit normal train operations during construction operations by the Contractor. The cost of such service or emergency work provided by the CTA must be borne by the Contractor.

D. Perform all work in accordance with all OSHA safety regulations and all other applicable laws, codes or ordinances.

E. All work must comply with the CTA, *Safety Manual for Contract Construction On, Above, or Adjacent to the CTA Rail System* and CTA Standard Operating Procedures.

F. As necessary, precautions must be taken to ensure the safety and continuity of the CTA operations and passengers. The Contractor must provide a minimum horizontal clearance of 7'-2" from the centerline of the nearest tangent track to any falsework, bracing and forms or other temporary obstruction during the work under this Contract. The clearance requirements for curved track sections must be calculated by the Contractor to ensure encroachment into the clearance envelope will not occur. Prepare, submit and obtain approval of detailed drawings prepared and sealed by a licensed structural engineer in the state of Illinois for all falsework, sheeting and construction procedures adjacent to and under the tracks before doing any work on same. After obtaining approval of such plans, said falsework, sheeting and construction procedures must be constructed strictly in accordance with the approved drawings and specifications. In case of any settlement or displacement of structures or tracks, the Contractor must immediately proceed with all shoring or other work necessary to maintain the CTA property in a safe condition for the operation of train service. If the Contractor fails to undertake this work within 24 hours after notice by the CTA in writing, the CTA may proceed to repair or shore any such structure or tracks; and the cost thereof must be deducted from any compensation due, or which may become due, to the Contractor under this Contract. If the settlement or displacement is severe enough to limit train service, the repairs must be made immediately. All costs of any disruption to the CTA service due to the Contractor's operations or negligence will be at the Contractor's expense.

1.12 TRACK FLAGGING OPERATIONS

A. Temporary Track Flagging slow zones per CTA SOP 7041 and CTA, *Safety Manual for Contract Construction On, Above, Adjacent to the CTA Rail System* are restricted in the following manner:

1. Temporary track flagging slow zones can only be mobilized, utilized and demobilized in non-rush hour time periods and no more than one (1) Track Flagging Operation zone will be permitted at any given time. The Contractor is responsible to furnish and install the required slow zone signage and equipment. A Track Flagging Operation zone is defined as a continuous work zone, of no more than 600 feet in length, regardless of the number of tracks fouled.
2. Current Standard Operating Procedures require Slow Zone with flagging protection whenever three or more workers are scheduled to work on, across or near a section of track for one half hour or more. Flagging protection must be ordered and assigned according to the CTA Flagmen Requirements Manual.
3. Temporary Track Flagging slow zone signs must be removed or turned so the sign cannot be read from the motor cab or hooded to cover the sign so it may not be read from the motor cab when the work crew clears the Right-of-Way.

4. The Contractor must provide the CTA with a written request for flagmen and other personnel by COB Tuesday the week before the work will be performed and the CTA personnel are requested.
5. A maximum of **8,100** flagger shifts will be provided, reimbursed through the TRACK FLAGGING OPERATIONS allowance, as part of the Contract.
6. A maximum of **< 0 >** infrastructure shifts for other CTA personnel (signal maintainer, traction power electrician, tower worker, etc.) will be provided at no cost to the Contractor as part of the contract.
7. Flagmen or CTA Infrastructure personnel required by CTA for a Track Access Occurrence as noted in Project Requirements will not be counted towards the allowable flagger or infrastructure shifts provided.

B. The providing of such personnel and any other safety precautions taken by the CTA will not relieve the Contractor of any liability for death, injury or damage arising in connection with the construction operations. See CTA SOP No. 7037, "Flagging on the Right-of Way", for a description of flagging personnel duties.

C. To minimize flagmen usage, the Contractor must use approved barricades, barricaded scaffolds and/or safety railings. Barricades and safety railing arrangements must be in accordance with the CTA, *Safety Manual for Contract Construction On, Above, or Adjacent to the CTA Rail System*.

D. The CTA does not guarantee that flagging or other personnel will always be available when requested. Requests for flagging manpower shall conform to the CTA, *Flagmen Requirements* Manual, and certain work locations require multiple flagging personnel when only one track is fouled by the work.

E. The Contractor will pay for all flagging and other personnel costs (costs will be deducted from the Contract) under any of the following circumstances:

1. Flagging or other personnel were requested by the Contractor and scheduled by the CTA but not used by the Contractor.
2. The Contractor failed to properly notify the CTA at least twenty-four (24) hours in advance of the date and time the work was to be performed to cancel scheduled personnel.
3. When the Contractor estimates that additional flagging personnel, signal maintainer, traction power electrician, or tower worker are needed to secure the project construction site or for a specific phase of construction.
4. When work being performed includes repair or rework resulting from previously installed non-conformant work.

In addition, The Contractor is responsible to reimburse the CTA for all flagger costs (costs will be deducted from the Contract) associated with the use of flaggers in excess of the **8,100** flagger shifts throughout the duration of the contract. The cost for the each flagger shift is $900.00 per flagger shift.

The Contractor will be responsible to reimburse the CTA for all costs (costs will be deducted from the Contract) associated with the use of other personnel in excess of the **< 0 >** infrastructure shifts throughout the duration of the contract. The cost for any other CTA personnel (signal maintainer, traction power electrician, tower worker, etc.) is $1,100.00 per infrastructure and/or operation shift.

F. By labor contract, CTA flagging personnel are entitled to a 30-minute break after a continuous 5-1/2 hour work period, including report and travel time. The 5-1/2 hour period begins when the person reports to work at his or her home terminal. Additionally, flagging personnel are entitled to occasional personal breaks (to use the washroom facilities) during the normal course of work. When flagging personnel leave the work site, work must cease unless provision is made for a relief flagger. The Contractor must coordinate the Project work schedule with the flagging personnel break periods.

G. All employees of the Contractor and subcontractors must report any actions of perceived CTA employee misconduct, or if any CTA employee does not provide a full level of cooperation in support of the contract; immediately and directly to the CTA Project Manager, as well as CTA Operations in writing. Only with timely, written documentation will CTA be enabled to resolve work site personnel issues and take appropriate disciplinary action, when necessary.

H. If the Contractor, CTA Construction or Safety Inspector believes that the Flagman is unable to perform his/her duties responsibly, work must be stopped immediately, ensure that the Right-of-Way is safe for train operations, and the Work Crew must exit, without delay, the Rail System Right-of-Way. The Contractor must provide a written report to the Construction Inspector prior to the end of the workday.

1. In addition, all employees of the Contractor and subcontractors must report any actions of perceived CTA employee misconduct, or if any CTA employee does not provide a full level of cooperation in support of the contract immediately to the CTA's Control Center and/or CTA Rail Operations Route Manager. Within 24 hours of alleged incident, provide written report to the CTA Project Manager including detailed explanation of incident, employee badge numbers, location of incident, etc.
2. Failure to make the proper notification in writing may adversely affect any claim the Contractor may file with respect to CTA employee performance or lack thereof.

I. CTA Flaggers only provide flagging protection for the CTA Right-of-Way. Flaggers for streets, highways or other railroads are solely the responsibility of the Contractor. Any additional flagging required by other agencies or railroads are the responsibility of the Contractor as part of the General Conditions of the Work and must be included in the Contractor's lump sum bid for the Work.

1.13 TRACK ACCESS OCCURRENCES

A. The entire system must be fully operational when the tracks are put back into service after a Track Access Occurrence. The track where work was conducted must be returned to CTA in revenue condition; all stations must be open, fully functional and properly cleaned. The Contractor must be immediately available with sufficient staff for up to one hour after revenue operation begins to ensure that all systems are functioning properly.

B. The Contractor must allow enough time prior to putting the tracks back into service to make sure the line can be fully operational. A test train must be required after any track replacement, signal modification or any construction activity, determined by the Engineer, to require a test train. The scheduling of test trains must include travel time to and from the location being tested. Additional time should also be allowed for any possible remedial work required before the system can be made fully operational.

C. CTA will provide up to 2 (two) test train occurrences at no cost to the

Contractor. Additional test trains will be charged to the Contractor at the rate of $2,400.00 per test train occurrence.

D. All components of the system, including, but not limited to, tracks, signals, stations, entrances, etc. must be fully and properly operational prior to putting the tracks and facilities back into service. Any facilities under demolition or construction and any temporary facilities must be safe and secure so they do not impact revenue service operations.

E. The Contractor is subject to Liquidated Damages if any station, facility, yard, structure, track, or component is not fully operational and useable at the prescribed predetermined time; including all planned staging of construction sites. See Project Requirements for Liquidated Damages.

1.14 ADDITIONAL REQUIREMENTS

A. The Contractor must coordinate any temporary relocation of signal equipment by the Contractor with the CTA Project Manager. CTA forces will not be responsible for performing this work.

B. The Contractor must clean all debris and equipment from the work or staging areas after work has been completed after each work day. In the event the Contractor fails to clean to the CTA's satisfaction, the CTA may perform any necessary cleaning and deduct the cost of such cleaning from the Contract sum due the Contractor.

C. The Contractor is responsible for maintaining access to and use of any adjacent residential and business properties, including telephone lines, electric power lines, street traffic controls and other utilities serving those properties.

D. The Contractor must maintain the signal and communications systems throughout the project:

1. The Contractor is responsible for all signal and communications system work necessary to support the staged construction.
2. At the start of suspension of service, the Contractor must disconnect and protect all signal and communications cables and wayside appliances in the area of construction.
3. The Contractor must connect all cables following accepted industry practices. Accepted industry procedures require the testing of any circuitry that is disconnected and reconnected.
4. The Contractor must reinstall all removed appliances exactly as when removed and activate all wayside appliances prior to service restoration. All connections to the running rail or structure must be new.
5. The Contractor must perform system safety testing, to be witnessed by CTA Signal representatives, prior to returning tracks to CTA Operations.
6. Contractor temporary work must be installed to allow clear access to CTA Maintenance staff for periodic maintenance and troubleshooting until the permanent systems are activated.
7. The Contractor must retain the services of a qualified Railroad Signal Engineer to oversee all signal and communications work.
8. A comprehensive plan for any signal and communications work must be submitted for approval prior to the start of the staged construction.

9. The Contractor is responsible for the complete electrical isolation of each newly installed section of running rail.

10. Up to two sets of proper splices will be allowed in existing or temporary cabling for construction staging purposes. Cables installed for the final signal system must be connected at junction boxes or housings and may not be spliced. All spliced cables must be meggered.

11. The Contractor must provide for testing of any temporary or permanent modifications made to the existing signal system, including modifications due to the relocation of equipment, removal and reinstallation of equipment, disconnection and reconnection of equipment, disconnection and reconnection of cables, and installation of cables. The extent of testing required must be as directed by the CTA, based on the extent of the modification. In general, the testing of field equipment that is removed and reinstalled in place will require verification that the equipment has been properly restored to service. Modifications or alterations of express or external cables must require testing of all circuits and devices connected to the cabling to ensure that they function properly; ringing out and/or meggering cable alone will not fulfill the testing requirements. In general, modifications related to external cabling must not require extensive testing of internal house circuitry functionality, in the absence of any internal circuitry modifications.

12. A fully functional signal and communication system must be operation at all times. Otherwise, the line will not be allowed to resume operation and the Contractor will be responsible for Liquidated Damages. See Project Requirements for Liquidated Damages.

1.15 AVAILABLE TRACK AND STAGING AREAS

A. Track space can be made available to the Contractor at the following locations for the storage of the contractor's rail borne equipment:

1. **NONE**

B. All foreign rail borne equipment must receive prior approval from the CTA Rail Vehicle Engineering Group.

C. CTA owned property located at:

1. **NONE**

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of SPECIAL PROCEDURES will not be measured for payment

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section.

B. Payment for work specified in the RAIL SAFETY TRAINING article will be included in the contract lump sum price as shown in the Schedule of Prices for MOBILIZATION.

C. Payment for work specified in the TRACK FLAGGING OPERATIONS article will be included in the allowance as show in the Schedule of Prices for TRACK FLAGGING OPERATIONS.

D. Payment for work specified in the TRACK ACCESS OCCURRENCES article will be included in the allowance as show in the Schedule of Prices for TRACK ACCESS OCCURRENCES.

4.03 PAY ITEM ACCOUNT NUMBERS

A. Mobilization: 017113.
B. Track Flagging Operations: 013500.
C. Track Access Occurrences: 013550.

END OF SECTION

SECTION 01 35 00 A
SPECIAL PROCEDURES ATTACHMENT

Flagmen Requirements

FLAGMAN REQUIREMENTS - TABLE OF CONTENTS

Safe Work Practices are mandatory when performing any work on or adjacent to the Rail System right-of-way. Whenever these tasks require flagging protection, this guide is to be used to determine the **minimum** number of CTA flagmen and Slow Zones, which are required. It is mandatory that all CTA employees and contractors (contractors must use CTA flagmen) follow these requirements for flagmen protection. In addition, all work must be performed in accordance with applicable Standard Operating Procedures, Rail Service Bulletins and Departmental Safety and Operating rules.

If there are any questions regarding these requirements, contact your immediate supervisor to arrange for a field evaluation of the area with representatives of Rail Operations, Rail Instruction and Safety.

7-6-07

J.A. Hruby
Vice President
Transit Operations

FLAG ZONE INDEX

The entire Rail System has been divided into 198 flag zones. These flag zones are based upon which Rail Terminal has the responsibility of providing flagmen. The Flag Zone numbers emulate train run numbers assigned to the Terminal supplying the Flagmen (except for the loop). For easy identification, all Flag Zones are listed on a "Flag Zone Index" chart.

This Flag Zone Index identifies each Flag Zone by:

1) Flag Zone Number
2) Location (limits of the zone)
3) Number of tracks
4) Track Characteristics/Special Conditions
5) Rail Stations within the flag zone
6) Flagmen Requirements based on:

a) The number of tracks fouled.
b) Track number where work is being performed.
c) Minimum number of flagmen required.

FLAGMEN REQUIREMENTS

Flagmen requirements are determined by one of two methods, Tracks Fouled or Track Numbers.

Determining Flagmen Requirements using "Tracks Fouled" Method

Tracks Fouled is defined as the placement of an individual or an item of equipment in such proximity to a track that a moving train could strike the individual or equipment. This also includes the area where workers relocate to clear the track upon the approach of a train. (Note: climbing or jumping up to a Rail Station Platform is not an acceptable method of clearing a fouled track). Flagmen requirements are normally determined by this method. To determine the minimum number of flagmen required, ascertain how many tracks will be fouled, then refer to the Tracks Fouled portion of the Flag Zone Index for the minimum number of flagmen required.

Determining Flagmen Requirements using "Track Numbers" Method (used only in areas of multiple tracks - four or more)

Track Number is defined as a specific number or letter used to identify a specific track. This method is used when work is performed in an area of multiple tracks (four or more).

When work is performed on one track in areas of four or more tracks, the track number portion of the Flag Zone Index is used to determine the minimum number of flagmen required.

When work is performed on more than one (1) track in areas of four (4) or more tracks, the track fouled portion of the Flag Zone Index Chart is used to determine the minimum number of flagmen required.

FLAG ZONE MAP

A Flag Zone map has been developed as a graphic aid identifying the limits of flagging zones and noting special track conditions. The maps are based on Rail Terminal Flagmen Assignments.

PROCEDURE FOR ORDERING FLAGMEN

Work Site Inspection

Before flagmen are ordered, **the person immediately in charge of the work** (in cases of outside contractors - a construction inspector or building inspector) is required to conduct an on-site evaluation of the work site. The purpose of this inspection is to determine which flag zones the work will be performed in. Upon review of the work area, consult the "Flag Zone Guide" to determine the minimum number of flagmen required. If work is performed in two or more flag zones, the flag zone shall govern the minimum number of flagmen ordered with the highest /largest number of flagmen. **Taking a track out of service with a Service Bulletin may reduce the total number of flagmen required.** To take a track out of service, a completed "Single Track/Reroute Request" form must be submitted to the Office of the Vice President, Rail Operations at least 14 days in advance of the scheduled work. Whenever possible, the person in charge should request a Transportation Manager to attend the work site inspection.

Once, the minimum number of flagmen is determined, contact the Rail Control Center Clerk *(for work charged to Function Numbers or Operations)* or the Capital Improvement Project Clerk *(for work charged to Capital Accounts or Job Orders)* to place a flagmen order. When placing the flagmen order, provide the clerk with following information:

1) Flag Zone Number where work will be performed. *(NOTE: If work is performed in two or more flag zones, the minimum number of flagmen ordered shall be governed by the flag zone with the highest number of flagmen).*

2) The location and type of work to be performed.

3) Tracks fouled by the work.

4) The track(s) where work will be performed.

5) The minimum number of flagmen required *(governed by the flag zone with the highest number of flagman),* including projected number of days and times flagmen will be required.

6) The meeting time and location where flagmen are to report for work.

7) The person in charge of the work, including CTA radio call sign.

Once this information is given to the clerk, the clerk will assign an order number for that job. Record the number and use it for all future reference for that job. When canceling the flagmen order, provide the clerk with the order number in order to properly cancel it.

If there are any questions regarding these requirements, contact your immediate supervisor to

arrange for a field evaluation of the area with representatives of Rail Operations, Rail Instruction and Safety.

Rail Control Center Clerk and Capital Improvement Clerk

Upon receipt of the flag order request and all necessary information, the clerk will:

1) Assign an order number.

2) Prepare the proper "Rail Operations Order" form.

3) Complete pertinent information including the amount of **tracks fouled, track number where work is to be performed, Flag Zone Number, number of flagmen and number of days flagmen will be required.**

4) Using the Flag Zone Index, check that the correct minimum numbers of flagmen are being ordered.

5) Execute the flag order by notifying the appropriate Terminal Clerk by telephone and fax a copy of the completed Rail Operations Order. Note: if unable to fax a copy of the Rail Operations Order, send a copy in the CTA departmental mail.

Terminal Clerk

Upon receipt of flag order, the clerk will:

1) Prepare the proper "Rail Operations Order" form.

2) Complete pertinent information including the amount of **tracks fouled, track number where work is to be performed, Flag Zone Number, number of flagmen and number of days flagmen will be required.**

3) Using the Flag Zone Index, check that the correct minimum numbers of flagmen are being ordered.

4) Execute the flag order by assigning the correct number of flagmen.

Transportation Manager

The Transportation Manager must verify that flag orders are in compliance with the Flag Zone index. All orders must be reviewed by a Transportation Manager and authorized by signature including date and time.

Canceling Flagmen Orders

Upon completion of work, the person in charge of the work area shall contact the appropriate Clerk and cancel the flag order by noon of the previous day when flagmen are no longer required for that job.

General

Rail Operations Management and Supervisors must periodically check all Slow Zones.

Definitions

Abutment – Earth retaining structures (typically concrete) which support slabs, stringers, trusses or girders.

Bent - a structure consisting of two or more columns and one or more cross girder segments supporting track or platform stringers.

Bent Number (#) - the unique identification number of a bent

Catenary - an overhead wire from which a transit vehicle collects 600 volt D.C. power.

Clearance - The distance between specified points along the tracks and specified points on a moving vehicle.

Clearance Diagram - a diagram that establishes the minimum safe distance between all points on a moving vehicle and fixed wayside structures or appurtenances.

Crossover - two turnouts, with track between the frogs, arranged to allow a continuous passage of trains between two parallel tracks.

Flagman - an employee designated to control the movement of trains by the display of hand signals, flags or lights.

Flagman, Relay - an additional flagman positioned to coordinate the safe movement of trains through a work area.

Flag Zone - a segment of track with definite boundaries.

Flag Zone Index - a chart identifying each flag zone by the 1) Flag Zone Number, 2) Location (limits of the flag zone), 3) Number of tracks, 4) Track Characteristics/Special Conditions, 5) Rail Stations within the flag zone and 6) Flagmen Requirements.

Flag Zone Map - a map of areas of a rail line illustrating the limits of flag zones.

Flag Zone Number - a unique number identifying a specific flag zone.

Fouling a Track (track fouled) - the placement of an individual or an item of equipment in such proximity to a track that the individual or equipment could be struck by a moving train. This would also include the area where workers clear to on the approach of a train on the track that they are working on/adjacent to on the approach of a train.

Interlocking - a powered group of switches, locks and signals through a junction, cross-over or crossing, so arranged, as to permit train movements without conflict.

Junction - a location where train routes converge or diverge.

Out of Service Track - a section of track authorized by a Service Bulletin or Rail Control that no trains (revenue or non-revenue) may operate on *(may require the installation of a portable track trip and may require the removal of traction power).*

DEFINITIONS (continued)

Portable (flagman's) Track Trip - a portable device, installed on the running rail with a removable trip arm, which causes a penalty brake application on a train when it is struck by the train side trip.

Relay Flagman*, see Flagman, Relay*

Revolving Amber Warning Lights - a device that operates when reverse train operation is established with cab signal protection (O'Hare - from Jefferson Park to Rosemont and North Mainline on tracks 3 & 4 from Addison Interlocking to the north end of Clark Junction).

Service Bulletin - an instructional bulletin that is used for planned irregular train operation - format used for removal of a track from service.

Signal - a device conveying information affecting movement of a train.

Signal Bond Marker – a sign designating the nearby track circuit number and change in allowable train speed.

Signal Number Plate (or Signal #) - A plate containing letters or numbers distinctive for each signal, attached to that signal or signal bond.

Slow Zone - a series of signs establishing a segment of track where trains must operate at a reduced speed due to workers on the right-of-way, track & structure conditions, or other reasons that trains must operate at a reduced speed.

Switch - a pair of switch points with their fastenings and operating rods providing the means for establishing a route from one track to another

Switch Point - a moveable tapered track rail, the point of which is designed to fit against the stock rail.

Turnout - an arrangement of a switch and frog with closure rails by means of which trains may be diverted from one track to another.

Third Rail - a rail mounted on insulators alongside the running rail which provides traction power for train operation.

Track Markers – signs posted at 100’ intervals to indicate route and track.

Workers Ahead Warning System - a flashing yellow light which alerts operators that workers are present on or near the track ahead in certain areas of limited visibility and in cab signal territory may reduce the maximum allowable train speed by one or more increments.

ABBREVIATIONS

NB - northbound
SB - southbound
No. or # - Number
Trks - tracks
RF - Relay Flagman

Flag Zone Index - O'Hare Terminal - O'Hare to LaSalle Interlocking - Dearborn Subway/Blue Line

Flag Zone No.	Location	No. Trks	Track Characteristics Special Conditions	Stations	Flagman Requirements		
					Tracks Fouled	Track No.	Flagman
101	O'Hare Terminal	3	Station platforms are constructed at the north end of the O'Hare Subway. Track is secured by direct fixation method, portable track trips are installed at drainage cut outs under rail or by using permanent track trip bases installed under the running rail. O'Hare platforms are island type.	O'Hare	1	-	1
					2	-	2
					3	-	3
102	O'Hare Terminal to the south (east) end of O'Hare East Interlocking	3	Subway track separated by concrete walls with a center track in a curve with restricted visibility. Track is secured by direct fixation method, portable track trips are installed at drainage cut outs under rail or by using permanent track trip bases installed under the running rail.	-	1	-	1
					2	-	2
					3	-	3
103	O'Hare East Interlocking to the south (east) end of Old Mannheim Interlocking	2	Subway track separated by a concrete wall leading to an incline onto ballasted track in expressway median. Ballasted track is in a curve with restricted visibility. Track is secured by direct fixation method in subway & incline, portable track trips are installed at drainage cut outs under rail or by using permanent track trip bases installed under the running rail.	-	1	-	2
					2	-	4
104	Old Mannheim Interlocking to Ramp AJ@ leading to southbound I-294	2	Ballasted track constructed in expressway median that has a curve with restricted visibility.	-	1	-	1
					2	-	2
105	Ramp AJ@ to the south (east) side of Rosemont Station platform	2	Ballasted track constructed in expressway median with a curve with restricted visibility. Track is constructed around Rosemont Yard from Bridge "J" to Rosemont Station. Rosemont Station platform is an island type.	Rosemont	1	-	1
					2	-	2
106	Rosemont Station platform to the north (west) portal of the Tollway Tunnel	2	Ballasted track constructed in expressway median leading to a tunnel.	-	1	-	2
					2	-	2
107	Tollway Tunnel - north portal to the south (east) side of East River Road Bridge	2	Ballasted track constructed in a tunnel with a curve with restricted visibility.	-	1	-	3
					2	-	3
108	East River Road Bridge to Oriole Avenue Bridge	2	Ballasted track constructed in expressway median. Cumberland Station platform is an island type. **CANFIELD & ORIOLE AVENUE BRIDGE PIERS ARE AREAS OF NO CLEARANCE**	Cumberland	1	-	2
					2	-	2

NOTE: *A pre-job inspection is required by the Person in Charge of the Work Area to insure that the proper number of flagmen & slow zone equipment is ordered.*

Flag Zone Index - O'HARE TERMINAL - O'Hare to LaSalle Interlocking - Dearborn Subway/Blue Line

Flag Zone No.	Location	No. Trks	Track Characteristics Special Conditions	Stations	Flagman Requirements		
					Tracks Fouled	Track No.	Flagman
109	Harlem Curve - Oriole Avenue bridge to the north (west) end of Harlem Station platform)	2	Ballasted tracks in a curve with restricted visibility constructed in expressway median.	-	1	-	3
					2	-	3
110	Harlem Station to the south (west) side of Harlem Interlocking	2	Ballasted tracks constructed in expressway median. Harlem Avenue Station platform is an island type.	Harlem	1	-	1
					2	-	2
111	Harlem Interlocking to north (west) side of Nagle Interlocking	2	Ballasted track constructed in expressway median. **SAYRE & NATOMA AVENUE BRIDGE PIERS ARE AREAS OF NO CLEARANCE**	-	1	-	2
					2	-	2
112	Nagle Curve - Nagle Interlocking to south (east) end of curve at Signal Relay Case at Moody	2	Ballasted tracks in a curve with restricted visibility constructed in expressway median. Workers Ahead Warning System installed in this zone. **NAGLE AVENUE BRIDGE PIER IS AREA OF NO CLEARANCE**	-	1	-	2
					2	-	3
113	South end of Nagle curve to the south (east) end of Foster Avenue Bridge	2	Ballasted track constructed in expressway median. **PEDESTRIAN BRIDGE @ AUSTIN, FOSTER & CENTRAL AVENUE BRIDGE PIERS ARE AREAS OF NO CLEARANCE**	-	1	-	2
					2	-	2
114	Foster Avenue Bridge to Central Avenue Bridge	2	Ballasted track with a center storage track constructed in expressway median.	-	1	-	1
					2	-	2
115	Central Avenue the south (east) end of Jefferson Park Station	2	Ballasted tracks in a curve with restricted visibility constructed in expressway median. Center storage track from Central Avenue to Edmunds. Workers Ahead Warning System installed in this zone. **IN THE AREA OF EDMUNDS, AREAS OF NO CLEARANCE EXIST BETWEEN CONCRETE RETAINING WALL & THE OUTSIDE OF THE NORTHBOUND & SOUTHBOUND TRACKS.**	Jefferson Park	1	-	2
					2	-	4
116	Jefferson Park to the south (east) end of Lawrence Avenue Bridge	2	Ballasted track with wide track centers constructed in expressway median.	-	1	-	1
					2	-	2

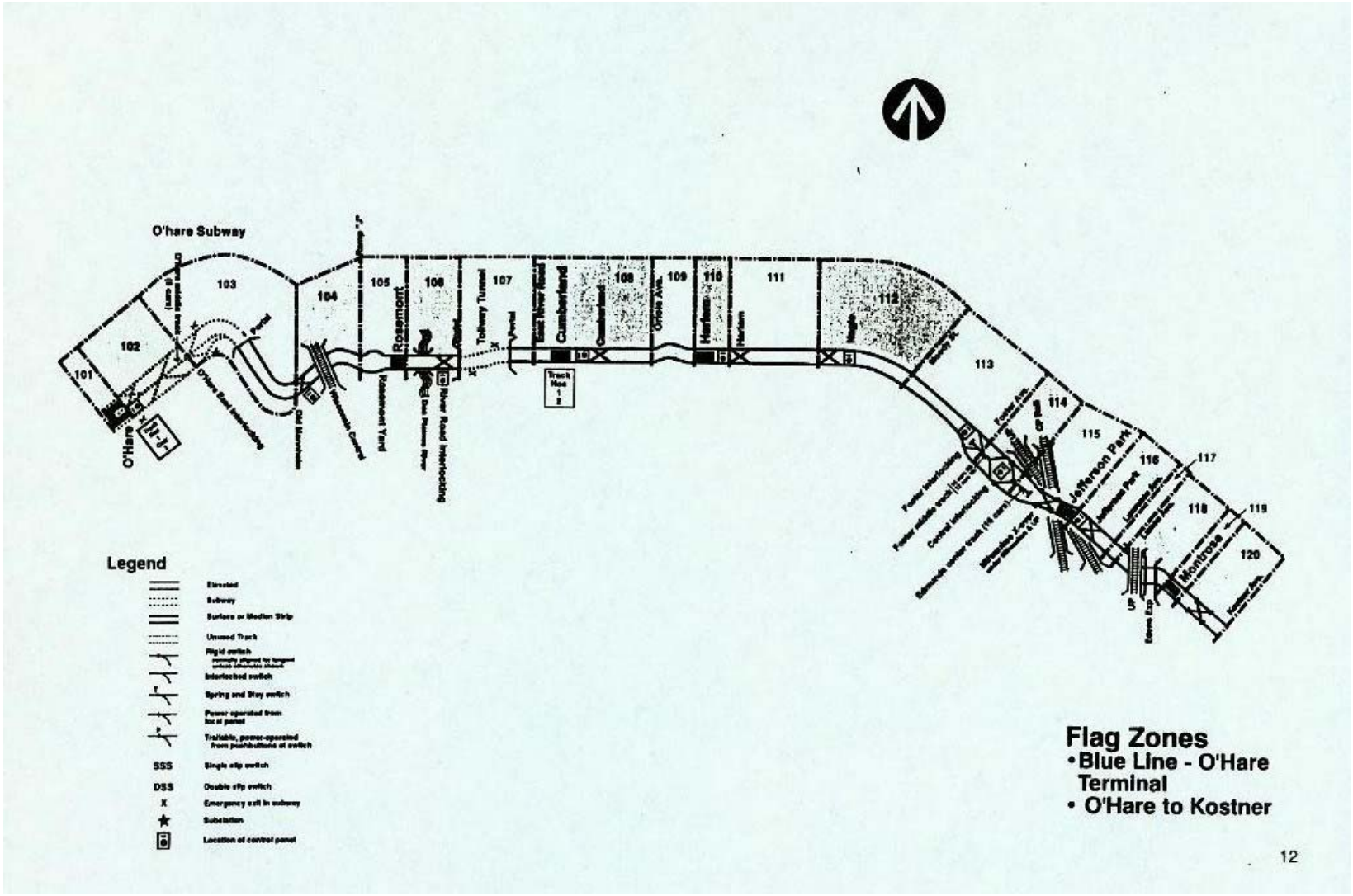
NOTE: *A pre-job inspection is required by the Person in Charge of the Work Area to insure that the proper number of flagmen & slow zone equipment is ordered.*

Flag Zone Index - O'HARE TERMINAL - O'Hare to LaSalle Interlocking - Dearborn Subway/Blue Line

Flag Zone No.	Location	No. Trks	Track Characteristics Special Conditions	Stations	Flagman Requirements		
					Tracks Fouled	Track No.	Flagman
117	Lawrence to Lamon Avenue at Pumping Station located along northbound Kennedy Expressway	2	Ballasted tracks in a curve with restricted visibility constructed in expressway median.	-	1	-	2
					2	-	2
118	Lamon to the north (west) end of Montrose Station	2	Ballasted tracks in a curve with restricted visibility constructed in expressway median.	-	1	-	4
					2	-	4
119	Montrose Station to the south (east) end of Montrose Avenue Bridge	2	Ballasted tracks in a curve with restricted visibility constructed in expressway median. Montrose Station platform is an island type and constructed in a curve with restricted visibility.	Montrose	1	-	2
					2	-	4
120	Montrose Avenue Bridge to Kostner	2	Ballasted tracks constructed in expressway median.		1	-	2
					2	-	2

NOTE: *A pre-job inspection is required by the Person in Charge of the Work Area to insure that the proper number of flagmen & slow zone equipment is ordered.*

Flag Zone Map - O'Hare Terminal - O'Hare to Kostner



Flag Zone Index - O'HARE TERMINAL - Kostner LaSalle Interlocking - Dearborn Subway/Blue Line

Flag Zone No.	Location	No. Trks	Track Characteristics Special Conditions	Stations	Flagman Requirements		
					Tracks Fouled	Track No.	Flagman
121	Expressway Tunnel (Kostner to the north side of Irving Park Road @ Power Isolation Switches)	2	Ballasted tracks constructed in expressway median in a tunnel with a curve with restricted visibility.	-	1	-	3
					2	-	3
122	Irving Park Station	2	Ballasted track constructed in expressway median. Irving Park Station platform is an island type.	Irving Park	1	-	1
					2	-	2
123	South (east) end of Irving Park Station to the north (west) side of Addison Crossover	2	Ballasted track constructed in expressway median.	-	1	-	2
					2	-	2
124	Addison Crossover to Addison Street	2	Ballasted track constructed in expressway median. Addison Street platform is an island type constructed in a curve with restricted visibility.	Addison	1	-	SB -1
							NB - 2
					2	-	3
125	Addison Street to Signal Bond #NWD 174 located approximately 1300 feet north of Kimball Subway North Portal.	2	Ballasted track constructed in expressway median.	-	1	-	2
					2	-	2
126	Signal Bond #NWD 174 to the north (west) end of Belmont Station	2	Ballasted track constructed in expressway median leading into a subway in a curve with restricted visibility. In the subway a concrete wall separates tracks. **NO CLEARANCE AREA IN CURVE ON BOTH THE NORTHBOUND AND SOUTHBOUND TRACK**	-	1	-	2
					2	-	4
127	Belmont Station to Belmont Crossover	2	Subway track separated by concrete platform and wall. Belmont Station platform is an island type.	Belmont	1	-	1
					2	-	2
128	Belmont Crossover to Logan Square	2	Subway track separated by a concrete wall in a curve with restricted visibility. **NO CLEARANCE AREA IN CURVE ON BOTH THE NORTHBOUND AND SOUTHBOUND TRACK**		1	-	2
					2	-	4

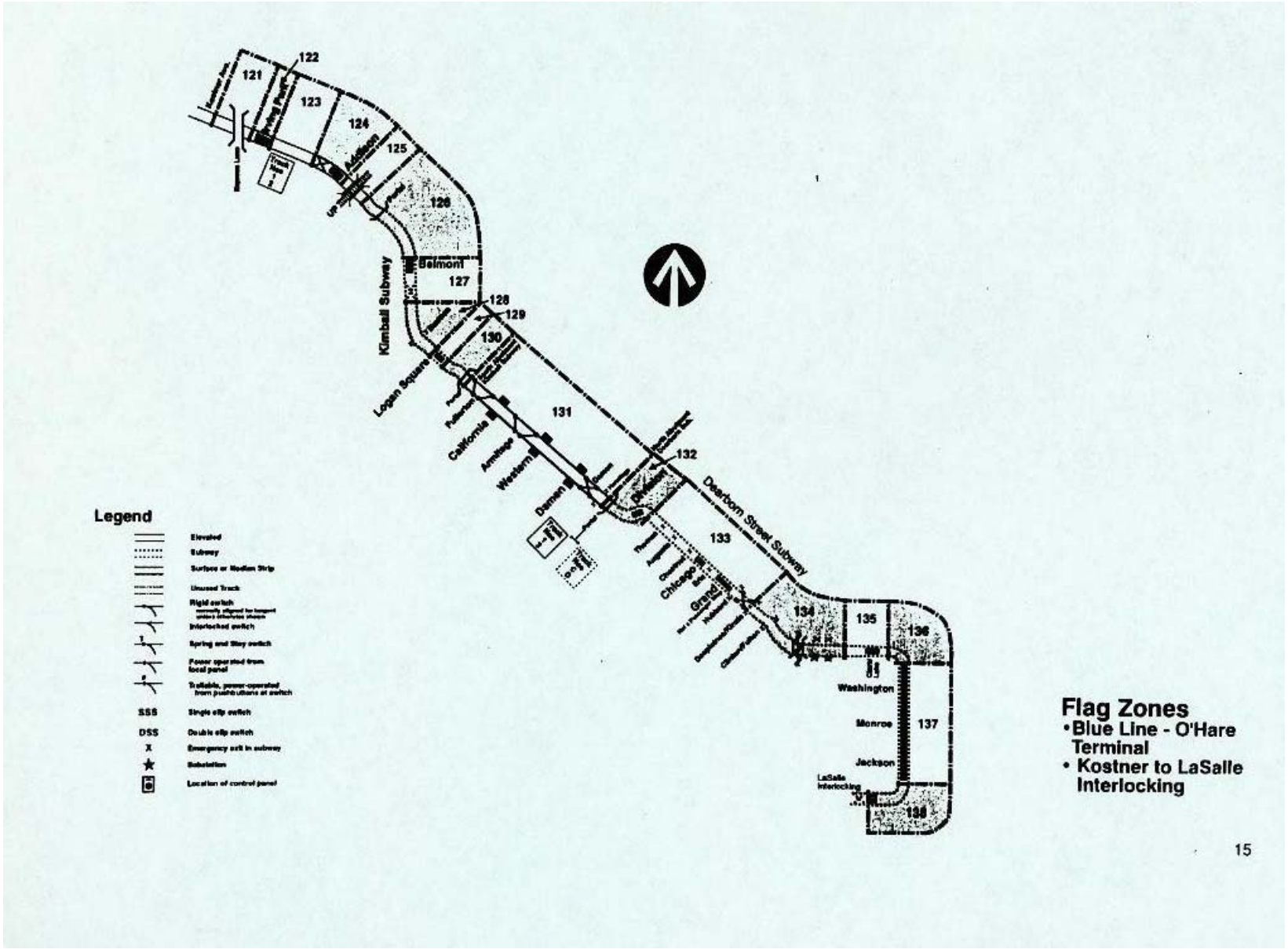
NOTE: *A pre-job inspection is required by the Person in Charge of the Work Area to insure that the proper number of flagmen & slow zone equipment is ordered.*

Flag Zone Index - O'HARE TERMINAL - Kostner to LaSalle Interlocking - Dearborn Subway/Blue Line

Flag Zone No.	Location	No. Trks	Track Characteristics Special Conditions	Stations	Flagman Requirements		
					Tracks Fouled	Track No.	Flagman
129	Logan Square Station	2	Subway track separated by concrete platform. Logan Square Station platform is an island type.	Logan Square	1	-	1
					2	-	2
130	Logan Square Station to the south abutment of the Kimball Subway	2	Subway track separated by a concrete wall in a curve with restricted visibility.	-	1	-	2
					2	-	4
131	South Abutment Kimball Subway to North Abutment Dearborn Subway	2	Open deck elevated structure. California, Western and Damen station platforms are outside type.	California Western Damen	1	-	2
					2	-	2
132	North Abutment Dearborn Subway to the south end of Division Curve @ Signals C-210 or D-213	2	Ballasted tracks on an incline leading into Subway in curves with restricted visibility. In the subway, tracks are separated by a concrete wall or station platform. Division Street platform is an island type.	Division	1	-	2
					2	-	4
133	South end of Division Curve to Hubbard Street Crossover	2	Subway tracks separated by a concrete wall. Chicago Avenue Station and Abandoned Grand Avenue platforms are island type.	Chicago	1	-	1
					2	-	2
134	Hubbard Street Crossover to underneath the Chicago River @ Signal C-112 or Signal D –115	2	Subway tracks separated by a concrete wall in a curve with restricted visibility.	-	1	-	2
135	Underneath Chicago River to the south end of Clark/Lake platform	2	Subway tracks separated by a concrete wall and concrete platform. Clark/Lake Station platform is an island type	Clark/Lake	1	-	1
					2	-	2
136	Washington Curve – Signals C-92 or D-84 to the north end of the continuous platform at Washington	2	Subway tracks separated by a concrete wall in a curve with restricted visibility.	-	1	-	2
					2	-	4
137	Washington to south of Jackson Station at Signals C-56 or D-84	2	Subway tracks separated by an island type of continuous platform. Washington, Monroe & Jackson Station platforms are island type.	Washington Monroe Jackson	1	-	1
					2	-	2
138	Jackson Curve - from the south end of Jackson Platform to the south end of LaSalle Interlocking	2	Subway tracks separated by a concrete wall in a curve with restricted visibility.	-	1	-	2
					2	-	3

NOTE: *A pre-job inspection is required by the Person in Charge of the Work Area to insure that the proper number of flagmen & slow zone equipment is ordered.*

Flag Zone Map - O'Hare Terminal - Kostner to LaSalle Crossover



Flag Zone Index - Forest Park Terminal - Desplaines to LaSalle Interlocking/Dearborn Subway - Blue Line

Flag Zone No.	Location	No. Trks	Track Characteristics Special Conditions	Stations	Flagman Requirements		
					Tracks Fouled	Track No.	Flagman
201	Forest Park Terminal to the south (west) end of Desplaines Avenue Bridge	2	Ballasted tracks, Forest Park platform is an island type	Forest Park	1	-	1
					2	-	2
202	Desplaines Avenue Bridge to the south (west) end of Harlem Avenue Station	2	Ballasted tracks in a reverse curve on an incline with a 3.5% grade, portion of the zone is under CSX Railroad bridge.	-	1	-	3
					2	-	3
203	Harlem Station to the south (west) end of Central Avenue Station	2	Ballasted tracks with wide track centers. Harlem, Oak Park and Austin station platforms are island type.	Harlem Oak Park Austin	1	-	1
					2	-	2
204	Central Avenue Station (abandoned) to Lockwood Street (8 clear sign for Lotus Tunnel northbound)	2	Ballasted tracks in a double reverse curve on an incline into a Lotus tunnel. The abandoned Central station platform is an island type.	-	1	-	4
					2	-	4
205	Lockwood Street to Belt Railroad bridge	2	Ballasted tracks with wide track centers in expressway median, Cicero Avenue station is an island type.	Cicero	1	-	1
					2	-	2
206	Belt Railroad bridge to south (west) side of Keeler Avenue overpass	2	Ballasted tracks in a curve with restricted visibility constructed in expressway median. The abandoned Kostner station is an island type		1	-	3
					2	-	4
207	Keeler to the south (west) side of Homan Avenue overpass	2	Ballasted tracks in expressway median. Pulaski Avenue station platform is an island type.	Pulaski	1	-	1
					2	-	2
208	Homan to north (east) side of Kedzie Avenue overpass	2	Ballasted curve tracks with restricted visibility in expressway median. Kedzie Avenue station platform is an island type	Kedzie	1	-	2 -TRK C 1 -TRK D
					2	-	3
209	Kedzie to the south (west) end of California Avenue Station	2	Ballasted tracks with wide track centers in expressway median.	-	1	-	1
					2	-	2
210	California Avenue Station (abandoned) to the north (east) end of California Avenue overpass	2	Ballasted curved tracks with restricted visibility in expressway median. The abandoned California Avenue station platform is an island type.	-	1	-	1 -TRK C 2 -TRK D
					2	-	3

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Flag Zone Index - Forest Park Terminal - Desplaines to LaSalle Crossover/Dearborn Subway - Blue Line

Flag Zone No.	Location	No. Trks	Track Characteristics Special Conditions	Stations	Flagman Requirements		
					Tracks Fouled	Track No.	Flagman
211	California to south (west) end of Loomis Junction	2	Ballasted tracks with wide track centers in expressway median. Western Avenue and Medical Center stations platforms are island types. Includes Western Stub Track.	Western Medical Center	1	-	1
					2	-	2
212	Loomis Junction to south (west) end of Racine Avenue Station Platform	2	Ballasted tracks that intersect with the Douglas Park Elevated Tracks at Loomis Junction. Extra Flag protection required on the Douglas Park Branch for work on the northbound track	-	1	-	1 - Trk D 2 - Trk C
					2	-	3
213	Racine to the north (east) end of Morgan Middle Track @ Morgan Street	2	Ballasted tracks with wide track centers in expressway median, with a center storage track between Racine and Morgan streets. Racine station platform is an island type.	Racine	1	-	1
					2	-	2
214	Morgan Middle Track to North Portal Dearborn Subway	2	Ballasted tracks with wide track centers in expressway median featuring a curve with restricted visibility (northbound) in the station area. U of I/Halsted station platform is an island type.	U of I/Halsted	1	-	1 - SB 2 - NB
					2	-	3
215	North Portal Dearborn Subway to the north (east) end Clinton Street Station	2	Subway tracks separated by a concrete wall, Clinton station platform is an island type.	Clinton	1	-	1
					2	-	2
216	Clinton to the south end of LaSalle Station at Signals C-41 & D-41	2	Subway tracks separated by a concrete wall in a curve with restricted visibility on a 3.2% grade.	-	1	-	2
					2	-	4
217	South end of LaSalle Station to the south end of LaSalle Interlocking	2	Subway tracks separated by a concrete platform. LaSalle station platform is an island type.	LaSalle	1	-	2
					2	-	4

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Flag Zone Index - 54th Terminal - 54th to Loomis Junction -Douglas Branch/Blue Line & Connector Track

Flag Zone No.	Location	No. Trks	Track Characteristics Special Conditions	Stations	Flagman Requirements		
					Tracks Fouled	Track No.	Flagman
301	54th to Belt Railway Bridge @ Kenton	2	Ballasted tracks with wide track centers. 54th station has 2 platforms. Laramie (abandoned) and Cicero Avenue stations are island type. Includes 54th, Laramie, 50th, 49th, Cicero, 47th & 47th Court Grade Crossings	54th Cicero	1	-	1
					2	-	2
302	Belt Railway Bridge to north (east) side of Kostner Avenue	2	Ballasted tracks in a curve with restricted visibility. Workers Ahead Warning System installed in the limits of this zone. Includes Kilbourn & Kostner Grade Crossings	-	1	-	2
					2	-	4
303	Kildare Avenue Station	2	Ballasted tracks with wide track centers. Kildare station platform is an island type.	Kildare	1	-	1
					2	-	2
304	South (west) end of Kildare Avenue to the south (west) end of Pulaski Avenue Station	2	Ballasted tracks on an incline leading to open deck elevated structure. Includes Kildare Grade Crossing.	-	1	-	2
					2	-	2
305	Pulaski to north (east) end of Central Park Avenue Station	2	Open deck elevated structure with wide track centers. Includes a center track between Pulaski and the Central Park Stations. Pulaski & Central Park station platforms are island type.	Pulaski Central Park	1	-	1
					2	-	2
306	Central Park to Wood Street	2	Open deck elevated structure. Kedzie, California, Western & Hoyne Avenue station platforms are outside type.	Kedzie California Western Hoyne	1	-	2
					2	-	2
307	Wood Street Curve	2	Open deck elevated structure in a curve with restricted visibility	-	1	-	3
					2	-	3
308	Cullerton Avenue to the north end of Harrison Street Crossover	2	Open deck elevated structure. 18th & Polk Street station platforms are outside type.	18th Polk	1	-	2
					2	-	2
309	Harrison to Ashland	2	Open deck elevated structure featuring a curve with restricted visibility.	-	1	-	3
					2	-	3

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Flag Zone Index - 54th Terminal - 54th to Loomis Junction -Douglas Branch/Blue Line & Connector Track

Flag Zone No.	Location	No. Trks	Track Characteristics Special Conditions	Stations	Flagman Requirements		
					Tracks Fouled	Track No.	Flagman
310	Ashland to the south (west) end of Loomis Junction	2	Open deck elevated structure on an incline with a 3.12% grade.	-	1	-	2
					2	-	2
311	Connector Track – Harrison Junction to Lake Street	1	Open deck elevated structure, used as a transfer track. There are no scheduled train movements on the Connector Track.	-	1	-	1

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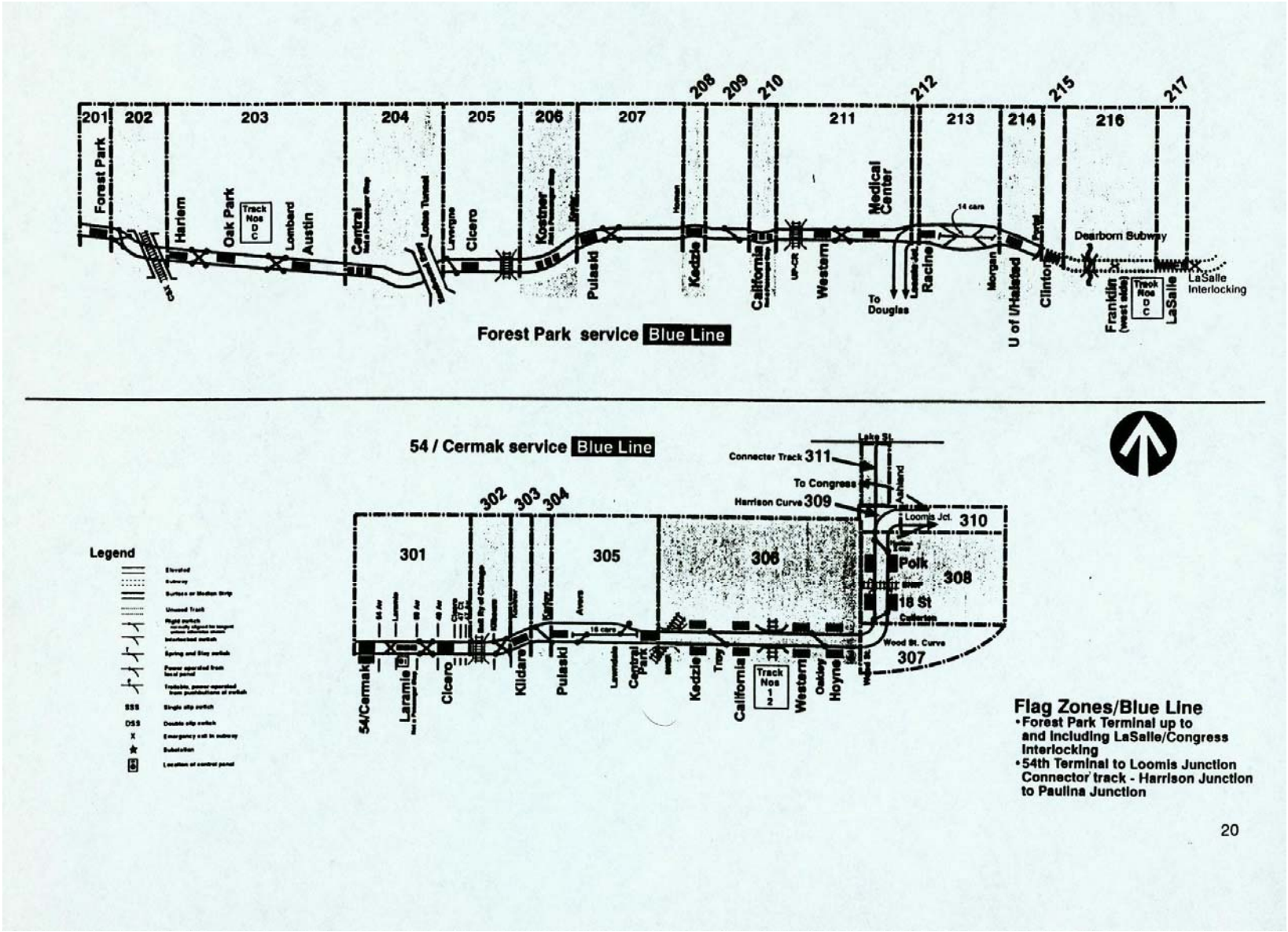
Flag Zone Map - Forest Park & 54th Terminals



Flag Zone Index - Kimball Terminal - Kimball to Wacker Drive / Brown Line

Flag Zone No.	Location	No. of Trks	Track Characteristics Special Conditions	Stations	Flagman Requirements		
					Tracks Fouled	Track No.	Flagman
401	Kimball Terminal to Kimball Interlocking	3	Ballasted tracks within the confines of Kimball Terminal. Kimball station has 2 platforms.	Kimball	1	-	1
					2	-	2
					3	-	3
402	Kimball Interlocking to the north (west) side of Spaulding Grade Crossing (includes Kimball curve)	3	Ballasted tracks, includes curve with restricted visibility, within the confines of Kimball Interlocking.	-	1	-	2
					2	-	3
					3	-	3
403	Spaulding Grade Crossing to North Branch Chicago River bridge	2	Ballasted tracks. Kedzie and Francisco station platforms are island type. Includes Spaulding, Kedzie, Albany, Sacramento & Francisco Grade Crossings.	Kedzie Francisco	1	-	1
					2	-	2
404	North Branch Chicago River bridge	2	Ballasted tracks over the North Branch of the Chicago River bridge. **NO CLEARANCE AREA ON BRIDGE.**	-	1	-	2
					2	-	2
405	North Branch Chicago River Bridge to south (east) side of Rockwell Grade Crossing	2	Ballasted tracks. Rockwell station platform is an island type. Includes Rockwell grade crossing.	Rockwell	1	-	1
					2	-	2
406	Rockwell Grade Crossing to north (west) end of Western Avenue Station	2	Ballasted tracks on incline leading to open deck elevated tracks.	-	1	-	2
					2	-	2
407	Western Station to Leavitt at the center track bumping post	3	Open deck elevated tracks, 2 main line tracks separated by a center storage track. Western Avenue station platforms are outside type.	Western	1	-	1
					2	-	2
408	Leavitt to south (east) end of Damen Station	2	Open deck elevated tangent tracks, Damen station platforms are outside type.	Damen	1	-	2
					2	-	2
409	Damen Curve - south (east) end of Damen Station to Sunnyside at Bent #326 (Sunnyside is 1 block north of Montrose).	2	Open deck elevated tracks in curve with restricted visibility. **NO CLEARANCE AREA IN CURVE.**	-	1	-	4
					2	-	4
410	Sunnyside to south end of Addison Station platform	2	Open deck elevated tangent tracks, Montrose, Irving Park and Addison station platforms are outside type.	Montrose Iriving Park Addison	1	-	2
					2	-	2

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Flag Zone Index - Kimball Terminal - Kimball to Wacker Drive / Brown Line

Flag Zone No.	Location	No. of Trks	Track Characteristics Special Conditions	Stations	Flagman Requirements		
					Tracks Fouled	Track No.	Flagman
411	Paulina Curve - south end of Addison Station to north (west) end of Paulina Station	2	Open deck elevated tracks in curve with restricted visibility, includes through girder bridge at track level in center of curve. **NO CLEARANCE AREA IN CURVE.**	-	1	-	4
					2	-	4
412	Paulina Station to north (west) side of Seminary Avenue at Bent #29 (2nd bent east of Seminary	2	Open deck elevated tangent track, Paulina and Southport station platforms are outside type.	Paulina Southport	1	-	2
					2	-	2
413	Roscoe Curve (Seminary Avenue at Signal RV1-10) to Clark Junction at Signal X-6)	2	Open deck elevated tracks in curve with restricted visibility. Workers Ahead Warning System installed in curve. **NO CLEARANCE AREA IN CURVE.**	-	1	-	4
					2	-	4
414	Clark Junction (north end of Clark Junction at Signals X-6 & X-8 on the Brown Line and Signals X-4, X2, X10 & X-12 on the Red Line to School Street @ Bent #6019)	6	Open deck elevated tracks within the confines of Clark Junction Interlocking, features the intersection of a 4 track mainline and a 2 track mainline. Flagman requirements based on position of where work is to be preformed and tracks fouled.	-	-	1	2
					-	2	3
					-	3	3
					-	4	2
					3	-	3
					4	-	5
					5	-	5
					6	-	6
415	School Street to North Abutment State Street Subway where tracks #2 & #3 meet tracks A & B.	4	Open deck elevated 4 track mainline. Belmont and Fullerton Station platforms are island type and Wellington, Diversey and Armitage station platforms are outside type.	Belmont Wellington Diversey Fullerton Armitage	-	1	2
					-	2	3
					-	3	3
					-	4	2
					3	-	3
					4	-	4

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Flag Zone No.	Location	No. of Trks	Track Characteristics Special Conditions	Stations	Flagman Requirements		
					Tracks Fouled	Track No.	Flagman
416	North Abutment State Street Subway to Willow Curve @ Bent #4036 (1st bent north of the alley north of Willow Street) Includes tracks A & B on the North Incline of the State Street Subway	4	Open deck elevated tracks that are located above/over the north incline of the State Street Subway and ballasted track on the North Incline of the State Street Subway. Abandoned track and footwalk along both elevated tracks. **Work in this zone may require additional flagman for north incline state street subway.**	-	-	1	2
					-	A	3
					-	B	3
					-	2	2
					3	-	4
					4	-	5
417	Willow Curve to North/Halsted Curve	2	Open deck elevated tracks in curve with restricted visibility. Abandoned track and footwalk along both tracks. **NO CLEARANCE AREA IN CURVE.**	-	1	-	4
					2	-	4
418	North/Halsted Curve Bent #3082 (1st bent west of Halsted) to Bent #3054 at Orchid Street	2	Open deck elevated tracks in reverse curve with restricted visibility. Abandoned track and footwalk along both tracks. **NO CLEARANCE AREA IN CURVE.**	-	1	-	4
					2	-	4
419	North/Halsted Curve to north (west) end of Sedgwick Station platform	2	Open deck elevated tangent tracks. Abandoned track and footwalk along both tracks.	-	1	-	2
					2	-	2
420	Sedgwick Curve (north end of Sedgwick station to Bent #2130 - approximate location of Blackhawk Street)	2	Open deck elevated tracks in curve with restricted visibility. Sedgwick station platforms are outside type. Abandoned track and footwalk is along both tracks. **NO CLEARANCE AREA IN CURVE.**	Sedgwick	1	-	3
					2	-	4
421	Sedgwick Curve to north side of Division Street (at Bent #2077)	2	Open deck elevated tangent tracks. Abandoned track and footwalk along both tracks (except in the area north of Division street.	-	1	-	2
					2	-	2
422	Church Curve (from Division Street to Oak Street at Bent #2043)	2	Open deck elevated tracks in reverse curve with restricted visibility. Abandoned track and footwalk along both tracks. **NO CLEARANCE AREA IN CURVE.**	-	1	-	3
					2	-	3

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Flag Zone No.	Location	No. Trks	Track Characteristics Special Conditions	Stations	Flagman Requirements		
					Tracks Fouled	Track No.	Flagman
423	Church Curve to south end of Institute Crossover	2	Open deck elevated tangent tracks. Abandoned track and footwalk along southbound track and footwalk and storage track along northbound track.	-	1	-	2
					2	-	2
424	Institute Crossover to the south end of Chicago Avenue Station	2	Open deck elevated tracks in a curve with restricted visibility at the north end of Chicago Avenue Station. Chicago Ave Station platforms are outside type. **NO CLEARANCE AREA IN CURVE.**	Chicago	1	-	3
					2	-	4
425	Chicago Avenue Station to Grand Avenue (Bent #1050 - south side of Grand Avenue)	2	Open deck elevated tangent track.	-	1	-	2
					2	-	2
426	Merchandise Mart Curve (Grand Avenue to north end of Merchandise Mart Station	2	Open deck elevated tracks in curve with restricted visibility. **NO CLEARANCE AREA IN CURVE.**	-	1	-	4
					2	-	4
427	Merchandise Mart Station	2	Open deck elevated tangent tracks with wide track centers. Merchandise Mart station platforms are outside type	Merchandise Mart	-	1 - NB	1
					-	2 - SB	2
					2	-	3
428	Wells Street Bridge (from the south end of Merchandise Mart Station to Wacker Drive (south side) at Bent #1007	2	Open deck elevated tangent track constructed on raiseable Wells Street bascule bridge. **NO SLOW ZONE SIGNS OR FLAGMEN CAN BE SET UP ON WELLS STREET BRIDGE.**	-	1	-	1
					2	-	2

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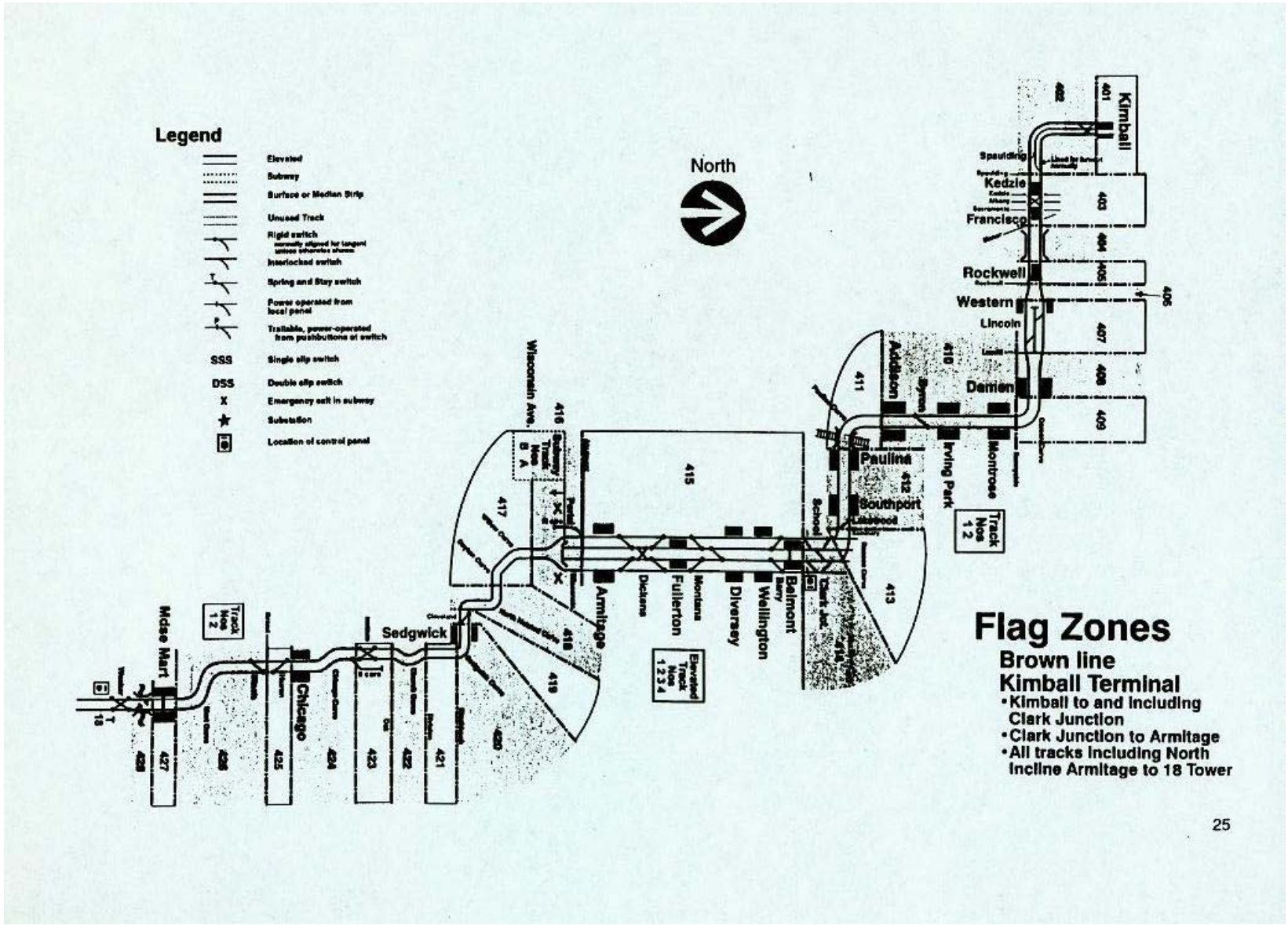
Flag Zone Map - Kimball Terminal - Kimball to Wacker Drive



Flag Zone Index - Harlem Terminal - Harlem to 18 Tower/Green Line

Flag Zone No.	Location	No. Trks	Track Characteristics Special Conditions	Stations	Flagman Requirements		
					Tracks Fouled	Track No.	Flagman
001	Harlem Terminal to the north (west) end of Oak Park Station	2	Raised embankment ballasted tracks. Harlem Station platform is an island type.	Harlem	1	-	2
					2	-	2
002	Oak Park Station to the north (east) end of Central Station Platform	2	Raised embankment ballasted tracks. Oak Park, Ridgeland, Austin & Central Stations platforms are island type.	Oak Park Ridgeland Austin Central	1	-	1
					2	-	2
003	Central to Lorel	2	Raised embankment ballasted tracks.	-	1	-	2
					2	-	2
004	Lorel to the north (west) end of Laramie Station platform @ Bent #3002	2	Raised embankment ballasted tracks leading to open deck elevated tracks in a curve with restricted visibility. Workers Ahead Warning System installed from Lorel to the Laramie Interlocking.	-	1	-	2
					2	-	2
005	Laramie to Fairfield @ Bent #2332	2	Open deck elevated tracks with wide track centers, tracks are separated by open space between elevated structure. Footwalk and handrail are inside style. Raised structure with bridge girder over railroad @ Kenton Avenue. Laramie, Cicero, Pulaski, Homan (abandoned), Kedzie & California Stations platforms are outside type.	Laramie Cicero Pulaski Kedzie California	1	-	1
					2	-	2
006	Fairfield to south (east) side of Canal Street @ Bent #2001	2	Open deck elevated tracks. Rockwell Bridge Workers Ahead Warning System installed from south (east) of California Station to Artesian, includes raised structure with bridge girder over railroad @ Rockwell Avenue. Ashland & Clinton Stations platforms are outside type.	Ashland Clinton	1	-	2
					2	-	2
007	Canal to south (east) side of Wacker Drive @ Bent #1015	2	Open deck elevated tracks constructed on raiseable Lake Street bascule bridge. **NO SLOW ZONE SIGNS OR FLAGMEN CAN BE SET UP ON LAKE STREET BRIDGE.**	-	1	-	1
					2	-	2

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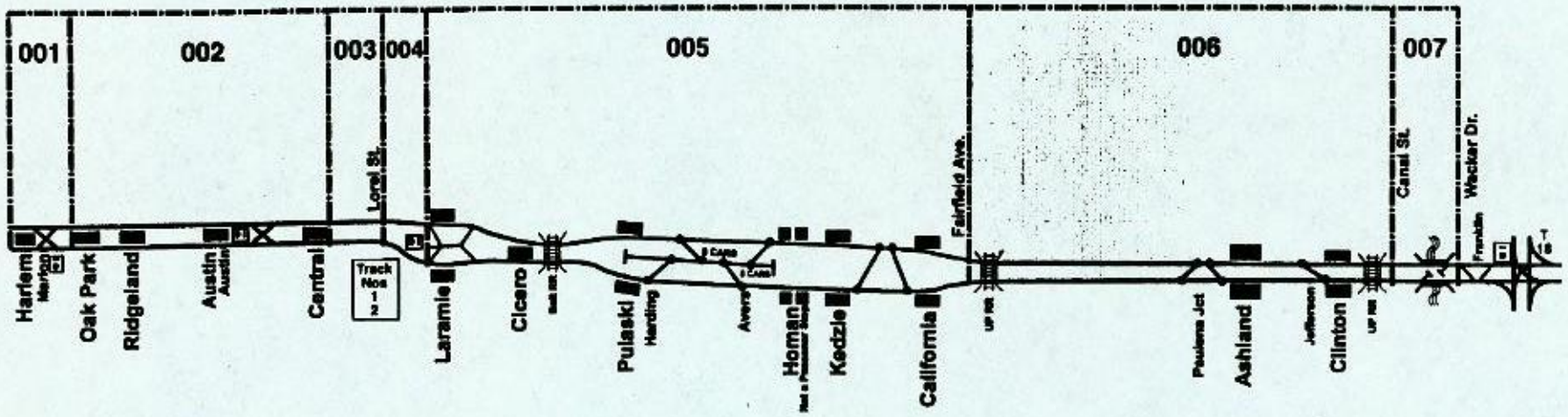
Flag Zone Map - Harlem Terminal - Harlem to 18 Tower



Legend

- Elevated
- Subway
- Surface or Median Strip
- Unused Track
- Rigid switch
- Interlocked switch
- Spring and Stay switch
- Power operated from local panel
- Trailable, power-operated from pushbuttons at switch
- SSS — Single slip switch
- DSS — Double slip switch
- Emergency exit in subway
- Substation
- Location of control panel

Harlem / Lake service Green Line

Flag Zones

- Green Line- Harlem Terminal
- From Harlem/Lake to Wacker Dr.

Flag Zone Index - 63rd/Ashland Terminal -Green Line - Englewood Branch - 63rd/Ashland to 59 Interlocking

Flag Zone No.	Location	No. Trks	Track Characteristics Special Conditions	Stations	Flagman Requirements		
					Tracks Fouled	Track No.	Flagman
601	63rd/Ashland Station to 63rd/Harvard Curve @ Peoria at Bent #2259	2	Open deck elevated tangent tracks, parallel to Rail Car Storage yard to Racine Avenue. 63rd/Ashland Station platform is an island type and the abandoned 63rd/Racine platforms are outside type.	63rd/Ashland	1	-	2
					2	-	2
602	63rd/Halsted Curve - North (east) side of Peoria Street to the south (west) end of 63rd/Halsted Station Platform	2	Open deck elevated tracks, in curve with restricted visibility. Workers Ahead Warning System installed in curve. **NO CLEARANCE AREA IN CURVE**	-	1	-	3
					2	-	3
603	Halsted Station to the south (east) end of 63rd/Harvard Curve @ Bent #2179 at Stewart Avenue	2	Open deck elevated tangent tracks, 63rd/Halsted station platforms are outside type.	63rd/Halsted	1	-	2
					2	-	2
604	63rd/Harvard Curve - South (west) side of Stewart Avenue to north side of 62nd Street @ Bent #2148	2	Open deck elevated tracks, in curve with restricted visibility. Workers Ahead Warning System installed in curve. **NO CLEARANCE AREA IN CURVE**	-	1	-	3
					2	-	3
605	62nd Street to the south side of 60th Street @ Bent #2108	2	Open deck elevated tracks	-	1	-	2
					2	-	2
606	59th/Wells Curve – 60th Street to Bent #2086 @ Relay House platform above northbound Dan Ryan Expressway	2	Open deck elevated tracks, in curve with restricted visibility. **NO CLEARANCE AREA IN CURVE**	-	1	-	3
					2	-	3
607	59th/Wentworth to 59th Junction at Signal X-92	2	Open deck elevated tracks, combination of tangent and curves with restricted visibility. Workers Ahead Warning System installed at 59th Junction.	-	1	-	2
					2	-	2

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Flag Zone Index - 63rd/Ashland Terminal - Green Line - Jackson Park Branch 63rd/Cottage Grove to 59th Junction

Flag Zone No.	Location	No. Trks	Track Characteristics Special Conditions	Stations	Flagman Requirements		
					Tracks Fouled	Track No.	Flagman
626	63rd/Cottage to the north (west) end of 63rd/King Drive at Signal X-32	2	Open deck elevated tracks. Tracks have wide track centers and are separated by inside footwalk and handrails. 63rd/Cottage Grove and 63rd/King Drive Station platforms are outside type.	63rd/Cottage 63rd/King Drive	1	-	1
					2	-	2
627	63rd/Calumet Curve - King Drive to Signal X-48	2	Open deck elevated tracks in a curve with restricted visibility. **NO CLEARANCE AREA IN CURVE**	-	1	-	3
					2	-	3
628	63rd/Calumet Curve to 59th Junction at Signal X-96	2	Open deck elevated tracks. Workers Ahead Warning System installed at 59th Junction.	-	1	-	2
					2	-	2

NOTE: *A pre-job inspection is required by the Person in Charge of the Work Area to insure that the proper number of flagmen & slow zone equipment is ordered.*

Flag Zone Index - 63rd/Ashland Terminal -Green Line - South Mainline - 59th Junction to 13th Junction

Flag Zone #	Location	# Trks	Track Characteristics Special Conditions	Stations	Flagman Requirements		
					Tracks Fouled	Track #	Flagman
651	59th Junction @ Signals X-92, X-96 to 3 bents south of 58th Street Platform @ Bent #770	2	Open deck elevated tracks within the confines of 59th Junction Interlocking. Workers Ahead Warning System installed throughout 59th Junction. **NO CLEARANCE AREA IN CURVE**	-	1	-	2
					2	-	3
					3	-	4
					4	-	5
652	58th to the south side of 57th Street @ Bent #753	2	Open deck elevated tracks with wide track centers, abandoned 58th platform is an island type	-	1	-	1
					2	-	2
653	57th Street to north side of 41st Street @ Bent #544	2	Open deck elevated tracks. Garfield, 51st, 47th and 43rd Street Platforms are outside type.	Garfield 51st 47th 43rd	1	-	2
					2	-	2
654	Prairie Curve – from 41st Street to the south (east) end of Indiana Station	2	Open deck elevated tracks in a curve with restricted visibility. Workers Ahead Warning System installed in curve. **NO CLEARANCE AREA IN CURVE.**	-	1	-	3
					2	-	3
655	South end of Indiana Station to the north (east) side of Michigan Avenue @ Bent #509	2	Open deck elevated tracks, Indiana Station platforms are outside type	Indiana	1	-	2
					2	-	2
656	39th/State Curve – Michigan Avenue to the south side of 39th Street @ Bent #480	2	Open deck elevated tracks in a curve with restricted visibility, independent track structure through curve. Workers Ahead Warning System installed in curve.	-	1	-	2
					2	-	3
657	Wabash to 17th Junction at Signal X-74 @ Bent #197	2	Open deck elevated tracks with a wide track centers (39th to 18th) separated by inside footwalk and handrail (36th to 18th). Center Storage track is located from 38th to 36th Streets. Bronzeville- 35th/IIT Station Platform is an island type.	Bronzeville - 35th/IIT	1	-	1
					2	-	2
658	17th to 14th on tracks A & B leading into the State Street Connector Subway	2	Open deck elevated tracks leading onto a ballasted incline	-	1	-	2
					2	-	2
659	14th to the south limits of the State Street Connector Subway	2	Ballasted tracks leading into subway tracks separated by a concrete wall. Subway track is in a curve with restricted visibility separated by a concrete wall.	-	1	-	2
					2	-	4

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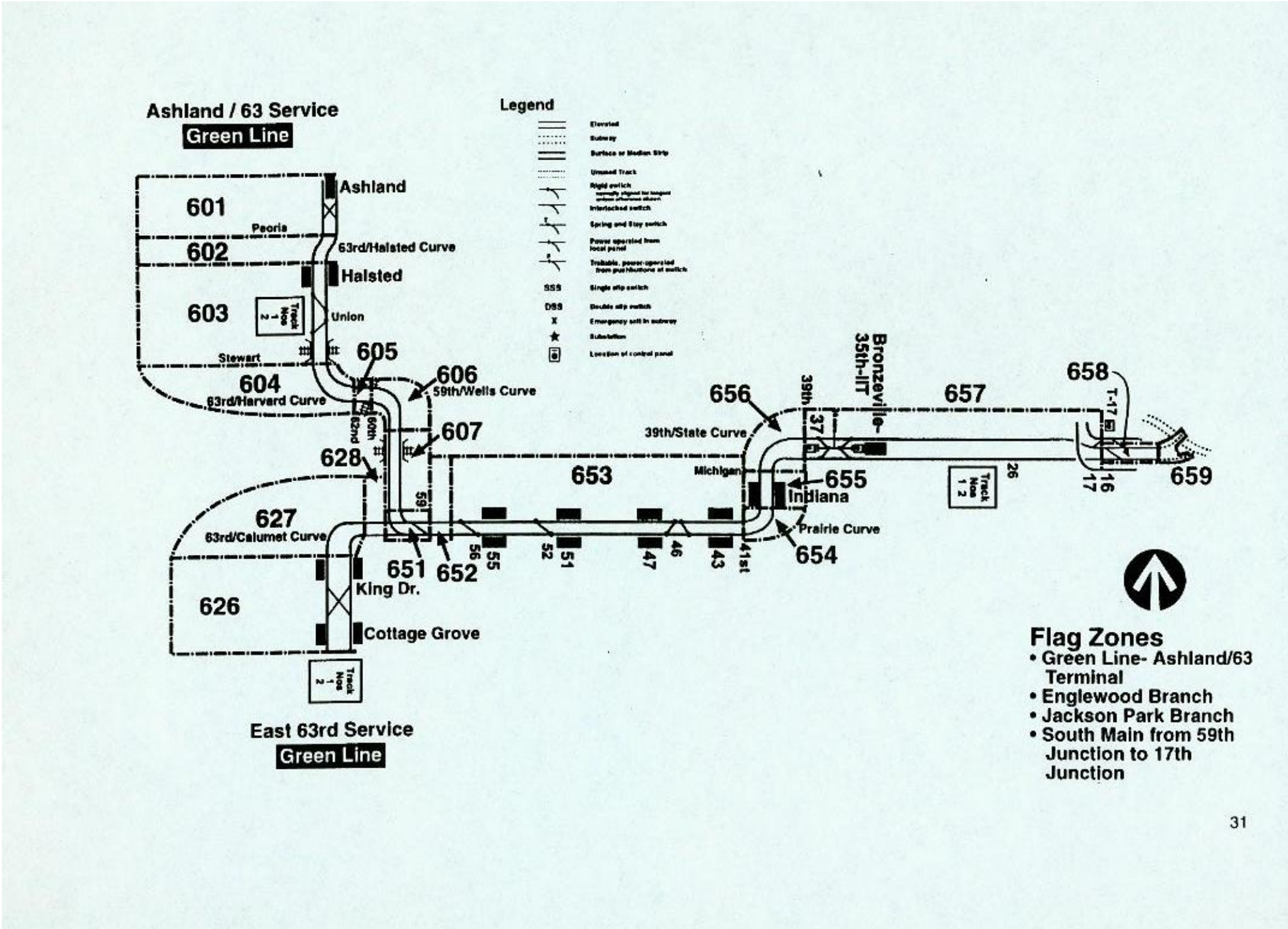
Flag Zone Map - 63rd/Ashland Terminal - 63rd/Ashland & 63rd Cottage to 13th Interlocking



Flag Zone Index - Midway Terminal Midway to 12 Tower - Orange Line

Flag Zone No.	Location	No. Trks	Track Characteristics Special Conditions	Stations	Flagman Requirements		
					Tracks Fouled	Track No.	Flagman
701	Midway Terminal *Access restricted per Service Bulletins R502-99 & R503-99*	3	Ballasted track in station area with 2 platforms, Midway station platform has 2 platforms.	Midway	1	-	1
					2	-	2
					3	-	3
702	Midway to 55th *Access restricted per Service Bulletins R502-99 & R503-99*	2	Ballasted track within the confines of Midway Interlocking leading to a concrete elevated structure. Coordinate work with Rail Supervision to properly protect work area from train movement to and from the rail car storage yard.	-	1	-	1
					2	-	2
703	55th Street Curve - 55th to Kostner *Access restricted per Service Bulletins R502-99 & R503-99*	2	Ballasted track constructed on a concrete elevated structure in a curve with restricted visibility. A *Workers Ahead Warning System is being installed in this zone.*	-	1	-	3
					2	-	3
704	Kostner to 2 block north of Keeler Avenue where structure splits. *Access restricted per Service Bulletins R502-99 & R503-99*	2	Ballasted track constructed on a concrete elevated structure.	-	1	-	2
					2	-	2
705	Kostner to the north side of Pulaski Crossover. *Access restricted per Service Bulletins R502-99 & R503-99*	2	Ballasted track constructed on a raised embankment. Pulaski Avenue Station platform is an island type.	Pulaski	1	-	1
					2	-	2
706	Pulaski Crossover to Lawndale. *Access restricted per Service Bulletins R502-99 & R503-99*	2	Ballasted track constructed on a raised embankment,	-	1	-	2
					2	-	2
707	Lawndale Curve. *Access restricted per Service Bulletins R502-99 & R503-99*	2	Ballasted track constructed on a concrete elevated structure in a curve with restricted visibility. A *Workers Ahead Warning System is being installed in this zone.*	-	1	-	3
					2	-	3
708	South side of Kedzie Station Platform to the north side of Western Avenue Platform *Access restricted per Service Bulletins R502-99 & R503-99*	2	Ballasted track constructed on a raised embankment, adjacent to Railroad right-of-way with a center storage track south of Western Avenue station to California Avenue. Additional visibility restrictions may be encountered do to train operation on adjacent Railroad right-of-way. Western and Kedzie Avenue Station platforms are island type.	Kedzie Western	1	-	1
					2	-	2

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Flag Zone Index - Midway Terminal /Orange Line - Midway to 12 Tower

Flag Zone No.	Location	No. Trks	Track Characteristics Special Conditions	Stations	Flagman Requirements		
					Tracks Fouled	Track No.	Flagman
709	39th/Oakley Curve - north side of Western Avenue Station to the south side of 47th Street. *Access restricted per Service Bulletins R502-99 & R503-99*	2	Ballasted track in a curve with restricted visibility. A *Workers Ahead Warning System is being installed in this zone*	-	1	-	3
					2	-	3
710	47th to 44th @ Signal Relay Case between tracks. *Access restricted per Service Bulletins R502-99 & R503-99*	2	Ballasted track constructed adjacent to Railroad right-of-way. Additional visibility restrictions may be encountered do to train operation on adjacent Railroad right-of-way.	-	1	-	2
					2	-	2
711	44th to the north side of 43rd Crossover *Access restricted per Service Bulletins R502-99 & R503-99*	2	Ballasted track in a curve with restricted visibility adjacent to Railroad right-of-way. Additional visibility restrictions may be encountered do to train operation on adjacent Railroad right-of-way. A *Workers Ahead Warning System is being installed in this zone.*	-	1	-	4
					2	-	4
712	43rd Crossover to the north side of 39th Street. *Access restricted per Service Bulletins R502-99 & R503-99*	2	Ballasted track leading to a concrete elevated structure adjacent to Railroad right-of-way. Additional visibility restrictions may be encountered do to train operation on adjacent Railroad right-of-way.		1	-	2
					2	-	2
713	39th/Archer Curve - 39th Street to the north (east) side of Oakley Avenue. *Access restricted per Service Bulletins R502-99 & R503-99*	2	Ballasted track constructed on a concrete elevated structure in a curve with restricted visibility. A *Workers Ahead Warning System is being installed in this zone.* **NO CLEARANCE AREA ALONG NORTHBOUND TRACK SOUTH (WEST) OF OAKLEY & ON OAKLEY STREET BRIDGE SOUTHBOUND TRACK**		1	-	3
					2	-	3
714	Oakley Avenue to the north (east) side of 35th Street. *Access restricted per Service Bulletins R502-99 & R503-99*	2	Ballasted track constructed on a raised embankment adjacent to Railroad right-of-way. Additional visibility restrictions may be encountered do to train operation on adjacent Railroad right-of-way. 35th/Archer station platform is an island type. **NO CLEARANCE AREA ON 35TH STREET & HOYNE AVENUE BRIDGES SOUTHBOUND TRACK**	35th/Archer	1	-	1
					2	-	2

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Flag Zone Index - Midway Terminal /Orange Line - Midway to 12 Tower

Flag Zone No.	Location	No. Trks	Track Characteristics Special Conditions	Stations	Flagman Requirements		
					Tracks Fouled	Track No.	Flagman
715	35th to the south (west) side of I-55 (Stevenson) Expressway Bridge. *Access restricted per Service Bulletins R502-99 & R503-99*	2	Ballasted track constructed on a raised embankment adjacent to Railroad right-of-way. Additional visibility restrictions may be encountered do to train operation on adjacent Railroad right-of-way. **NO CLEARANCE AREA ON 34TH STREET, DAMEN AVENUE, 33RD STREET & WOOD STREET BRIDGES SOUTHBOUND TRACK**	-	1	-	2
					2	-	2
716	I-55 Bridge to the south side of Ashland Station. *Access restricted per Service Bulletins R502-99 & R503-99*	2	Ballasted track in a curve with restricted visibility adjacent to Railroad right-of-way. Additional visibility restrictions may be encountered do to train operation on adjacent Railroad right-of-way. A *Workers Ahead Warning System is being installed in this zone.* **NO CLEARANCE AREA ON THE WEST 31ST BRIDGE NORTHBOUND & SOUTHBOUND TRACKS.**	-	1	-	3
					2	-	3
717	Ashland Station to the south (west) side of Lock Street. *Access restricted per Service Bulletins R502-99 & R503-99*	2	Ballasted track constructed adjacent to Railroad right-of way and below grade of I-55 (Stevenson) Expressway. Additional visibility restrictions may be encountered do to train operation on adjacent Railroad right-of-way. Ashland Avenue station platform is an island type.	Ashland	1	-	1
					2	-	2
718	Lock Street to south (west) side of Throop Street. *Access restricted per Service Bulletins R502-99 & R503-99*	2	Ballasted track constructed adjacent to Railroad right-of way and below grade of I-55 (Stevenson) Expressway. Additional visibility restrictions may be encountered do to train operation on adjacent Railroad right-of-way. **NO CLEARANCE AREA ON LOCK STREET BRIDGE SOUTHBOUND TRACK AND FULLER STREET & LOOMIS STREET BRIDGES NORTHBOUND & SOUTHBOUND TRACKS.**	-	1	-	2
					2	-	2

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Flag Zone Index - Midway Terminal /Orange Line - Midway to 12 Tower

Flag Zone No.	Location	No. Trks	Track Characteristics Special Conditions	Stations	Flagman Requirements		
					Tracks Fouled	Track No.	Flagman
719	Senour Curve - Throop Street to the north (east) side of Corbett Street Bridge. *Access restricted per Service Bulletins R502-99 & R503-99*	2	Ballasted track in a curve with restricted visibility adjacent to Railroad right-of way and below grade of I-55 (Stevenson) Expressway. A *Workers Ahead Warning System is being installed in this zone.* Additional visibility restrictions may be encountered do to train operation on adjacent Railroad right-of-way. **NO CLEARANCE AREA ON THROOP STREET BRIDGE NORTHBOUND & SOUTHBOUND TRACKS AND ON CORBETT STREET BRIDGE SOUTHBOUND TRACK.**	-	1	-	3
					2	-	3
720	Corbett Street to north (east) side of Halsted Street. *Access restricted per Service Bulletins R502-99 & R503-99*	2	Ballasted track constructed on raised embankment adjacent to Railroad right-of-way. Additional visibility restrictions may be encountered do to train operation on adjacent Railroad right-of-way. Halsted Street Station Platform is an island type. **NO CLEARANCE AREA IN HALSTED STREET STATION SOUTHBOUND TRACK AND ON HALSTED STREET BRIDGES NORTHBOUND & SOUTHBOUND TRACKS.**	Halsted	1	-	2
					2	-	3
721	Halsted Street to Federal Junction *Access restricted per Service Bulletins R502-99 & R503-99*	2	Ballasted track in a curve with restricted visibility adjacent to Railroad right-of-way. Additional visibility restrictions may be encountered do to train operation on adjacent Railroad right-of-way. *Two (2) Workers Ahead Warning Systems are being installed in this zone.* **NO CLEARANCE AREAS – NORTHBOUND TRACK FROM LOWE TO WALLACE & NORMAL TO CANAL; SOUTHBOUND TRACK FROM LOWE TO WALLACE & WALLACE TO CANAL.**	-	1	-	4
					2	-	4
722	Federal Junction to 17th Interlocking *Access restricted per Service Bulletins R502-99 & R503-99*	2	Ballasted track leading to open deck elevated track in a curve on an incline.	-	1	-	2
					2	-	3

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Flag Zone Index - Midway Terminal /Orange Line - Midway to 12 Tower

Flag Zone No.	Location	No. Trks	Track Characteristics Special Conditions	Stations	Flagman Requirements		
					Tracks Fouled	Track No.	Flagman
723	17 Junction to north end of Saint Charles Air Line Bridge at 16th Street	4	Open deck elevated tracks within the confines of 17th Junction.	-	-	1	2
					-	2	3
					-	3	3
					-	4	2
					3	-	3
					4	-	4
724	16th Street to the north end of Roosevelt Road station platform	2	Open deck elevated tracks, with a center storage track from 14th Street to the south end of Roosevelt Road Station platform. Roosevelt Road station platform is an island type.	Roosevelt	1	-	1
					2	-	2
725	Roosevelt Road platform to south end of Harrison Curve at 9th Street	2	Open deck elevated tracks.	-	1	-	2
					2	-	2
726	Harrison Curve	2	Open deck elevated tracks in a double reverse curve with restricted visibility. **NO CLEARANCE AREA IN CURVE AND AREAS ON OUTSIDE FOOTWALK**	-	1	-	4
					2	-	4
727	Harrison Curve to 12 Tower	2	Open deck elevated tracks.	-	1	-	2
					2	-	2

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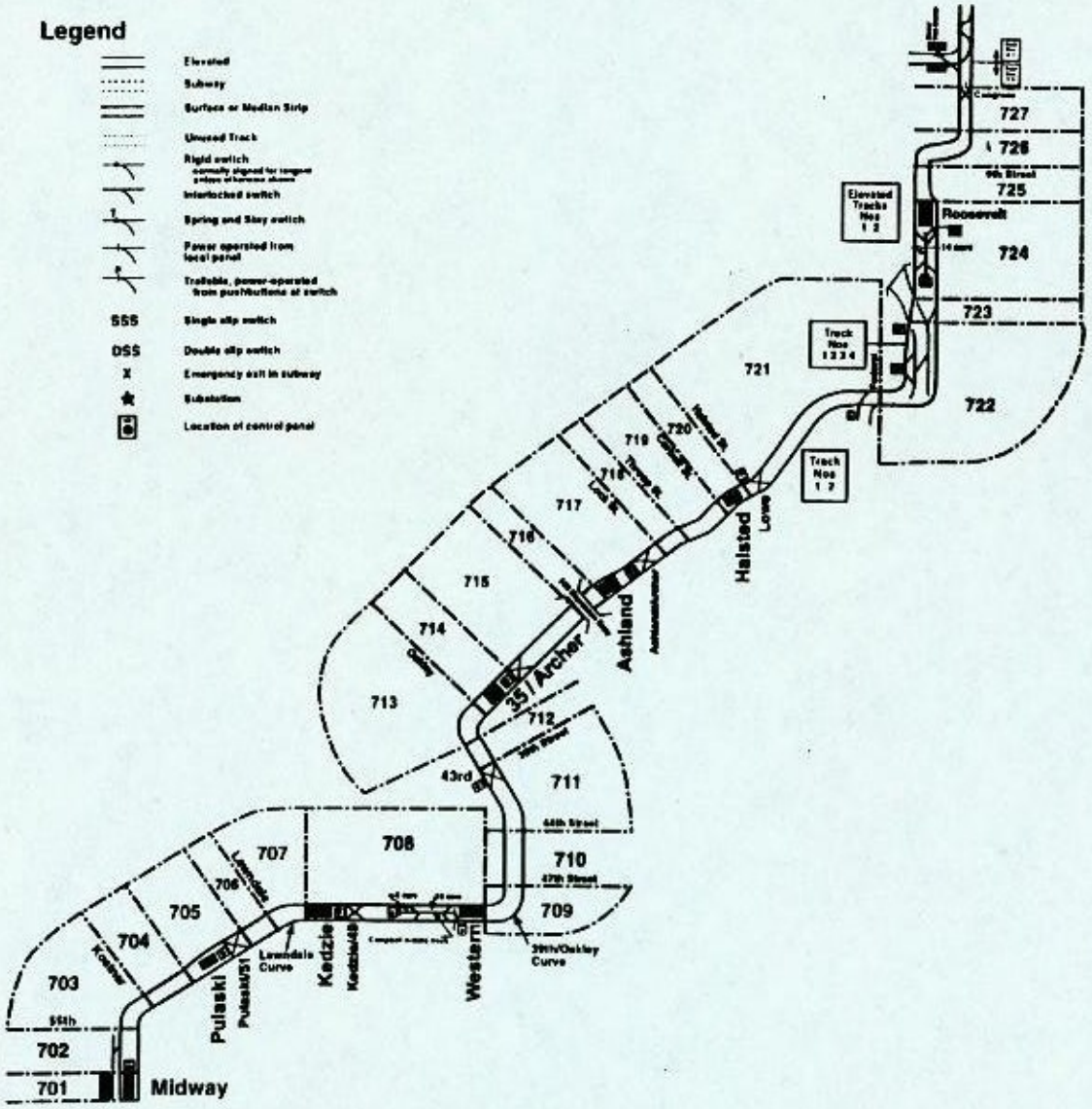
Flag Zone Map - Midway Terminal - Midway to 12 Tower



Flag Zones

Orange line
Midway Terminal

- Midway to Congress Crossover

Flag Zone Index - Midway Terminal - Loop/ Orange Line

Flag Zone No.	Location	No. Trks	Track Characteristics Special Conditions	Stations	Flagman Requirements		
					Tracks Fouled	Track No.	Flagman
08	Wells/Van Buren Curve - From Power Isolation Switches @ Bent # 163 to Sherman Street	2	Open deck elevated tracks with a curve with restricted visibility. **NO CLEARANCE AREA IN CURVE & AREAS ON OUTSIDE FOOTWALK.**	-	1	-	3
					2	-	3
10	Wells/Van Buren Curve to the north (east side of State Street.	2	Open deck elevated tracks. LaSalle/Van Buren & Library station platforms are outside type. Bridge through girders located in between tracks at both stations.	LaSalle/Van Buren Library	1	-	2
					2	-	2
12	12 Tower	4	Open deck elevated tracks within the confines of 12 Tower Interlocking. Features the intersection of the Inner & Outer Loop tracks with the 2 track South Loop Connector. **NO CLEARANCE AREA IN INTERLOCKING TURNOUTS.**	-	-	North Leg	4
					-	West Leg	4
					-	South Leg	3
					-	Center	3
14	12 Tower to the south end of Lake/Wabash Curve at north side of Randolph	2	Open deck elevated tracks. Adams/Wabash, Madison/Wabash & Randolph/Wabash Station platforms are outside type. Bridge through girders located in between tracks at all 3 stations.	Adams/Wabash Madison/Wabash Randolph/Wabash	1	-	2
					2	-	2
15	Lake/Wabash Curve - from the north side of Randolph Street to the south (east) side of State/Lake northbound platform	2	Open deck elevated tracks with a curve with restricted visibility. **NO CLEARANCE AREA IN CURVE & AREAS ON OUTSIDE FOOTWALK**.	-	1	-	3
					2	-	3
16	State/Lake platform 18 Tower the north (west) side of LaSalle Crossover	2	Open deck elevated tracks. State/Lake & Clark/Lake Station platforms are outside type.	State/Lake Clark/Lake	1	-	2
					2	-	2

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Flag Zone Index - Midway Terminal - Loop/ Orange Line

Flag Zone No.	Location	No. Trks	Track Characteristics Special Conditions	Stations	Flagman Requirements		
					Tracks Fouled	Track No.	Flagman
18	18 Tower	4	Open deck elevated tracks within the confines of 18 Tower Interlocking. Features the intersection of the Inner & Outer Loop tracks with the 2 track Lake Street Branch and the 2 track Ravenswood Branch. **NO CLEARANCE AREA IN INTERLOCKING TURNOUTS.**	-	-	North Leg	3
					-	West Leg	2
					-	South Leg	2
					-	East Leg	4
					-	Center	4
20	18 Tower to the north side of Wells/Van Buren Curve	2	Open deck elevated tracks. Washington/Wells & Quincy/Wells Station platforms and the abandoned Randolph/Wells platform are outside type. Bridge Through girders located in between tracks at both stations.	Washington/Wells Quincy/Wells	1	-	2
					2	-	2
22	North (west) side of 18 Tower to Wacker/Lake @ Bent #1015	2	Open deck elevated tracks	-	1	-	2
					2	-	2
24	North side of 18 Tower to Wacker/Wells	2	Open deck elevated tracks, includes northbound Brown Line turnout from Lake Street	-	1	-	3
					2	-	3

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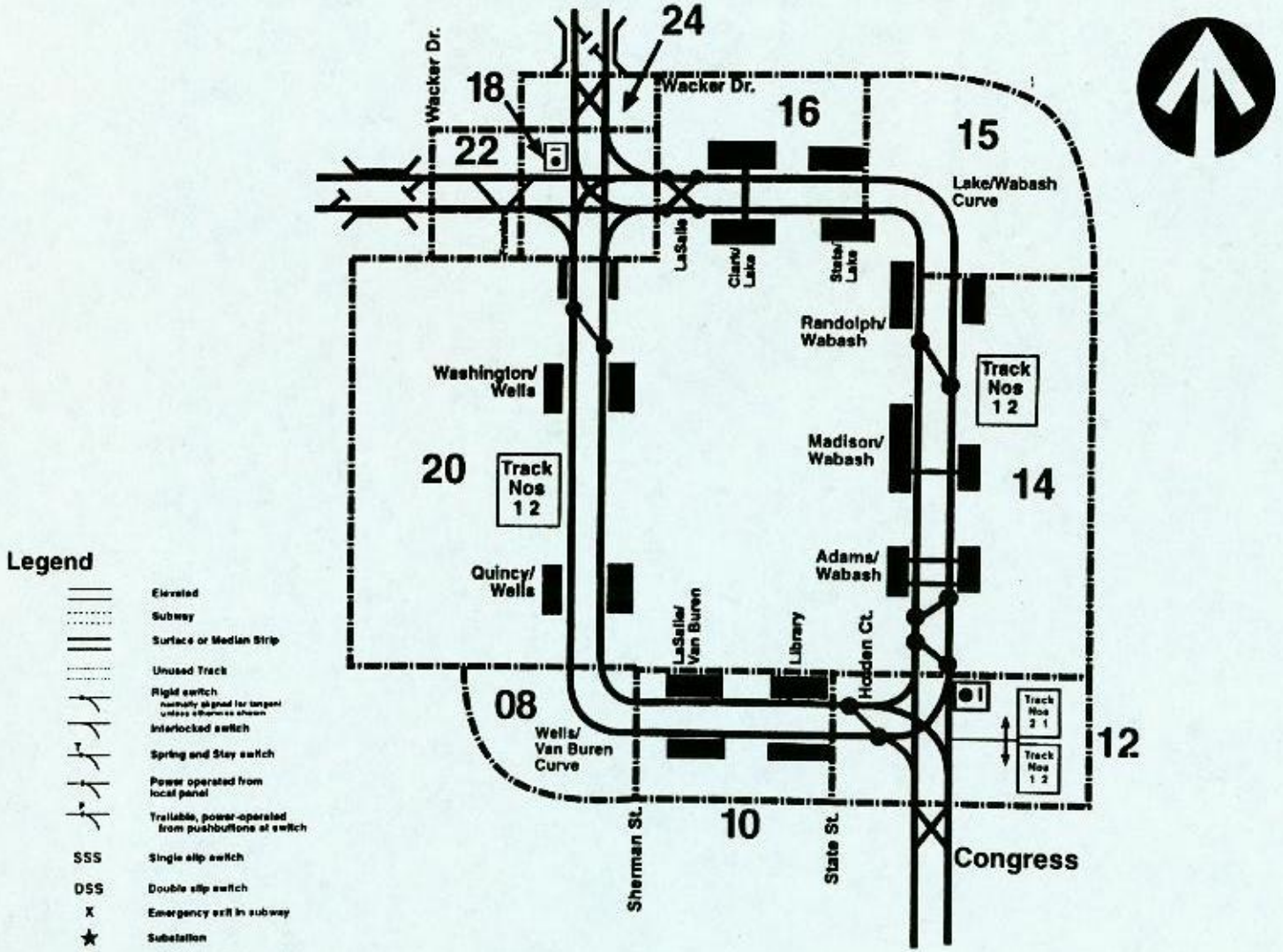
Flag Zone Map - Midway Terminal - Loop



Legend

- Elevated
- Subway
- Surface or Median Strip
- Unused Track
- Rigid switch (normally aligned for tangent unless otherwise shown)
- Interlocked switch
- Spring and Stay switch
- Power operated from local panel
- Trailable, power-operated from pushbuttons at switch
- SSS — Single slip switch
- DSS — Double slip switch
- X — Emergency exit in subway
- ★ — Substation
- Location of control panel

Flag Zones

- Loop - Midway Terminal

Flag Zone Index - Howard Terminal - Dempster to Howard North Interlocking/Yellow Line

Flag Zone No.	Location	No. Trks	Track Characteristics Special Conditions	Stations	Flagman Requirements		
					Tracks Fouled	Track No.	Flagman
551	Dempster to the north side of Oakton Street	2	Ballasted tracks with wide track centers, the 2 tracks route into a tail track north of Skokie Station. Includes Niles Center, Main, & Searle Grade Crossings and a pedestrian grade crossing at the north end of the station. 600 volt Traction Power distributed from overhead Catenary. Includes Skokie Station platforms which are outside type	Skokie	1	-	1
					2	-	2
552	Oakton Curve - from Oakton to the north (west) side of Kostner Avenue	2	Ballasted track in curve with restricted visibility includes Oakton Grade Crossing. 600 volt Traction Power distributed from overhead Catenary.	-	1	-	2
					2	-	3
553	Kostner to Hamlin	2	Ballasted track with wide track centers includes Kostner, Crawford & East Prairie Grade Crossings. The transition from overhead Catenary to 3rd rail is between East Prairie & Crawford.	-	1	-	1
					2	-	2
554	Hamlin to Howard North Interlocking at Signal X-30 & X-32	2	Ballasted track leading to open deck elevated structure constructed on an 850-foot length bridge over McCormick Blvd & North Shore Channel. Descending into ballasted track in a open cut with continuous curves	-	1	-	2
					2	-	2

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Flag Zone Index - Howard Terminal - Linden to Howard North Interlocking/Purple Line

Flag Zone No.	Location	No. Trks	Track Characteristics Special Conditions	Stations	Flagman Requirements		
					Tracks Fouled	Track No.	Flagman
501	Linden Terminal to north abutment of the North Shore Channel Bridge	2	Ballasted tracks, includes Isabella and Maple Grade Crossings. The north portion of the zone is within the confines of Linden interlocking. Linden Avenue Station platform is an island type. Includes Isabella and Maple Grade Crossings, which includes barnyard gates at track level.	Linden	1	-	1
					2	-	2
502	North Shore Channel Bridge – from the north abutment to the south abutment	2	Open deck elevated tracks constructed on bridge over the North Shore Channel	-	1	-	2
					2	-	2
503	South abutment North Shore Channel Bridge to the north end of Noyes Station Platform	2	Ballasted tracks, Central Station platform is an island type.	Central	1	-	2
					2	-	3
504	Noyes to north end of Davis Station platform	2	Ballasted tracks, Noyes & Foster Station platforms are island types.	Noyes Foster	1	-	1
					2	-	2
505	Davis Curve - Davis Station to Grove (1 block south of Davis)	2	Ballasted tracks in a curve with restricted visibility. Davis Street Station platforms are outside type	Davis	1	-	2
					2	-	3
506	Grove to Mulford Street (north end of Chicago Avenue Curve)	2	Ballasted tracks, Dempster & Main Street Station platforms are outside type and South Blvd. Station platform is an island type.	Dempster Main South Blvd.	1	-	2
					2	-	2
507	Chicago Avenue Curve – from Mulford to Howard North Interlocking at Signal X-34	2	Ballasted tracks on 2 separate curved bridges over Howard Yard with a significant grade.	-	1	-	2
					2	-	3

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Flag Zone Index - Howard Terminal - Linden to Howard North Interlocking/Purple Line

Flag Zone No.	Location	No. Trks	Track Characteristics Special Conditions	Stations	Flagman Requirements		
					Tracks Fouled	Track No.	Flagman
501	Linden Terminal to north abutment of the North Shore Channel Bridge	2	Ballasted tracks, includes Isabella and Maple Grade Crossings. The north portion of the zone is within the confines of Linden interlocking. Linden Avenue Station platform is an island type. Includes Isabella and Maple Grade Crossings, which includes barnyard gates at track level.	Linden	1	-	1
					2	-	2
502	North Shore Channel Bridge – from the north abutment to the south abutment	2	Open deck elevated tracks constructed on bridge over the North Shore Channel	-	1	-	2
					2	-	2
503	South abutment North Shore Channel Bridge to the north end of Noyes Station Platform	2	Ballasted tracks, Central Station platform is an island type.	Central	1	-	2
					2	-	3
504	Noyes to north end of Davis Station platform	2	Ballasted tracks, Noyes & Foster Station platforms are island types.	Noyes Foster	1	-	1
					2	-	2
505	Davis Curve - Davis Station to Grove (1 block south of Davis)	2	Ballasted tracks in a curve with restricted visibility. Davis Street Station platforms are outside type	Davis	1	-	2
					2	-	3
506	Grove to Mulford Street (north end of Chicago Avenue Curve)	2	Ballasted tracks, Dempster & Main Street Station platforms are outside type and South Blvd. Station platform is an island type.	Dempster Main South Blvd.	1	-	2
					2	-	2
507	Chicago Avenue Curve – from Mulford to Howard North Interlocking at Signal X-34	2	Ballasted tracks on 2 separate curved bridges over Howard Yard with a significant grade.	-	1	-	2
					2	-	3

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Flag Zone Index - Howard Terminal - Howard to Clark Junction/Red Line North

Flag Zone No.	Location	No. Trks	Track Characteristics Special Conditions	Stations	Flagman Requirements		
					Tracks Fouled	Track No.	Flagman
804	Jarvis to Greenleaf	4	Raised embankment ballasted tracks in a curve with restricted visibility.	-	-	1	3 - 1 RF
					-	2	3 - 1 RF
					-	3	3 - 1 RF
					-	4	3 - 1 RF
					3	-	5 - 2 RF
					4	-	6 - 2 RF
805	Green Leaf to south end of Morse Station Platform	4	Raised embankment ballasted tracks with wide track centers between tracks #2 & #3, Morse Station Platform is an island type and is located between tracks #2 & #3.	Morse	-	1	2
					-	2	2
					-	3	2
					-	4	2
					3	-	3
					4	-	4
806	Morse to the north end of Granville Interlocking at following signals: Track #1 -X-2R Track #2 -X-6R Track #3 -X-6L Track #4 -X-8L	4	Raised embankment ballasted tracks, in a high-speed reverse curve with restricted visibility. Loyola Station platform is an island type and is located between track #2 & #3.	Loyola	-	1	3 -1 RF
					-	2	3 -1 RF
					-	3	5 -3 RF
					-	4	5 -3 RF
					3	-	5
					4	-	6
					4	-	4

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Flag Zone Index - Howard Terminal - Howard to Clark Junction/Red Line North

Flag Zone No.	Location	No. Trks	Track Characteristics Special Conditions	Stations	Flagman Requirements		
					Tracks Fouled	Track No.	Flagman
807	Granville Interlocking to Leland	4	Raised embankment ballasted tracks with wide track centers between tracks #2 & #3. Granville, Thorndale, Bryn Mawr, Berywn, Argyle and Lawrence Station platforms are island type and are located between by tracks #2 & #3.	Granville Thorndale Bryn Mawr Berywn Argyle Lawrence	-	1	2
					-	2	2
					-	3	2
					-	4	2
					3	-	3
					4	-	4
808	Leland to Irving Park	4	Raised embankment ballasted tracks leading to open deck elevated structure. Wilson Station platform is an island type between tracks #2 & #3 . An additional not in service platform is located between track #3 & #4 which creates a **NO CLEARANCE AREA THE ENTIRE LENGTH OF THE PLATFORM.** Another platform not is service is located along track #1. Track #1 features a curve with restricted visibility.	Wilson	-	1	2
					-	2	3
					-	3	3
					-	4	2
					3	-	3
					4	-	4
809	Irving Park Curve	4	Open deck elevated tracks, with a curve with restricted visibility. **NO CLEARANCE AREA IN CURVE.**	-	-	1	3 -1 RF
					-	2	4 -1 RF
					-	3	4 -1 RF
					-	4	3 -1 RF
					3	-	5 -2 RF
					4	-	6 -2 RF

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Flag Zone Index - Howard Terminal - Howard to Clark Junction/Red Line North

Flag Zone No.	Location	No. Trks	Track Characteristics Special Conditions	Stations	Flagman Requirements		
					Tracks Fouled	Track No.	Flagman
810	Sheridan Road Station	4	Open deck elevated tracks, Sheridan Road Station platforms are island types between track #1 & #2 and #3 & #4 (the area in the station on tracks #2 and #3 is also between platforms).	Sheridan Road	-	1	3 -1 RF
					-	2	4 -1 RF
					-	3	4 -1 RF
					-	4	3 -1 RF
					3	-	5 -2 RF
					4	-	6 -2 RF
811	Sheridan Road Curve to Grace Street	4	Open deck elevated tracks, with a curve at south end of station with restricted visibility. **NO CLEARANCE AREA IN CURVE.** Another curve with restricted visibility is located north or Grace Street. **NO CLEARANCE AREA IN CURVE.**		-	1	3 -1 RF
					-	2	4 -1 RF
					-	3	4 -1 RF
					-	4	3 -1 RF
					3	-	5 - 2 RF
					4	-	6 - 2 RF

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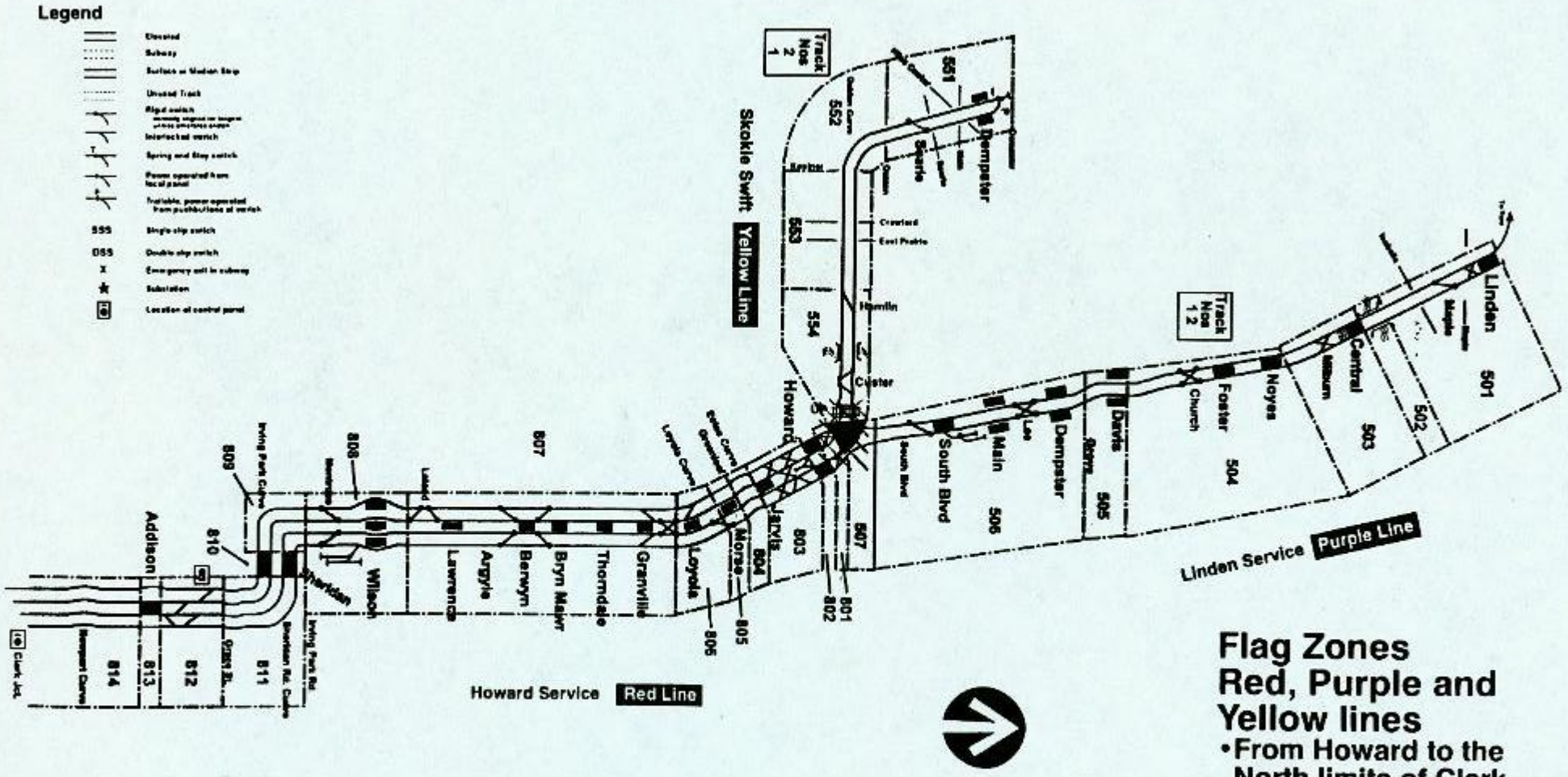
Flag Zone No.	Location	No. Trks	Track Characteristics Special Conditions	Stations	Flagman Requirements		
					Tracks Fouled	Track No.	Flagman
812	Grace Street to north end of Addison Station Platform	4	Open deck elevated tracks, includes Addison Interlocking.	-	-	1	2
					-	2	3
					-	3	3
					-	4	2
					3	-	3
					4	-	4
813	Addison Station	4	Open deck elevated tracks, tracks #1 & #2 are constructed on a concrete bed with direct fixation fasteners. Track #1 curves away from the station. Addison Station platform is an island type and is located between tracks #2 & #3. **NO CLEARANCE BETWEEN TRACK #1 AND RETAINING WALL TO THE WEST OF THE STRUCTURE.**	Addison	-	1	2
					-	2	2
					-	3	2
					-	4	2
					3	-	3
					4	-	4
814	Addison Station to Clark Junction at the following signals: Track #1 - X-4 Track #2 - X-2 Track #3 - X-10 Track #4 - X-12	4	Open deck elevated tracks, includes curve with restricted visibility at Newport. **NO CLEARANCE AREA IN CURVE.**		-	1	2
					-	2	3
					-	3	3
					-	4	2
					3	-	3
					4	-	4

NOTE: *A pre-job inspection is required by the Person in Charge of the Work Area to insure that the proper number of flagmen & slow zone equipment is ordered.*

Flag Zone Map - Howard Terminal - Purple, Yellow and Red Line North to Clark Junction

Flag Zone Map - Howard Terminal - Purple, Yellow and Red Line North to Clark Junction



Flag Zones Red, Purple and Yellow lines

- From Howard to the North limits of Clark Junction Interlocking
- Dempster to Howard
- Linden to Howard

Flag Zone Index - 95th Terminal - 95th to North Portal/State Subway - Red Line

Flag Zone No.	Location	No. Trks	Track Characteristics Special Conditions	Stations	Flagman Requirements		
					Tracks Fouled	Track No.	Flagman
901	95th Terminal to 67th	2	Ballasted tracks in a expressway median. 95th, 87th, 79th & 69th Street Station platforms are island type.	95th 87th 79th 69th	1	-	1
					2	-	2
902	67th to METRA Bridge	2	Ballasted tracks in a high speed reverse curve with limited visibility in a expressway median.	-	1	-	3
					2	-	4
903	METRA Bridge to the south side of 63rd Street Station platform	2	Ballasted tracks in a high-speed curve with limited visibility in a expressway median. Northbound & Southbound tracks are constructed at different heights.	-	1	-	2
					2	-	3
904	63rd to 48th	2	Ballasted tracks in a expressway median. 63rd & 55th Street station platforms are island type. Includes 63rd Street storage track north of 63rd Street Station.	63rd 55th	1	-	1
					2	-	2
905	48th to north end of 47th Crossover @ 45th Street	2	Ballasted tracks in a reverse curve with limited visibility in a expressway median. 47th Street Station platform is an island type.	47th	1	-	2
					2	-	3
906	47th Crossover (@45th Street) to 31st	2	Ballasted tracks in a expressway median. 35th Street station platform is a island type.	35th	1	-	1
					2	-	2
907	31st to the south side of Cermak/Chinatown Station platform	2	Ballasted track in a curve with limited visibility through a tunnel. Workers Ahead Warning System from 31st to 26th Street.	-	1	-	2
					2	-	3
908	Cermak/Chinatown Station to the south side of Roosevelt Road Station/State Subway platform; includes the Orange Line Connector Structure	2	Ballasted track leading into Subway. Workers Ahead Warning Systems from 18th to 15th Crossover and 15th Crossover to 13th Street. The northbound & southbound Workers Ahead Warning Systems from 15th to 13th Street are independent of each other. Orange Line Connector is ballasted track on a steel elevated structure.	Cermak/ Chinatown	1	-	2
					2	-	3
909	Roosevelt Road Station to Lake (north end of continuous platform)	2	Subway tracks separated by concrete wall or station platforms. Roosevelt, Harrison and a continuous platform from Van Buren to Lake Street are island type.	Roosevelt Harrison Jackson Monroe Washington	1	-	1
					2	-	2

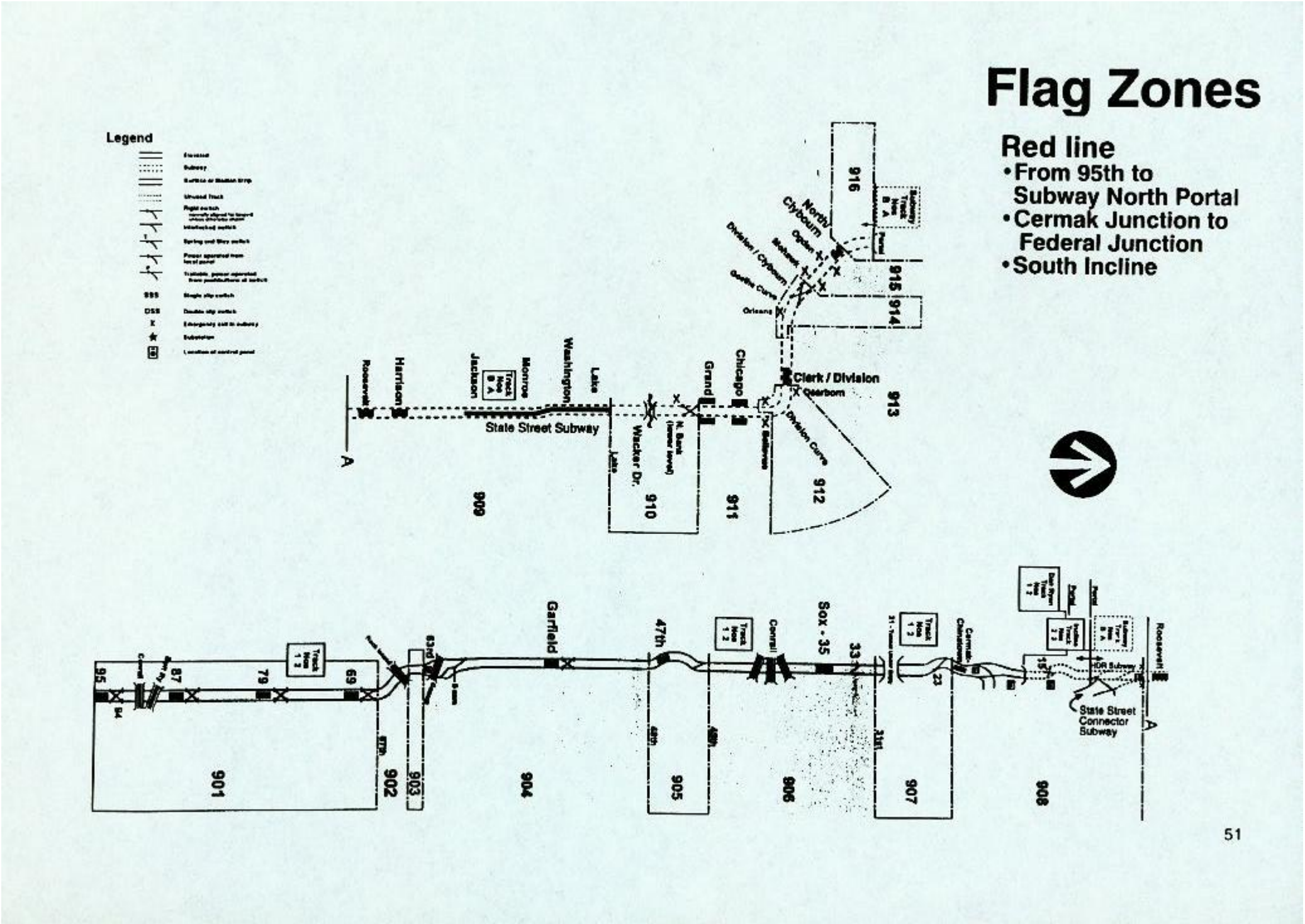
NOTE: *A pre-job inspection is required by the Person in Charge of the Work Area to insure that the proper number of flagmen & slow zone equipment is ordered.*

Flag Zone Index - 95th Terminal - 95th to North Portal/State Subway - Red Line

lag Zone No.	Location	No. Trks	Track Characteristics Special Conditions	Stations	Flagman Requirements		
					Tracks Fouled	Track No.	Flagman
910	Lake to north end of Grand Avenue Crossover	2	Subway tracks separated by a concrete wall in curves passing under the Chicago River with significant grade changes.	-	1	-	2
					2	-	4
911	Grand Crossover to Division Curve at Signal A-184 northbound and B-174 southbound.	2	Subway tracks separated by a concrete wall. Grand & Chicago Avenue station platforms are outside type	Grand Chicago	1	-	1
					2	-	2
912	Division Curve -from Signal A-184 northbound track & Signal B -174 southbound track to south (east) end of platform.	2	Subway tracks separated by a concrete wall in a curve with restricted visibility.	-	1	-	2
					2	-	4
913	Division Station to Goethe Curve	2	Subway tracks separated by a concrete wall & station platform. Division Station Platform is an island type.	Division	1	-	1
					2	-	2
914	Goethe Curve – from signal A-216 northbound track & Signal B-201 southbound track to the north end of Division Clybourn Crossover	2	Subway tracks separated by a concrete wall in a curve with restricted visibility. Workers Ahead Warning System (no speed reduction)installed in curve.	-	1	-	2
					2	-	4
915	Goethe Curve to North/Clybourn Station (north end of station)	2	Subway tracks separated by a concrete wall. North/Clybourn station platforms are outside type	North/Clybourn	1	-	1
					2	-	2
916	North/Clybourn Curve - from North/Clybourn Station to the north portal State Street Subway.	2	Subway tracks separated by a concrete wall in a curve with restricted visibility. Workers Ahead Warning System (no speed reduction) from south end of the curve to the north emergency exits at Wisconsin.		1	-	2
					2	-	4

NOTE: *A pre-job inspection is required by the Person in Charge of the Work Area to insure that the proper number of flagmen & slow zone equipment is ordered.*

Flag Zone Map - 95th Terminal - 95th to North Portal State Street Subway



FLAG ZONE MATRIX

Line	Terminal	Flagman Boundaries	No. of Flag Zones	Track Type	Stations
Blue	O'Hare	O'Hare to LaSalle Crossover/Dearborn Subway	38	Subway, Ballasted & Open Deck	19
	Forest Park	Forest Park to LaSalle Crossover/Dearborn Subway	17	Ballasted & Subway	14
	54th	54th to Loomis Junction & Connector Track	11	Ballasted & Open Deck	11
Brown	Kimball	Kimball to Wacker/Wells	28	Ballasted & Open Deck	19
Green	Harlem	Harlem to Wacker/Lake	7	Raised Embankment & Open Deck	12
	63rd/Ashland	63rd/Ashland to 59th Junction (Englewood)	7	Open Deck	2
		63rd/Cottage Grove to 59th Junction (Jackson Park)	2	Open Deck	2
		59th Junction to 17th Junction (South Main) & 13th Interlocking	2	Open Deck	6
Orange	Midway	Midway to Congress Crossover. Access is restricted per Service Bulletins R648-93 & R695-93 from Midway to 17th Junction.	27	Raised Embankment, Ballasted & Open Deck	8
		Loop	10	Open Deck	9
Red, Purple & Yellow	95th	95th to north abutment State Street Subway	16	Ballasted & Subway	13
	Howard	Howard to Clark Junction (North Main)	14	Raised Embankment & Open Deck	13
		Skokie to Howard (Skokie)	4	Ballasted & Open Deck	1
		Linden to Howard (Evanston)	7	Ballasted & Open Deck	8
Totals	**-**	**-**	**198**	**-**	**142**

APPENDIX A

RAIL SERVICE BULLETINS

- **Flagman Boundaries** (Bulletin # R500-99)
- **Slow Zones** (Bulletin # R501-99)
- **Employees on Right-Of-Way- Orange Line**(Bulletin # R502-99)
- **Employees on Right-Of-Way- Orange Line**(Bulletin # R503-99)
- **Permanently Mounted Track Trip Bases - O'Hare Subway** (Bulletin # R504-99)
- **Workers Ahead Warning System Locations** (Bulletin # R0106-06)
- **Flagging Assignments (Bulletin # R107-05)**
- **Employees On Right-Of-Way (Bulletin # R50-02)**

Chicago Transit Authority
Transit Operations
Rail Operations

File	x	Special	x
Post	x	Type	w
R500-99			

Rail Service Bulletin

Supersedes R350-96

Subject: Flag Zone Boundaries

Line/Route: System Wide

Effective: **Wednesday, December 1, 1999**

Listed below are the assigned boundaries for flagmen system-wide:

Line	Route	Zones	Boundaries	Terminal
Purple	Evanston	501-507	Howard to Linden	Howard
Yellow	Skokie	551-554	Howard to Skokie	Howard
Red	North Mainline	801-814	Howard to Clark Junction	Howard
	Dan Ryan & State Subway	901-908	95th to 13th Junction & HDR Connecting Track	95th
		909-916*	13th Junction to Wisconsin Avenue	
Blue	O'Hare/Kennedy & Dearborn Subway	101-131	O'Hare to North Abutment Dearborn Subway	O'Hare
		132-138*	North Abutment to LaSalle/Congress	
	Congress	201-214	Forest Park to Dearborn Subway Portal	Forest Park
		215-216*	Dearborn Subway Portal to LaSalle/Congress	
	Douglas	301-310	54th to Loomis Junction	54th
		311	Blue/Green Line Connector Track	
Brown	Ravenswood Branch	401-413	Kimball to Clark Junction	Kimball
	North Mainline	414-416	Clark Junction to Willow Curve/Wisconsin Ave.	
	Ravenswood Loop	417-428	Willow Curve to Wacker/Wells	
Green	Lake Street	001-007	Harlem/Lake to Wacker Drive	Harlem
	Englewood Branch	601-607	63rd/Ashland to 59th Junction	63rd/Ashland
	Jackson Park Branch	626-628	63rd/Cottage Grove to 59th Junction	
	South Mainline	651-657	59th Junction to 17th Junction	
	South Incline	658-659	17th Junction to 13th Junction	
Orange	Midway	701-722	Midway to 17th Junction	Midway
	South Loop Connector	723-727	Federal Junction to 12 Tower	
	Loop Elevated	08-20*	Van Buren, Wabash, Lake and Wells.	
	Green Line Lake Street	22*	18 Tower to Wacker/Lake	
	Brown Line Wells Street	24*	18 Tower to Wacker/Wells	

*Will be filled from an alternate terminal when qualified personnel are not available.

William R. Mooney
Vice President,
Rail Operations

Chicago Transit Authority
Transit Operations
Rail Operations

File	x	Special	x
Post	x	Type	w
R501-99			

Rail Service Bulletin

Supersedes R259-97

To: All Concerned

Subject: Slow Zones

Line/Route: System Wide

Effective: **Wednesday, December 1, 1999**

No workers or flagmen, working in a slow zone, are to be allowed on the tracks if the slow zone is improperly set up. If a Slow Zone is found to be improperly set up, the following actions must be taken:

- All personnel at the work site must leave the tracks immediately.
- The condition must be reported to Communication/Power Control (C/PC).
- C/PC will dispatch the nearest Rail Supervisor, Rail Instructor or Transportation Manager to the scene.
- The Rail Supervisor, Rail Instructor or Transportation Manager responding to the scene will evaluate the situation and make any corrections required to bring the Slow Zone into compliance with the established standards and procedures.
- C/PC will notify Occupational Safety and Investigations of the incident.

Unsafe Track Condition

If the person in charge (inspector, foreman, roadmaster, etc.) deems the track unsafe for train traffic, all train movements over that portion of track must be curtailed.

William R. Mooney
Vice President,
Rail Operations

WM/LS/ls
R501-99
11-17-99

Chicago Transit Authority
Transit Operations
Rail Operations

File	x	Special	x
Post	x	Type	w
R502-99			

Rail Service Bulletin

Supersedes S648-93

To: All Concerned

Subject: Employees On Right-Of-Way

Line/Route: Orange/Midway

Effective: **Wednesday, December 1, 1999**

Due to clearance restrictions on the Midway portion of the Orange Line, no employee will be permitted on the right-of-way between Federal Junction and Midway Terminal, regardless of reason, without authorization from Communication/ Power Control. To obtain authorization, before entering the tracks, employees must:

1. Have a two way radio with the capability of transmitting on channel 2 or channel 6.
2. Provide the Controller with the following information:
   - the work location;
   - length of time needed to be at that location;
   - the method of getting to the location (walking, riding a train, be lifted up by snorkel, etc).
3. Inform the Controller when the right-of-way has been cleared.

When granting authorization, the Controller must alert every approaching train until the person(s) have cleared the right-of-way. Likewise when passing a person(s) on the right-of-way, operators must inform the Rail Controller of the exact location where the person was passed.

Should it be necessary to change a work location, these procedures must be repeated.

Access to the right-of-way can only be authorized by a Controller when an emergency condition exists requiring immediately attention. Under all other situations access to the right-of-way is either authorized by a Rail Service Bulletin or, during the hours when no revenue service is scheduled by the Track Maintenance Roadmaster as described in bulletin R503-99.

William R. Mooney

Vice President,
Rail Operations

WM/LS/ls
R502-99
11-17-99

Chicago Transit Authority
Transit Operations
Rail Operations

File	x	Special	x
Post	x	Type	w
R503-99			

Rail Service Bulletin

Supersedes S695-93

To: All Concerned

Subject: Employees On Right-Of-Way

Line/Route: Orange/Midway

Effective: **Wednesday, December 1, 1999 - 0030 to 0430 Hours**

CTA Maintenance personnel will be working at various locations on the Midway portion of the Orange Line between Federal Junction and Midway Terminal. Daily, between 0030 and 0430 hours, after the last revenue train has returned to Midway Terminal, the Midway Track Roadmaster, radio call K440 on channel 2, will arrange with Communication/Power Control to take out of service the sections of track in the area were the employees will be working. In addition, the Roadmaster will coordinate and be responsible for all other employees needing access to the right-of-way.

In the event the operation a non-revenue train is required, the Roadmaster must ascertain that all personnel have cleared the right-of-way before allowing the tracks to be returned to service.

All personnel or groups involved in these activities must be equipped with radios and whenever possible, a portable telephone.

No one will be permitted on the right-of-way during these hours unless the track has been taken out of service.

All personnel must be clear the right of way by 0430 hours.

The conditions outlined in this bulletin only apply between 0030 and 0430 hours. At all other times, employees needing access to the right-of-way must follow the procedures in bulletin R502-99.

William R. Moore
Vice President,
Rail Operations

WM/LS/ls
R502-99
11-19-99

Chicago Transit Authority
Transit Operations
Rail Operations

File	x	Special	x
Post	x	Type	w
R504-99			

Rail Service Bulletin

Supersedes S40-90

To: All Concerned

Subject: Permanently Mounted Track Trip Bases

Line/Route: Blue/O'Hare

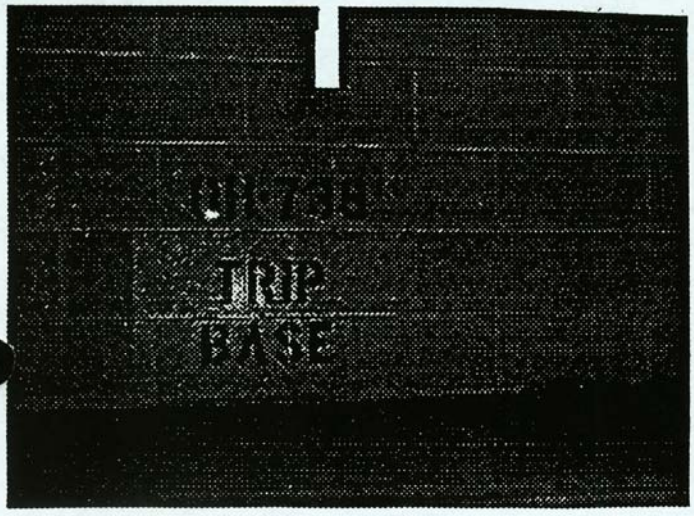
Location: O'Hare Subway

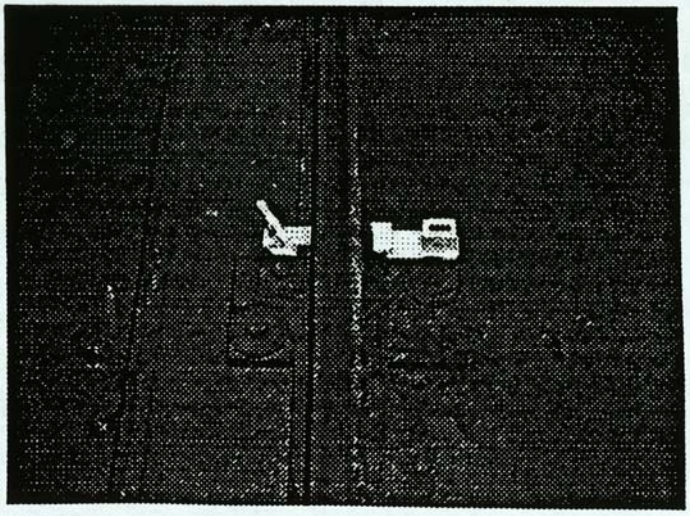
Effective: **Wednesday, December 1, 1999**

On April 9, 1990, track trip bases were permanently installed at approximately 100 foot intervals in the O'Hare Subway. These fixed track trip bases are located in areas where portable track trips used by flagging personnel cannot be installed on the running rail due to insufficient clearance between the subway floor and the bottom of the running rail. The location of these fixed track trip bases is identified by the words "TRIP BASE" stenciled on the subway wall, as shown below.

When flagmen are assigned to protect work crews in the O'Hare Subway, the standard portable track trip shall be issued and used where the base can be installed on the running rail. In those areas where the standard portable base cannot be installed on the running rail, flagmen shall use the standard track trip staff with the permanently installed track trip bases.

William R. Mooney
Vice President,
Rail Operations





Chicago Transit Authority
Transit Operations
Rail Operations

File	x	Special	x
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R0160-06			

Rail Service Bulletin

Supersedes R505-99

To: All Concerned

Subject: Workers Ahead (WA) Warning System Locations

Location: Various

Route / Line: System Wide

Effective: **Thursday, March 02, 2006**

The following are the locations of the active Workers Ahead (WA) Warning System sites:

LINE	BRANCH	LIMITS	ATC SPEED REDUCTION
BLUE	O'HARE	PORTAL TO EAST B1 CROSSOVER	YES
BLUE	O'HARE	MANNHEIM CURVE	YES
BLUE	O'HARE	ROSEMONT YARD	YES
BLUE	O'HARE	TOLLWAY TUNNEL	YES
BLUE	O'HARE	CUMBERLAND	YES
BLUE	O'HARE	HARLEM	YES
BLUE	O'HARE	NAGLE AVENUE	YES
BLUE	O'HARE	MILWAUKEE AVENUE OVERPASS	YES
BLUE	DOUGLAS	CONNECTOR TRACK	YES
BLUE	DOUGLAS	HARRISON JUNCTION	YES
BLUE	DOUGLAS	18TH STREET CURVE	YES
BLUE	DOUGLAS	KILDARE	YES
BLUE	DOUGLAS	KOSTNER to 47th AVENUE	YES
BLUE	CONGRESS	LOTUS TUNNEL	NO
BROWN	RAVENSWOOD	ROSCOE CURVE	YES
PURPLE	EVANSTON	LINDEN TUNNEL	NO
PURPLE	EVANSTON	DAVIS STATION TO 300 FT. SOUTH OF DAVIS RELAY HOUSE	YES

LINE	BRANCH	LIMITS	ATC SPEED REDUCTION
PURPLE	EVANSTON	RELAY HOUSE SOUTH OF MAIN STATION TO 250 FT. NORTH OF LEE DIAMOND CROSSOVER	YES
RED	NORTH MAIN	SOUTH END OF MORSE STATION TO 500 FEET NORTH OF GRANVILLE STATION (ALL FOUR TRACKS)	YES
RED	STATE SUBWAY	NORTH / CLYBOURN CURVE	YES
RED	STATE SUBWAY	GOETHE CURVE [SOUTH of DIVISION / CLYBOURN CROSSOVER] - SB	YES
RED	STATE SUBWAY	GOETHE CURVE [SOUTH of DIVISION / CLYBOURN CROSSOVER] - NB	YES
RED	STATE SUBWAY	CHICAGO RIVER	YES
RED	STATE SUBWAY	MONROE	YES
RED	DAN RYAN SUBWAY	13th JUNCTION TO 15th INTERLOCKING - SB	YES
RED	DAN RYAN SUBWAY	15th INTERLOCKING TO 13th JUNCTION - NB	YES
RED	DAN RYAN SUBWAY	15th INTERLOCKING TO 18th STREET	YES
RED	DAN RYAN	26th STREET TO 31ST STREET TUNNEL	YES
RED	DAN RYAN	47TH STREET	YES
RED	DAN RYAN	63RD TO 67TH	YES
LOOP	ELEVATED	TOWER 12	YES
GREEN	LAKE	LOCKWOOD to LARAMIE	YES
GREEN	LAKE	CALIFORNIA to ARTESIAN	YES
GREEN	SOUTH MAIN	35TH IIT TUNNEL	YES
GREEN	SOUTH MAIN	39th / STATE CURVE	YES
GREEN	SOUTH MAIN	40th / INDIANA CURVE	YES
GREEN	SOUTH MAIN	59th JUNCTION	YES
GREEN	ENGLEWOOD	63rd / HARVARD CURVE	YES
GREEN	ENGLEWOOD	63rd / HALSTED CURVE	YES

The Workers Ahead Warning System is designed to enhance the safety of persons at track level. However, this does not relieve or reduce the responsibilities of employees to protect themselves and to comply with all pertinent rules and Standard Operating Procedures. Employees working in areas along the Rail System right-of-way where Workers Ahead Warning Systems are active must utilized the system.

The following rules apply:

Rail System Rule R4.10	- Workers Ahead warning system
Rail System Rule R8.25	- Use of care while on tracks
Rail System Rule R8.26	- Employees on tracks to signal motormen
Rail System Rule R8.27	- Passing persons on tracks
Standard Operating Procedure 8111	- Workers Ahead warning system

Contact a manager or instructor with any questions.

Vice President,
Rail Operations

JAH/WKR/wkr
R0160-06
08-14-06

Chicago Transit Authority
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Rail Operations

File	x	Special	x
Post	x	Type	w
R107-05			

Rail Service Bulletin

To: All Concerned

Subject: **Flagman Assignments**

Line/Route: Systemwide

Effective: **Friday, February 4, 2005**

Employees working in the capacity of flagman are responsible for the following actions (in accordance with SOP 7037 and Rail System Rules R1.5, R8.24, R8.25 and R11.2):

Reporting for Duty

- Secure, examine and sign for flagging equipment prior to leaving the terminal.
- Obtain a Time Slip from the terminal clerk.
- Participate in the job briefing, if one is conducted.
- Proceed directly to the assigned work location via CTA service.
- Depart the terminal no more than 10 minutes after reporting (if there is no briefing), or 10 minutes after the briefing is concluded.

At the Work Location

- Notify the controller via two-way radio of work location and direction prior to entering the right-of-way.
- If a Slow Zone is used, ensure that it is set up properly prior to permitting workers on the right-of-way.
- If the Slow Zone is set up incorrectly, notify the work crew foreman and do not permit any workers on the right-of-way.
- Notify the controller via two-way radio if the work crew fails to arrive after 30 minutes of the scheduled start time.
- Ensure that all Slow Zone signs are removed or turned once work is concluded and workers have left the right-of-way (if conditions warrant).
- Notify the controller via two-way radio when all persons are clear of the right-of-way.

When Work Assignment is Complete

- Complete the Time Slip accurately and have the work crew foreman sign it.
- Indicate the actual time spent at the work location, **not** the flagging trick's scheduled start and finish times.
- Return immediately to the terminal via CTA service.
- Turn in flagging equipment and Time Slip to the terminal clerk.
- Failure to submit a properly completed Time Slip may affect the employee's pay.

Contact your Manager, Controller, Instructor or Supervisor with any questions.

Vice President,
Rail Operations

JAH/BCN/bcn
R107-05
02/02/05

Chicago Transit Authority
Transit Operations
Rail Operations

File	x	Special	x
Post	x	Type	w
R50-02			

Rail Service Bulletin

Supercedes S648-93

To: All Concerned

Subject: Employees On Right-Of-Way

Activity: Track Safety

Line/Route: Orange/Midway

Location: Midway Terminal to Federal Junction

Effective: Sunday, January 27, 2002

With the installation of a "WA" workers ahead warning system on the Midway portion of the Orange Line, the restriction prohibiting employees access to the right-of-way has been modified.

Between Midway and Lowe Interlocking

Between Midway Terminal and Lowe Interlocking employees will be allowed on the right-of-way, during non-rush periods providing they:

- notify Communication/Power Control prior to entering the right-of-way
- inform the Controller where they will be and for how long
- inform the Controller their method of arrival (walk, ride train, lifted by snorkel, etc.)
- use the "WA" system where available
- inform the Controller when clear of the right-of-way.

Announcements must be made whenever anyone is on the right-of-way.

When ordering flagmen follow the procedures outlined in the "Flagmen Requirements" manual including a work site inspection when determining the amount of flagmen required.

Between Lowe Interlocking and Federal Junction

In this area visibility is highly restricted due to curves and obstructions on the adjacent railroad right-of-way. No employee will be permitted on the right-of-way (regardless of reason) without authorization from Communication/Power Control. Before entering tracks employees must:

- have a two way radio with the capability of transmitting on channel 2 or channel 6
- inform the Controller where they will be and for how long
- inform the Controller their method of arrival (walk, ride train, lifted by snorkel, etc.)
- use the "WA" system extending throughout this area
- inform the Controller when clear of the right-of-way.

When granting personnel authorization, the Controller must alert every approaching train until the person(s) has cleared the right-of-way.

When passing a person on the right-of-way in this area, operators must inform the Rail Controller the exact location where the person(s) was passed.

When changing locations in this area, employees must repeat this procedure.

Controllers are reminded that in the aforementioned “WA” zone, the allowable train speed in both directions is reduced from 70/55 mph to 15 mph increasing the one way running time a minimum of three minutes.

All regular maintenance work in this area must be done:

- at night during the hours when there is no scheduled service
- at night with the tracks taken out of service
- under a single track operation
- under authorization of a Rail Service Bulletin.

Additional Requirements

In the work area, the Workers Ahead System must be fully operational before commencing work. No work will be allowed if the “WA” system is not operational. Communication/Power Control must be notified every thirty minutes, via radio channel 6, of the work crew’s location until they have cleared the right-of-way.

For additional information regarding the Midway “WA” system track maintenance procedures, see Bulletins R19-02, R20-02 and R51-02.

Bulletins S648-93 and S695-93 are rescinded.

If you have any questions regarding the contents of this bulletin, you may contact your Instructor, your Manager or the Rail Operations Capital Project Oversight group.

William R. Moorman
Vice President,
Rail Operations

WM/LS/ls
R050-02
1-29-02

APPENDIX B

Forms

- Rail Operations Order- Capital Projects
- Protection At Rail Work Locations
- Flagman Operation Check
- RTO/Flagman Operation Report
- Slow Zone Inspection
- Important CTA Telephone Numbers

Rail Operations Manpower Order

Capital Order Number: CP07- **Job Order #:**

Req.		Filled
	Extra Flagman	
	Work Train	
	Supervisor	
	Operator	
	Towerman	
	Switchman	
	CA	

Detail:

Order Information

Work Begin: **Route:** **Requested By:**

Duration: **Terminal:** **Requested Time:** 09:21

Zone: **Location:** **Requested Date:** Monday, July 30, 2007

Terminal Report Time: **Track #:** **Phone: ( ) -** **Ext.**

Job Site Report Time: **Tracks Fouled:** **Pager/Radio:**

Job Site End Time: **Maint. Code:** 3108 - Miscellaneous Outside Contractors

Contractor:

Purpose and Remarks

Submit Reset

Note: Please set print to landscape view! - - 'File -> Page Setup -> Orientation -> Landscape'

PROTECTION AT RAIL WORK LOCATION

Date _____ Weather _____

Route _____ Location _____ Direction _____

Track No. _____ Arrived at Scene _____ hours

☐ MOVING GANG (Working less than 30 min. at one location)
☐ STATIONARY GANG

Foreman ___ Approximate number of men in gang _____

Type of work being done _____

WARNING SIGN/LIGHT PLACEMENT

1. BEGIN SLOW ZONE sign and track trip approximately _____ feet from gang.

   Visible for approximately _____ feet.

2. Approach zone signs

   A. 15 MPH speed board approximately _____ feet from BEGIN SLOW ZONE sign.

      Visible for approximately _____ feet.

   B. SLOW ZONE 600 FT. AHEAD sign approximately _____ feet from BEGIN SLOW ZONE sign.

      Visible for approximately _____ feet.

   C. SLOW ZONE AHEAD sign approximately _____ feet from BEGIN SLOW ZONE sign.

      Visible for approximately _____ feet.

3. CLEAR SLOW ZONE sign approximately _____ feet beyond gang.

FLAGMAN

Name _____ Badge _____

Terminal _____

cta 3014 (rev. 11/84) Transportation Service (front)

EQUIPMENT	YES	NO
SAFETY VEST	☐	☐
PORTABLE TRACK TRIP	☐	☐
HORN	☐	☐
RED FLAG	☐	☐
RED LIGHT	☐	☐
WHITE LIGHT	☐	☐

WAS THE FLAGMAN FOLLOWING THE CORRECT FLAGGING PROCEDURE? YES ☐ NO ☐
(If "NO," enter incorrect procedure in "REMARKS").

REMARKS: _____

Service Supervisor _____ Badge _____

cta 3014 (rev. 11/84) Transportation Service (back)

FLAGMAN OPERATION CHECK

Flagman _____ **Badge** _____ **Date** _____

Terminal _____ **Day** _____

Location _____ **Start** _____**M Finish** _____**M**

		RULE NO.
☐	INATTENTIVE TO DUTY	72
☐	DELAYED GIVING STOP SIGNAL	
☐	DELAYED TRAIN UNNECESSARILY	
☐	GAVE IMPROPER FLAG SIGNAL	128
☐	TRACK TRIP NOT IN TRIPPING POSITION	235(g)
☐	PORTABLE TRACK TRIP POSITIONED AT INSUFFICIENT DISTANCE IN ADVANCE OF WORK LOCATION	235(d)
☐	FAILED TO REMAIN IN FULL VIEW OF APPROACHING TRAIN	235(e)
☐	FAILED TO USE WHISTLE TO WARN WORK GANG	235(f)
☐	GAVE PROCEED SIGNAL WHEN WORK MEN WERE NOT IN SAFE POSITION	
☐	GAVE PROCEED SIGNAL WHEN MATERIALS OR TOOLS WERE NOT IN CLEAR	235(h)
☐	FAILED TO HAVE FULL FLAGGING EQUIPMENT	235(b) 23(a)

☐ PORTABLE TRACK TRIP ☐ FLAGS ☐ WHISTLE

☐ LANTERNS ☐ SAFETY VEST ☐ PORTABLE RADIO

REMARKS: _____

☐ OPERATED CORRECTLY

☐ COMMENDATION - See REMARKS for details

☐ FAILED AS INDICATED ABOVE

☐ Flagman instructed by me at time of observation

☐ VIOLATION - See REMARKS for details

Service Supervisor _____ **Badge** _____ **District** _____

ACTION TAKEN: _____

Superintendent _____ **Date** _____

cta 3250 (rev 12/82) Transportation

RTO/FLAGMAN OPERATION REPORT

Flagman Operator _____ Badge _____ Date _____

Station _____ Day _____

Location of Incident _____

Line _____

Start _____hours Finish _____hours

- ❑ Flagman inattentive to duty
- ❑ Flagman reported late
  Time
- ❑ Failed to use whistle or horn to warn work gang
- ❑ Gave proceed signal when workmen were not in safe position
- ❑ Gave proceed signal when material or tools were not in clear
- ❑ Failed to have full flagging equipment
- ❑ Operator inattentive to duty
  Time Train No.
- ❑ Operator running trip
  Time Train No. Trip #
- ❑ Operator exceeding safe speed thru work gang/slow zone
  Time Train No.
- ❑ Other: _____

Remarks: (note: Also report exceptionally good performance)

_____

_____

_____

_____

_____

_____

_____

Completed by: _____ Date _____

Telephone: _____

cta 214.26 (rev. 08/97) Service Delivery Safety

DISTRIBUTION:
White - Transportation Manager
Green - Immediate Supervisor
Canary - Route General Manag
Pink - Safety
Goldenrod - File

SLOW ZONE INSPECTION

Location_____ Date_____ Time_____Hours

Work Gang_____ Area_____

Y - Satisfactory **N - Unsatisfactory** **— - Does Not Apply**

SLOW ZONE

_____ Slow Zone Ahead

_____ Slow Zone 600 Feet Ahead

_____ 15 MPH

_____ Begin Slow Zone/6 MPH

_____ Clear Slow Zone

_____ Forward Protective Area

_____ Rear Protective Area

_____ Work Area

_____ Flashing Lights

_____ Visibility of Slow Zone

WORK GANG

_____ Personal Protective Equipment

_____ Tools and Material

FLAGMAN

_____ Portable Track Trip

_____ Red Flag

_____ Lanterns

_____ Air Horn / Whistle

_____ Personal Protective Equipment

_____ Position of Flagman

Comments and Recommendations

Flagman_____ Track #_____ Trip No._____

Flagman_____ Track #_____ Trip No._____

Flagman_____ Track #_____ Trip No._____

Supervisor/Foreman _____ Inspected by _____

IMPORTANT TELEPHONE NUMBERS

CTA Rail Controller	**312-432-8030**	**CTA Extension 28030**
CTA Power Controller	**312-432-8039**	**CTA Extension 28039**
CTA Emergency Power Off		**CTA Extension 22222**
CTA Rail Terminals		
Blue Line		
O'Hare	**773-686-0785**	**CTA Extension 41655-54**
54TH	**708-484-9222**	**CTA Extension 49222-333**
Forest Park	**708-366-5115**	**CTA Extensions 16689-90**
Brown Line		
Kimball	**773-539-3434**	**CTA Extension 30013-41**
Green Line		
Harlem	**708-366-0083**	**CTA Extensions 16918-17**
63rd/Ashland	**773-925-2863**	**CTA Extension 70519**
Orange Line		
Midway	**773-581-9789**	**CTA Extensions 16938-36**
Red, Purple, Yellow Lines		
Howard	**773-508-9165**	**CTA Extension 30014**
	773-508-9118	**CTA Extension 33216**
95TH	**773-264-2577**	**CTA Extensions 48065-64**
Rail Training & Instruction	**773-736-2471**	**CTA Extension 41414**
@ Jefferson Park	**773-736-1321**	**CTA Extension 41416**
Rail Operations @ Jefferson Park	**773-685-4162**	**CTA Extensions 41427-28**
Facilities Training @ IIT	**773-842-3153**	**CTA Extension 23153**
Ordering Flagmen		
Planning Analyst	**312-681-4534**	**CTA Extension 14534**
Safety		
Inspections & Investigations	**312-681-2747**	**CTA Extension 12747**
System Safety	**312-681-2748**	**CTA Extension 12748**
Environmental Affairs	**312-681-3868**	**CTA Extension 13868**

To contact a specific individual of the above mentioned departments by radio, contact the CTA Control Center.

1-888-YOUR-CTA

Dial this number from any public phone. After you hear recording, dial the CTA extension or dial *1 from any public phone on CTA property and enter extension.

APPENDIX C

Standard Operating Procedures

- **Slow Zones (SOP # 7041)**
- **Flagging on the right-of-way (SOP # 7037)**
- **Train operation through slow zones (SOP # 7038)**
- **Safety on rapid transit tracks (SOP # 8130)**
- **Workers Ahead warning system (SOP # 8111)**
- **CTA Employees on the rail system right-of-way (General Safety Bulletin # 3026)**

Title: **Slow Zones**

Issued to: All Rail Operations, Engineering and Facilities Maintenance personnel; Capital Construction and outside agency personnel as necessary

Approved by: Executive Vice-President, Transit Operations

Supersedes: Slow zones, 7041 (1-1-86)

A Slow Zone

- is a section of track marked with warning signs and lamps through which trains operate at reduced speed.
- provides protection for people, trains, equipment and tracks.
- is set up when a group (three or more people) is scheduled to work on, across, or near a section of track for one-half hour or more.
- is set up when conditions require, whether or not workmen are present. Examples are: track partially stripped, with spikes out, or needing realignment; guard rail out; or work being done under an elevated structure.

Responsibility for the Slow Zone

The department in charge of the scheduled work has jurisdiction over the slow zone. The same department remains responsible in the event the slow zone must be left unmanned (See *Note*, page 4).

The department with jurisdiction provides all marking devices and accessories.

- Sign/lamp units
- Signpost mounting devices
- Batteries for lamps

Before 1200 hours of the preceding day, the department must initiate an order for a flagman by notifying Operations Systems Support, CTA ext. 6817, which then immediately informs the appropriate terminal clerk.

The terminal clerk assigns flagmen for the next day's assignments if sufficient manpower is available and issues equipment (See SOP 7037: *Flagging on the Right-of-Way*).

SAFETY IS PART OF THE JOB
Follow all CTA-established rules relating to safe operation, as well as those rules relating to use of tools, materials, equipment and personal safety in performance of these procedures.

Set-Up of the Slow Zone

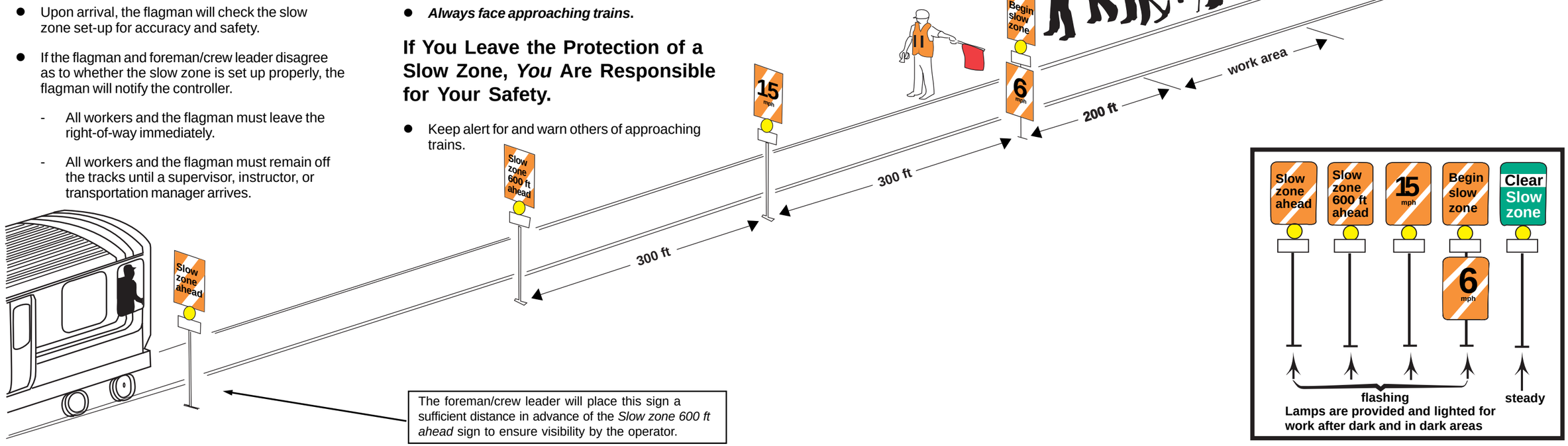
- The foreman/crew leader is responsible for setting up the slow zone as shown in the diagram and for calling the controller when preparing to set up the slow zone.
- If necessary, the foreman/crew leader will extend the distances shown to ensure visibility by train operators.
- The foreman/crew leader will send a worker against traffic a sufficient distance to serve as flagman while the slow zone is being set up.
- The foreman/crew leader and transportation manager will cooperate to keep the length of the work area to a safe minimum.
- The foreman/crew leader will relocate sign posts, flagman and the portable track trip each time the work area progresses 25 feet.
- An additional slow zone will be set up on an adjacent track if the foreman or transportation manager feels that it is necessary.
- The foreman/crew leader will ensure that all lamps are working properly.
- Upon arrival, the flagman will check the slow zone set-up for accuracy and safety.
- If the flagman and foreman/crew leader disagree as to whether the slow zone is set up properly, the flagman will notify the controller.
  - All workers and the flagman must leave the right-of-way immediately.
  - All workers and the flagman must remain off the tracks until a supervisor, instructor, or transportation manager arrives.
  - The supervisor, instructor or transportation manager will evaluate the situation and make any necessary corrections.
- If the *person in charge* at the slow zone deems the track to be unsafe, no trains may enter or pass through the slow zone until the hazard has been corrected.

Safety Requirements for *All* Non-Operating Personnel

- Wear CTA safety vest and hard hat. (Flagmen are not required to wear a hard hat.)
- Notify the controller whenever you are the first person on the track.
- Look both ways before stepping onto any track.
- Always step ***over*** rails - never on them.
- Avoid contact with the third rail.
- Do not touch any part of any train except for purposes of boarding or alighting.
- Watch for moving switch points.
- ***Always face approaching trains.***

If You Leave the Protection of a Slow Zone, *You* Are Responsible for Your Safety.

- Keep alert for and warn others of approaching trains.



- When working alone, stop work well in advance of the train's arrival and remain in full view of approaching trains.
- Slow or stop trains as safety requires.
- Signal the operator to proceed only *after* the track is cleared.

Emergency Evacuation

- The foreman/crew leader must prepare an emergency evacuation plan identifying a clear area for each person. Practice an orderly track evacuation periodically so each person is fully aware of his/her part in the plan. Several short blasts of the flagman's warning horn is a signal to execute the emergency evacuation plan.
- The foreman/crew leader must similarly prepare a plan and train the work crew for emergencies that would require medical or other assistance.
- In the absence of the foreman, a work crew member shall be assigned responsibility for compliance with procedures.
- When work is being performed by a contractor, the contractor is responsible for ensuring that his foreman complies with all procedures.
- Emergencies and violations must be reported by the foreman or CTA construction inspector as soon as possible to the department involved and to the controller.

Standard Operation

1. Once the slow zone has been set up properly, the foreman/crew leader instructs the workers and flagman to begin work.
2. When a train reaches the *Slow zone 600 ft ahead* sign, the flagman sounds the air horn to warn the work crew of the approaching train. Using the red flag or lamp held horizontally over the affected track, the flagman signals the train to reduce speed.
3. As quickly as possible, workers complete tasks sufficiently to assure safe passage of the train.
4. Workers remove tools and materials that could interfere with train operation, move to positions of safety, and ***face the approaching train***.
5. The operator stops the train at any point where signalled to do so. If the operator has not received a proceed signal from the flagman, the train must be stopped *no less than* 1 car length in advance of the *Begin slow zone* sign.
6. The foreman/crew leader signals the flagman when the work area is clear.
7. The flagman then removes the track trip staff, shows it to the operator, and signals the operator to proceed.
8. The operator proceeds at the designated speed until the motorcab passes the *Clear Slow zone* sign. Once the cab has passed the sign, the train may resume normal speed.
9. The flagman replaces the track trip staff as soon as the train clears his/her position.
10. Workers resume work after the train has cleared and it is safe to do so.

Removal of the Slow Zone

1. The foreman/crew leader makes certain that all tools and materials have been removed or secured properly.
2. With the flagman's protection, workers leave the site in single file. As necessary, the foreman/crew leader designates a second flagman to provide protection from both directions.
3. The flagman removes the portable track trip when directed to do so by the foreman/crew leader.
4. With flagman protection, signposts and mounting devices are removed beginning with the *Clear Slow zone* sign and moving forward, in order, removing the *Slow zone ahead* sign last.
5. The flagman notifies the controller when the area is clear.

Note: If a slow zone is to remain after workers leave, the flagman must notify the controller, leave in place the signposts and stands and place an appropriate speed board on the "Begin slow zone" sign.

	Transit Operations Standard Operating Procedure	Publication Number: 7037 (05-24-09)	Page 1 of 5

Title: **Flagging on the Right-of-Way**

Issued to: Flagman, Rail Service Supervisor (Operations), Track Gang Foreman (Maintenance)

Approved by: William R Mosny
Chief Operating Officer

Supersedes: Flagging on the right-of-way, 7037 (12-04-00)

Any group of 3 or more people who will be on or near the right-of-way for more than one-half hour must operate under the protection of a flagman within an established slow zone. The department requesting a flagman is responsible for providing all sign/lamp assemblies and signpost mounting devices necessary for properly setting up the slow zone.

REPORTING FOR DUTY AT A TERMINAL (Operations Personnel)

Although no uniform is designated for flagmen, wear apparel that is both safe and appropriate for the job and weather.

- CTA-issued high-visibility safety vest
- Natural fiber outerwear, since synthetic fabrics may ignite from 600 volt arcing

Do **not** wear

- Shorts, cut-offs, sleeveless shirts, tank or halter tops
- Loose, ill-fitting, unfastened and/or unbuttoned clothing and belts with sashes or hanging pendants
- Long coats that may come in contact with third rail
- Clothing that restricts the wearer's vision (e.g. hoods) unless it can be worn in a way that vision remains unobstructed (e.g. with the hood down).

- Report to the clerk and transportation manager.

- Select, examine and test all necessary flagging equipment:

  - red flag (for use in daylight)
  - air horn with extra cannister
  - portable radio (previously issued)
  - portable track trip
  - flashlight (previously issued)
  - whistle (previously issued; as back-up if air horn malfunctions)
  - Dietz light (battery-operated flashing yellow light; for times or areas of limited visibility)

- When all equipment has been checked for proper operation, complete form *cta 3784 EQUIPMENT REPORT - FLAGMAN'S*, and leave the form with the clerk.

- Check the trainroom bulletin board and with the clerk for operating orders and/or bulletins regarding special train routings or other events scheduled at or affecting the flagging location. See the transportation manager for clarification.

- Obtain a time slip (form *cta 3533 TIME SLIP*) from the clerk.

- Perform a radio check (*10-40*). For specific instructions, refer to SOP 8200 *Radio Communication*.

- Proceed immediately via CTA service to the assigned work location.

  - Whenever possible, alight at the nearest station and walk to the work site.
  - Tools, supplies, materials and equipment that may be offensive to customers must not be transported on revenue service trains.
  - Flammable items must not be transported on revenue service trains.
  - Do not occupy seats to the exclusion of customers, nor occupy unused operating cabs in the train.
  - Do not occupy the head cab with the operator unless your specific job function requires it.
    - In cases where riding in the cab with the operator is necessary (e.g. to use the operator's radio), communicate the reason, starting point, ending point and run number to the controller and await verbal authority from the controller for the in-cab ride.

AT THE WORK LOCATION

Upon arrival at the work site, report to the work crew leader for instructions. The work crew leader is responsible for setting up the slow zone correctly, and has jurisdiction over the flagman.

- Call the controller to confirm arrival and to provide details regarding the exact location of the work crew, the number of people in the crew, any other work that is or will be performed near the work site, and the expected length of time the work crew will need a flagman.

- Check that the slow zone meets all the requirements of all applicable standard operating procedures.

Note: ***If the slow zone has been set up improperly and the flagman and work crew leader cannot agree to correct it, the flagman will call the controller to request supervisory assistance. Once the controller has been notified:***
- ***The workers and flagman must leave the right-of-way IMMEDIATELY.***
- ***The workers and flagman must remain off of the tracks until a supervisor, instructor, or transportation manager arrives.***
- ***The supervisor, instructor or transportation manager will evaluate the situation and make any necessary adjustments.***

INSTALLING THE PORTABLE TRACK TRIP

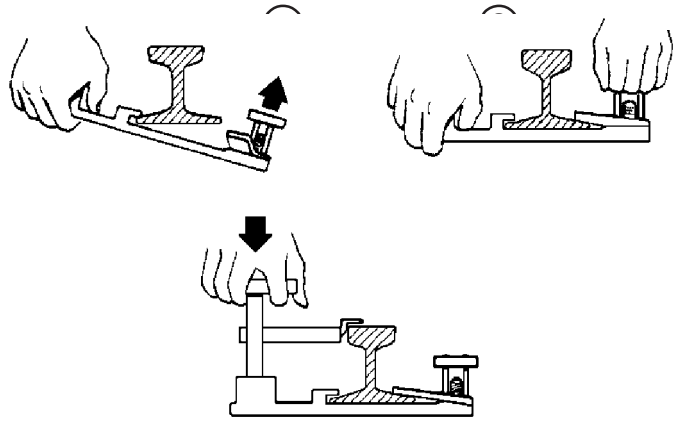
With the crew leader's assistance, select the location for installing the portable track trip.

- The location must provide secure footing.

- It must be directly across the track from the *Begin slow zone/6 mph* sign and both must be within 25 feet of the prescribed distance from the work area.

- At curves, hills, subway entrances, etc., provide rail operators with a view of the flagman's position that is as long and clear as allowable. Some circumstances will require two persons to *team flag* to provide ample warning.

Do not lean over the third rail or straddle it with your legs when installing the portable track trip base or when inserting the staff into the socket.



1. Slide the portable track trip base under the running rail opposite the motor cab (when facing in the direction of travel). Move ballast as necessary to insert the base under the rail. The socket for the staff must be on the outside of the running rail.

2. Mount the base onto the running rail by engaging the lip onto the outer base of the running rail. Secure the base by positioning the tightening plate (under the tightening handle) on top of the inner base of the running rail. Tighten the handle securely.

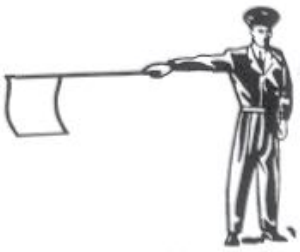
3. Drop the staff into the socket with the tip of the trip resting on the running rail.

- When properly installed, the portable track trip, if run over, will bring the train to a stop. Also, if a train passes a trip, the wheels will permanently flatten the tip of the trip, providing proof of the train's having run the trip.

FLAGGING (Operations and Maintenance Personnel)

- Stand at track level next to the portable track trip, whenever clearance permits, even when flagging for workers on a platform or a work train.

- Stand in full view and face approaching trains.



- As a train approaches the *Slow zone 600 ft ahead* sign:

  - Sound one long blast on the air horn or whistle to warn workers.

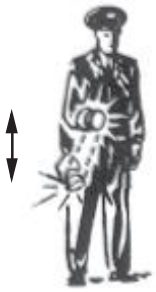
  - At the same time, raise the red flag at arm's length in a *horizontal position* across the track being governed to signal the train to reduce speed.

- During periods of darkness and in the subway, motion is necessary to ensure recognition.

- To signal the train to stop, swing the flag or flashlight horizontally at a right angle to the track.
- To signal the train to make an emergency stop, violently swing the flag or flashlight across the track.

Note: In an emergency, if a red flag or flashlight is not available, signals may be given with the arm only.

- When the train stops:
  - Wait for the work crew foreman to signal that workers, tools, and equipment are in the clear and that the train may proceed.
  - Remove the track trip staff, face the train and show the trip staff to the operator of the train. During daylight, remove the red flag from the operator's view, then signal to proceed by hand signal.
  - After dark or in the subway, after showing the trip staff to the operator, signal to proceed by raising and lowering the flashlight vertically.
  - If a speed other than the standard restricted speed (6 mph) is desired, indicate this to the operator by voice or hand signal before giving the proceed signal.



Note: Never signal to proceed using the red flag or any red object.

- If two flagmen are assigned to the same location (one for each direction of train travel) and two trains arrive simultaneously, the loop-bound train receives priority.
  - The flagman guarding the loop-bound track must signal the other flagman to detain his/her train by momentarily holding the red flag or outstretched arm (during daylight) or flashlight (at night or in the subway) over the track of the train to be detained (outbound).
  - Allow the loop-bound train to proceed only after you have received a signal from the other flagman acknowledging that your signal was received.

- If it appears that an approaching train is not going to stop:
  - Leave the portable track trip in the tripping position.
  - Use short blasts of the air horn or blow the whistle to warn the workers.
  - Stand clear of the train.
  - Move the red flag or flashlight (at night or in the subway) *violently* across the track to attract the operator's attention. Continue blowing the air horn or whistle as a warning.
- If the train does not stop or stops after hitting the portable track trip:
  - Note the run and head car numbers of the train and immediately call the controller.
  - Report the incident, request any necessary assistance, and order a replacement portable track trip.
- Immediately report any violation of speed restrictions or failure to obey signals to the controller. Provide the exact time, location, direction, run number and head car number.
- **If members of a work crew fail to face passing trains or otherwise jeopardize their safety or the safety of others, or if they unnecessarily delay trains, notify the work crew leader. If violations continue, call the controller.**

WHEN WORK ASSIGNMENT IS COMPLETED (Operations personnel)

- When the work crew leader indicates that the work for the day is done, complete the time slip and have the work crew leader sign it.
- If a slow zone is to remain in place, notify the controller.
- Notify the controller when the right-of-way is clear.
- Return to the terminal and report to the clerk. Indicate on the time slip the actual time spent at the work location. Do not use the flagging trick's scheduled start and finish times.
  - Follow the same directives as for riding CTA service to the work location (page 2, top).
- Report any defective equipment or unusual incidents.
- Turn in flagging equipment and time slip to the clerk.

SAFETY IS PART OF THE JOB
Follow all CTA-established rules relating to safe operation, as well as those rules relating to use of tools, materials, equipment and personal safety in performance of these procedures.

	Transit Operations Standard Operating Procedure	Publication Number: 7038 (06-21-09)	Page 1 of 2

Title: **Train Operation Through Slow Zones**

Issued to: Rapid Transit Operator, Rail Supervisor

Approved by: William R Mooney
Chief Operating Offivcer

Supersedes: Train Operation Through Slow Zones, 7038 (05-06-01)

A slow zone

- is a section of track marked with warning signs and lamps through which trains operate at reduced speed.
- is used to protect people working or to limit speed because of some condition on or near the track.

To approach or pass through a slow zone, operate as follows:

1. Begin reducing speed to 15 mph.

Sound horn to alert flagman (succession of short sounds).

2. Begin 15 mph speed limit.

Stand in the motor cab.

Be prepared to stop one car length before reaching the "Begin slow zone" sign.

3. Stop if signaled to do so by the flagman.

Open the window to listen for instructions.

When the flagman shows that the track trip has been removed and gives a "proceed" signal:

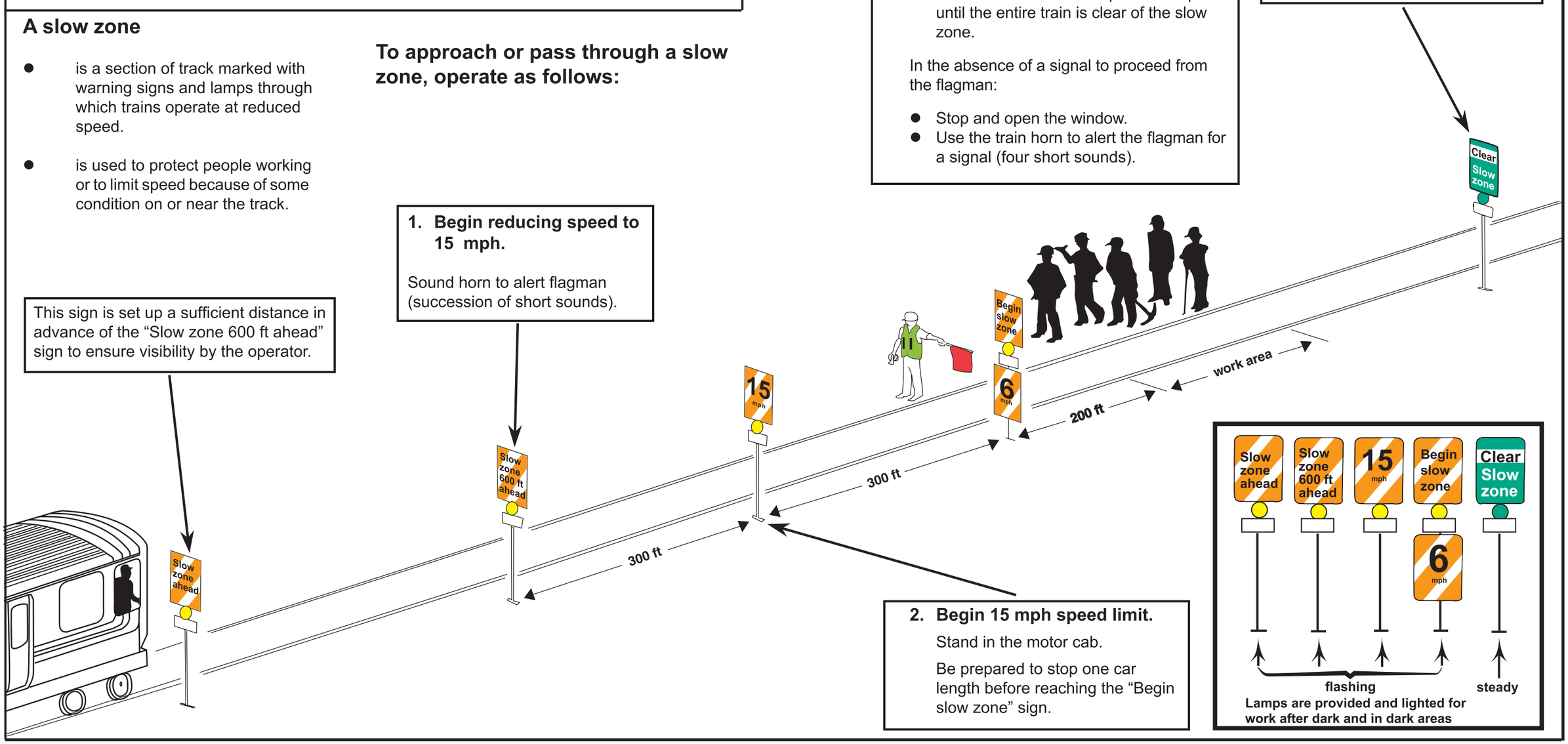
- Acknowledge by train horn (two short sounds).
- Observe the track ahead for obstructions and to ensure that all personnel are clear.
- Proceed at or below the permitted speed until the entire train is clear of the slow zone.

In the absence of a signal to proceed from the flagman:

- Stop and open the window.
- Use the train horn to alert the flagman for a signal (four short sounds).

4. Resume permitted speed once the head car of the train has reached this sign.

This sign is set up a sufficient distance in advance of the "Slow zone 600 ft ahead" sign to ensure visibility by the operator.



cta	**Transit Operations** Standard Operating Procedure	**Publication Number:** **8130 (07-12-09)**	**Page 1 of 6**

Title: **Safety on Rapid Transit Tracks**

Issued to: CTA and outside agency personnel, as necessary

Approved by: William R Mosny
Chief Operating Officer

Supersedes: Safety on Rapid Transit Tracks, 8130 (04-27-03)

Introduction

When entering upon or working adjacent to the right-of-way, ***with or without*** flagging protection, all personnel must follow established safety procedures as specified in General Safety Bulletin #3026, *CTA Employees on the Rail System Right-of-Way* (September, 2007), and current Rail System Rule Book rules. The following guidelines will help you protect yourself and others whenever it is necessary for you to enter the rail system right-of-way.

***NOTE*: All CTA non-operating employees and employees of outside agencies who are assigned to work on or adjacent to CTA's rail system right-of-way must have successfully completed the Rail System Safety Tour and must carry a valid Rail Safety Tour Identification Card.**


CHICAGO TRANSIT AUTHORITY
RAIL SAFETY TOUR IDENTIFICATION CARD
No. 5458 This Certification will
expire on 05/21/2007
Charlie Keevil
Name
99999
Badge/I.D. No.
Affiliation SAMPLE CARD
The personwhose name and photograph appear above satisfactorily completed CTA's Rail Safety Tour on 05/21/2006
Director, Rail Operations

CONDITIONS

1. This card must remain in the possession of the person certified on the front of this card anytime work is being preformed on CTA property.

2. This card is to be presented by the holder upon request of CTA officials.

Outside contractor/agency employee Rail Safety Tour Identification Card
(valid for one year from date of issue)


EMPLOYEE RAIL SAFETY TOUR ID CARD
No. 1328
Charlie Keevil 99999
Name Badge/ID No.
SAMPLE CARD
Title/Position/Area Affiliation/Dept.
The person whose name appears above satisfactorily completed CTA's Rail Safety Tour on: 05/21/2004
Expires on: 05/21/2007
Director, Rail Operations

CONDITIONS

1. This card must remain in the possession of the person certified on the front of this card anytime work is being preformed on CTA property.

2. This card is to be presented by the holder upon request of CTA officials.

CTA employee Rail Safety Tour Identification Card
(valid for three years from date of issue)

Communication

- Before entering or working adjacent to the right-of-way:

  - A group shall have a pre-entry safety discussion covering evacuation procedures and safety precautions.
  - One person of the group must be designated as the primary contact with the controller for calling on and off the right-of-way.

- When this is completed, you must notify the controller via radio of your desire to enter the right-of-way. You must call onto and enter the right-of-way (and call off and leave the right-of-way) *from a station* or *between two stations* (if entering the right-of-way at a non-station location).

  - Employees equipped with radios must notify the controller on the proper route channel. Employees with radios not equipped with a route channel must notify the controller via channel 2.

  - If you do not have a radio, you must identify yourself and display your employee ID card to the operator of the next train through the station and request the use of the operator's radio to notify the controller.

  - If no radio is available, call the controller on a telephone.

  Provide the following information to the controller:

  - Who you are and the number of people in your group. If you are a CTA employee, you must also provide your radio call number and your classification.

  - The area where you will be working/on the right-of-way, including the direction of the track upon which you will be working. To ensure that the controller knows exactly where you will be and unless the work area is within the limits of a station, the work area must only be *between two adjacent stations* and must be stated as between those two adjacent stations.

Example:	K570:	K570 to Control.
	Control:	K570, your message.
	K570:	K570, at 87th. Request permission to enter the right-of-way, northbound between 87th and 79th.

    If your location changes, you must *re-call* the controller to call off the prior track area and to call on to the new area. Provide the name of the station through which you are moving and the next *adjacent* station toward which you will now be working/on the right-of-way.

Example:	K570:	K570 to Control.
	Control:	K570, your message.
	K570:	K570, I'm now off the tracks between 87th and 79th. Am now at 79th. Request permission to enter the right-of-way, northbound between 79th and 69th.

  - How long you will be working/on the right-of-way at that location.

Upon the completion of your assignment, notify the controller (from the station at the end of the last work area) that work is complete and to call off the right-of-way.

Personal Protective Equipment

Whenever working on or adjacent to the rail system right-of-way,

- All personnel must wear:
  - Approved CTA high-visibility fluorescent green safety vests,
  - Proper footwear,
  - Protective headwear, if required.
- All personnel must carry a flashlight.
- All groups, even if the group consists of just one person, must possess a working portable flashing yellow light when working in times or places of reduced visibility.

General Precautions

- Be alert; be conscious of hazards presented by the third rail and trains.
- Consider the 600 volt third rail to be energized at all times.
- Never hesitate to signal an operator to slow down or stop if safety is involved; but do not delay service unnecessarily.
- Exercise caution while on the tracks:
  - Stop and look in both directions before crossing a track. Remain in the clear if a train is approaching. Expect trains to run in either direction, on any track, at any time.
  - Avoid walking on or crossing tracks unless necessary. Use the footwalk whenever possible.
  - Step ***over*** rails, never on them.
  - Watch for moving switchpoints. Never stand or place any part of your body on or in movable portions of switches, switchpoints or linkage.
  - Do not allow any part of your body, article of clothing, tools or equipment to contact the third rail or any part of a train.
  - Walk against the normal flow of train traffic whenever possible, so you can observe approaching trains.

Actions When Trains Approach

1. Stop work.
2. Warn others who may not be aware of the approaching train.
3. Face the train and signal the operator to proceed, slow down or stop. Give signals well in advance. If in a group, designate one employee to give all signals.

4. Make certain all equipment is in the clear.

5. Go to a position where you are clear of approaching trains. Make certain you can be seen by the operator of any approaching train.

   - Do not step to an adjacent track unless you are sure it is clear and will remain clear until the train passes.

   - Do not stand between trains on curves or in areas of restricted clearance. If caught/ trapped between trains, lie down on the footwalk, *making sure you don't contact the third rail.*

6. When you are certain that you and all equipment and personnel are in the clear, stand and *face the train*, then signal the operator to proceed. In areas of restricted clearance, do not allow two trains to pass on each side of you at the same time. Flag both trains to a stop. Then give a proceed signal to one train at a time. When two trains are traveling in opposite directions, the loopbound train should be given priority whenever possible.

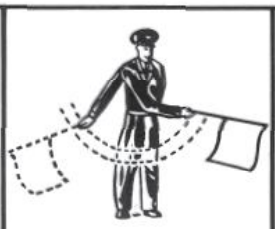
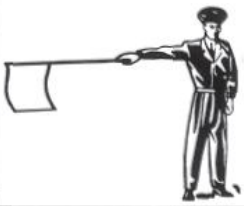
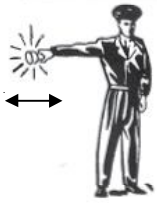
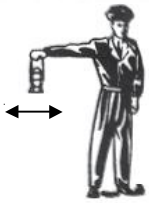
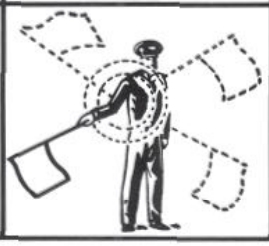
7. Remain stationary and watch the train until the entire train has passed.

8. Notify the controller and your immediate supervisor if the operator fails to respond to signals.

Hand, Flag, Flashlight and Lantern Signals

If your duties require you to give signals, you must ensure that you have the proper equipment, in good working order, ready for immediate use. Flags or lights of the prescribed colors must be used whenever normal operation cannot be maintained in a track area.

- Flags or hand signals must be used during daylight.
- Lights must be used during darkness, periods of low visibility, or in subways.
  - During periods of darkness and in the subway, motion is necessary to ensure recognition. When signalling with a light to reduce speed, slowly move the light back and forth horizontally at shoulder height to ensure that the operator sees and recognizes the signal.
- ***The proceed signal shall NEVER be given with a red flag or any red object.***

		**STOP or REMAIN STANDING-** Swung horizontally at right angle to track		
		**REDUCE SPEED-** Held horizontally at arm's length above track being governed		
	***NOTE: Proceed signal shall NEVER be given with a red flag OR ANY RED OBJECT.***	**PROCEED-Raised and lowered vertically above track being governed**	 ***Proceed signal shall be given with GREEN or WHITE light.***	
		**BACK-Swung vertically in a circle at half-arm's length at right angle to track**		

Note: **The relative speed with which a signal is given indicates the relative speed at which compliance with the signal is desired. Any object or hand waved violently by anyone on or near a track is a signal to stop immediately.**

Operator Approaching People On or Near Tracks

- Never operate past anyone on a footwalk or at track level without first receiving a proceed signal and making sure that everyone and all equipment are in the clear. Stand in the motorcab, open the motorcab window and proceed at restricted speed until the entire train is clear of everyone on or near the tracks.
- Warn persons on the tracks by short horn blasts.
- Acknowledge all signals with two short horn blasts.
- Obey all signals, lights and signs.
- Notify the controller to report failure of persons at track level or on footwalks to signal correctly or to stop work and face the train.

SAFETY IS PART OF THE JOB
Follow all CTA-established rules relating to safe operation, as well as those rules relating to use of tools, materials, equipment and personal safety in performance of these procedures.

Title: **Workers Ahead Warning System**

Issued to: Rail Operations Personnel and outside agency employees, as necessary

Approved by: William R Mosny
Chief Operating Officer

Supersedes: Workers Ahead Warning System, 8111 (04-28-02)

Introduction

The Workers Ahead (*WA*) warning system is designed to enhance the safety of persons working at track level in areas of limited visibility. The Authority has installed WA warning systems at several locations, but these installations do not relieve or reduce the responsibility of employees to protect themselves and to comply with pertinent safety rules and standard operating procedures. Whenever personnel are present on the right-of-way within a Workers Ahead warning zone, the WA Warning System must be activated. It must be used *in addition to* any slow zones which overlap or are located entirely within the Workers Ahead warning zone.

When the system is activated by an employee at track level, operators of approaching trains will encounter a flashing yellow wayside warning light beneath a sign labeled "BEGIN WA ZONE." In cab signal territory *only*, when the system is activated, the cab signal indication of maximum allowable speed will be reduced below the normal allowable speed. Generally, in areas where cab signal allowable speed is normally set at (green) 55 mph, allowable speed will be reduced to (yellow) 35 mph or less. However, at some locations on the Orange Line, the allowable speed will be 15 mph.

Note: The speed-reducing feature is NOT in effect when allowable speed has already been reduced due to right-of-way conditions or a train ahead.

When the system is turned off, WA warning lights will be dark, normal speed limits will be in effect and operators may proceed at permitted speed. Rule R6.2 does not apply to these warning lights.

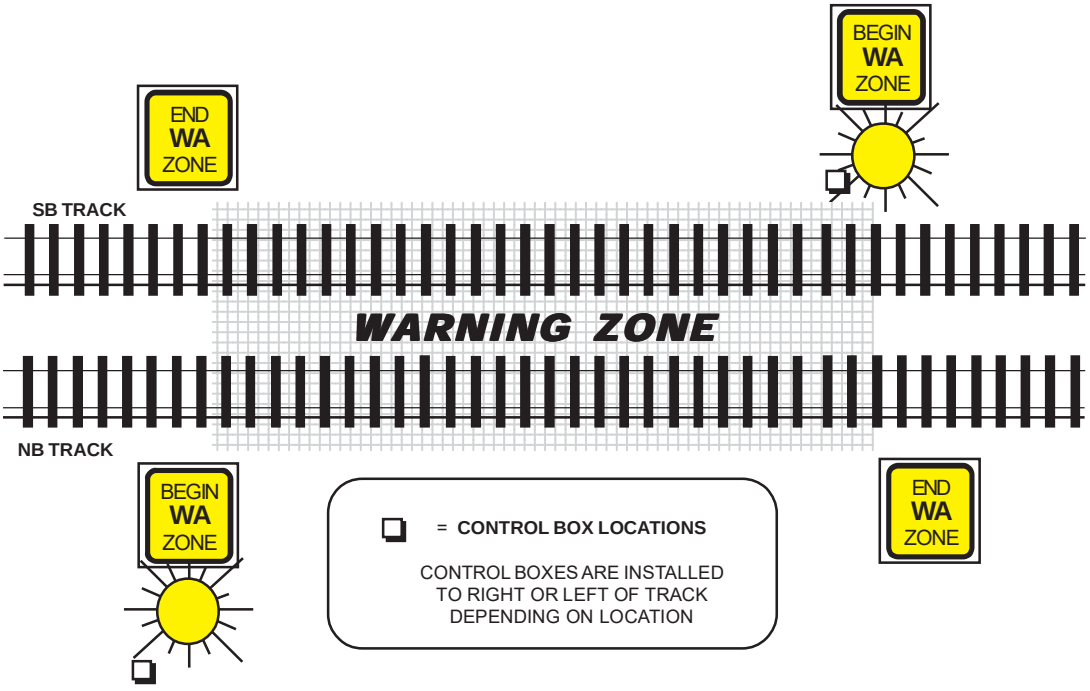
Operators approaching a flashing yellow WA warning light must:

- Reduce speed and sound horn (a succession of short sounds)
- Operate on sight, with extreme caution, expecting to encounter workers ahead through the limits of the WA warning zone.

Operators shall not operate past persons at track level until they receive a proper proceed signal and see that all persons and equipment are in the clear.

The end of the warning zone is identified by a yellow sign with wording "END WA ZONE" in black lettering.

Workers Ahead warning system controls can activate the warning system on one or more tracks to reduce the speed of train traffic **operating in normal direction only.**



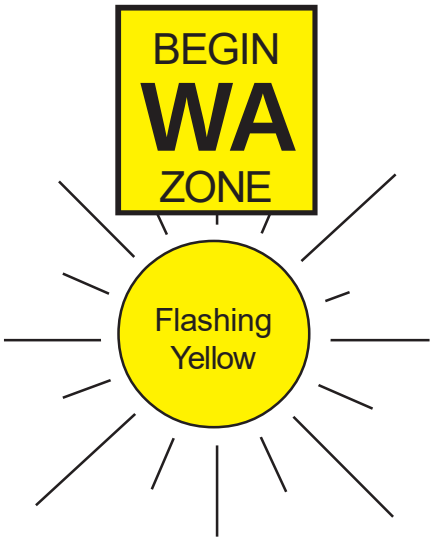
Activating the System

- Before entering the Workers Ahead warning zone at track level, check the Workers Ahead warning light to see if the system is turned on. If the system is already turned on, **leave it turned on**; it indicates that other workers are already in the WA zone. **Notify other workers present that you are also working in the WA zone.** If the system is turned off, unlock the control box and flip the toggle switch to the opposite position. Check to make sure that the red indicator light illuminates to indicate that the WA system is activated. Then close and lock the control box, if it is so equipped.

- Always verify that the WA warning lights are operating properly before beginning any work in the area. If it is not practical to visually check the warning light at the opposite end of the warning zone, flag down the first train that enters the warning zone. **Verify with the operator that the Workers Ahead warning light at the entrance to the warning zone is working properly.**

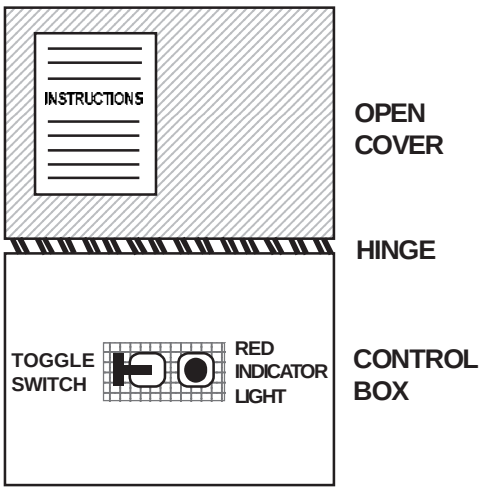
Note: If any warning light fails to illuminate and flash when the system is turned on, notify the rail controller of the defective warning light and await instructions. If necessary, flag a train to a stop and request that the operator report the defect to the controller.

Warning Light and Sign



- yellow plate with black lettering
- "BEGIN WA ZONE" marker and warning light located at the entrance to the warning zone
- the flashing yellow warning light will illuminate when the system is activated
- the light will be dark (off) when the system is turned off

Control Boxes



- painted blaze orange; located at both ends of the warning zone
- the toggle switch turns the system on or off; it controls all the WA warning lights at that location
- the red indicator light illuminates when the system is activated and is dark when the system is turned off
- the control box covers open with a switch lock key

End of warning zone

- yellow plate with black lettering
- "END WA ZONE" marker is located at the exit from the warning zone

Turning Off the System

- If other workers are present when you are leaving the WA zone, leave the system turned on. Multiple crews must coordinate responsibility for turning the system off. If you are sure that no other workers are present, turn the system off. Unlock and open the control box where you are leaving the WA zone and flip the toggle switch to the opposite position. The red indicator light inside the box and the yellow warning lights on the right-of-way will turn off. **Close and lock the control box with the switch lock provided.**

- Leave the WA zone; do not re-enter the WA zone without first re-activating the warning system.

Outside Agencies

- Representatives of outside agencies must be accompanied by at least one CTA flagman or other authorized CTA employee.

- WA system controls shall be operated *only* by CTA employees.

SAFETY IS PART OF THE JOB

Follow all CTA-established safety rules relating to the use of tools, materials, equipment and personal safety in the performance of these procedures.

cta	**Transit Operations** **General Information**	**Publication Number:** **8212 (05-25-08)**	**Page 1 of 1**

Title: **Test Train Procedures**

Issued to: All Rail Operations employees

Approved by: William R Mo
Chief Operating Officer

Supersedes: None

INTRODUCTION

A test train is an out-of-service train used to test new or rebuilt structure, track, traction power, signals or station platforms for the verification of safe service.

When determined by the Chief Engineer, a test train is to be operated to check:

- The dynamic clearance envelope of the train.
- The live load response of track and/or structure.
- Traction power energy demand.
- Signal system operation.
- For any other condition prior to resuming revenue service.

PROCEDURE

- In a planned construction or track outage, test train arrangements are made in advance and will be provided for in the Rail Service Bulletin authorizing the construction or track outage.

- In an emergency, notify the Control Center Manager and request a test train.

- The type and quantity of any equipment required for the test will be specified by the Chief Engineer or his designee.

- The Chief Engineer or his designee shall be in charge of the operation of the test train and must approve the infrastructure for safe service.

- The Chief Engineer shall prescribe what, if any, special instrumentation or loading is to be carried with or attached to the test train for testing purposes. When instrumentation is to be attached to the train, it must be approved by the Chief Rail Equipment Engineer or his designee.

- All operational details for the test train will be prescribed by the Chief Engineer or his designee, including, but not limited to speed and number and direction of trips through the area to be tested.

- An employee with valid operating certification will operate the test train at the direction of the Chief Engineer or his designee.

- At the Chief Engineer's direction, other personnel must ride the test train, such as contractors or maintenance employees who may be required to make adjustments to the track, signal system, station, etc. prior to the resumption of revenue service.

GENERAL SAFETY BULLETIN

General Safety Bulletin # 3026
January 2005

SUBJECT: CTA EMPLOYEES ON THE RAIL SYSTEM RIGHT-OF-WAY

The purpose of this bulletin is to establish safety procedures for CTA employees entering, working on, over, under or near the right-of-way with or without the protection of an assigned flagman. (Rule 8.24.3) **Rule** refers to Rail System Rule Book.

1) Responsibility

A. It is the responsibility of each employee to use caution and exercise all established safety rules to prevent injury to themselves or others when entering, working on, over, under or near the right-of-way to ensure his or her own personal safety. (Rule 3.1.3)

B. Only employees who have attended the Rail Safety Training Program and have been certified shall be allowed to enter or work on, over, under or near the right-of-way.

C. It is the responsibility of each supervisor/foreman to ensure that their employees:
- Attend the Rail Safety Training Program and are certified,
- Follow required safety procedures and departmental practices and
- Have all required personal protective equipment, including a vest, flashlight and proper footwear. (Rule 1.5.1) When working during dusk to dawn have a portable flashing yellow light. Safety Rule Book (Rule #110)
- Use Workers Ahead Warning System when available. (Rule 4.10)

D. All employees working on or near the rail system must comply with all Rail Standard Operating Procedure (SOP) # 8130 (09-01-02) and the Safety Rule Book concerning Safety On Rapid Transit Tracks and Yards (Rules 105 through 126).

E. All employees shall wear the required personal protective equipment whenever entering or working near the right-of-way. (Rule 1.5.1) They must stop work and face approaching trains. Safety Rule Book (Rules 105 through 126).

F. Use proper flagging and /or hand signals. (Rule 5.2.2)

2) Communication – portable Radios (Rule 1.9)

A. Before entering or working on, over, under or near the right-of-way, employees shall notify the Rail Controller for specified route via radio, providing the following information:
   - Employee call number, classification and number of employees in group,
   - Work location, including direction of train traffic and
   - Estimated duration of time on the right-of-way.

B. Approval to enter the right-of-way shall not be deemed granted until communications between the Rail Controller and requestor are verified, in order to determine the adequacy of communication (The Rail Controller to note information on Rail Control Personnel on the Right-Of-Way Log). General Safety Bulletin # 3026

C. Employees ***not*** equipped with a radio shall notify the Rail Controller for specified route as follows:

   - When traveling by train, employees shall identify self to the Operator and request use of the Operator's radio.
   - When arriving at work location by method other than train, prior to entering the right-of-way employees shall flag first train to a stop and request use of the Operator's radio.
   - When leaving the right-of-way by method other than train, employees shall flag train to a stop and request use of the Operator's radio.

D. Walk against the normal flow of traffic when possible, so you can observe approaching trains. (SOP) # 8130

E. Employees with radio ***not*** equipped with route channels shall notify Communications/Power Control via Channel 2.

F. Employees shall notify the Rail Controller via radio when leaving the right-of-way. (Rule 8.24.4)

G. The Rail Controller, upon receiving notification from employees, shall do the following:
   - Note information on Rail Control Personnel on Right-Of-Way Log.
   - Identify self to employee by Controller Number.
   - Broadcast initially and rebroadcast information regarding employee's location every ten minutes. The Rail Controller, will document runs acknowledging the broadcast in both directions until personnel has left the Right-of –Way.

H. All Operators in the immediate work vicinity and subsequent Operators receiving the initial call shall acknowledge the broadcast message, reduce train speed and operate with caution. (Rule 8.9)

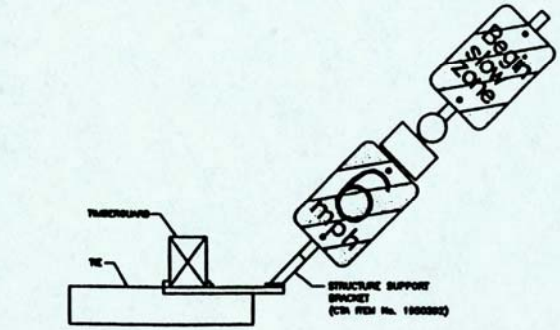
I. The Operator shall notify the Rail Controller whenever stopping to pick up or drop off employees on the right-of-way between stations.

Eliminating hazards prevents injuries and saves lives.

APPENDIX D

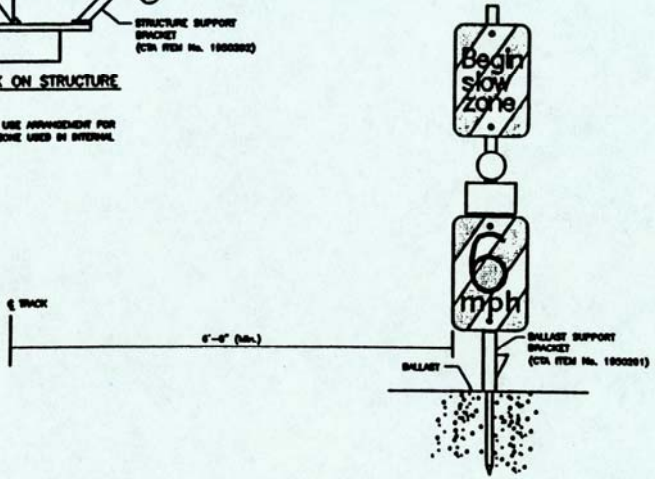
DRAWINGS/SKETCHES

- **Portable Rail System Slow Zone Bracket Arrangement of Post Supports** (CTA Drawing # PA-3370)
- **Portable Rail System Slow Zone Assembly Signposts** (CTA Drawing # PA-3378)
- **Slow Zone Sketch - tangent 2 track area, workers present**
- **Slow Zone Sketch - tangent 4 track area, workers present**
- **Slow Zone Sketch - tangent 4 track area, workers present**
- **Slow Zone Sketch - curved 4 track area, workers present**
- **Slow Zone Sketch - curved 2 track area, workers present**
- **Slow Zone Sketch - 24 hour slow zone, 15 MPH Speed Restriction**
- **Slow Zone Sketch - 24 hour slow zone, 15 MPH Speed Restriction**
- **Slow Zone Sketch - 24 hour slow zone, 25 MPH Speed Restriction**
- **Slow Zone Equipment Listing**

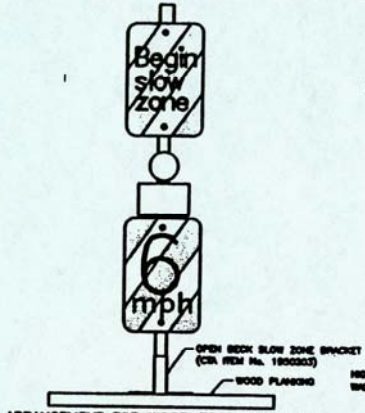


ARRANGEMENT FOR TRACK ON STRUCTURE

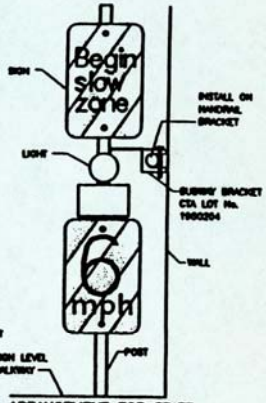
LOCATIONS SIMILAR TO 1 OR 2 TRACKS USE ARRANGEMENT FOR FOOTWALK/FIBERGLASS WHEN SLOW ZONE USED IN INTERVAL TRACKS OF 4 TRACK LOCATIONS.



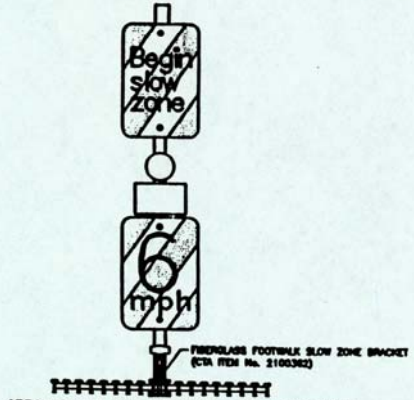
ARRANGEMENT FOR BALLAST TRACK



ARRANGEMENT FOR WOOD FOOTWALK AREA



ARRANGEMENT FOR STATE AND DEARBORN SUBWAYS

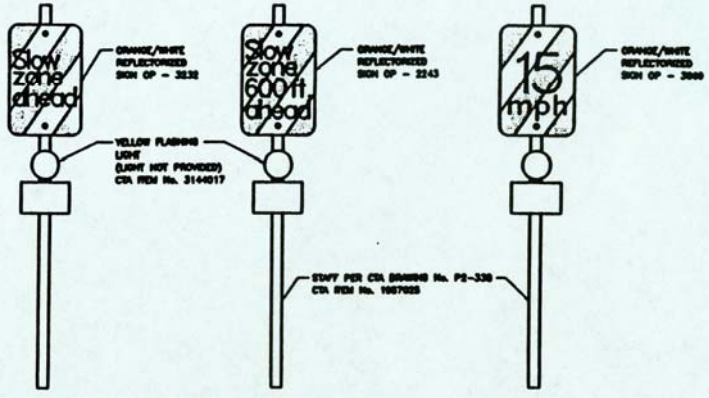


ARRANGEMENT FOR FIBERGLASS FOOTWALK AREA

n Charge	S. Martin					CHICAGO TRANSIT AUTHORITY cta	PORTABLE RAIL SYSTEM SLOW ZONE BRACKETS ARRANGEMENT OF POST SUPPORTS
Designed By							
Drawn By	P.Sheridan						
Checked By	F. Tijan						
Approved By	D. Penepacker						SCALE: 3/4" = 1'-0" DATE: 2/15/99 J.O. No.
		Revision	Date	Approved	Description		

SHEET NO 1 OF 1

DRG No. P4-337C



SLOW ZONE AHEAD SIGN
ASSEMBLY ITEM No. 1957020

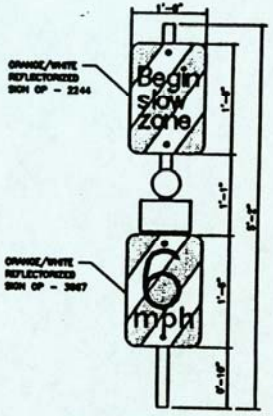
Sign Assembly: Slow Zone Ahead, CTA Item #1957020, fiberglass orange/white reflectorized sign with wording "Slow Zone Ahead" per CTA OP# 3232 (CTA detail specification #5002 – latest revision) attached to wood post (per CTA Drawing P2-338).

SLOW ZONE 600 FT. AHEAD SIGN
ASSEMBLY ITEM No. 1957021

Sign Assembly: Slow Zone 600 FT. Ahead, CTA Item #1957021, fiberglass orange/white reflectorized sign with wording "Slow Zone 600 FT. Ahead" per CTA OP# 2243 (CTA detail specification #5002 – latest revision) attached to wood post (per CTA Drawing P2-338).

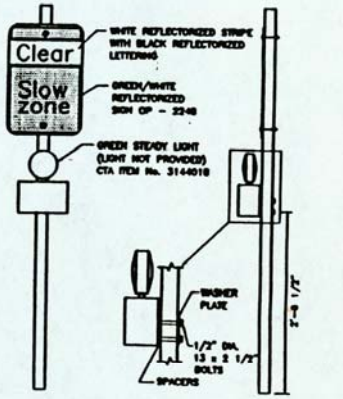
15 MPH SIGN
ASSEMBLY ITEM No. 1957022

Sign Assembly: 15 MPH CTA Item #1957022, fiberglass orange/white reflectorized sign with wording "15 MPH" per CTA OP# 3069 (CTA detail specification #5002 – latest revision) attached to wood post (per CTA Drawing P2-338).



BEGIN SLOW ZONE/6 MPH SIGN
ASSEMBLY ITEM No. 1957023

Sign Assembly: Begin Slow Zone/6 MPH, CTA Item #1957023, fiberglass orange/white reflectorized sign with wording "Begin Slow Zone/6 MPH" per CTA OP# 2244 & 3067 (CTA detail specification #5002 – latest revision) attached to wood post (per CTA Drawing P2-338).



CLEAR SLOW ZONE SIGN
ASSEMBLY ITEM No. 1957024

Sign Assembly: Clear Slow Zone, CTA Item #1957024, fiberglass orange/white reflectorized sign with wording "Clear Slow Zone" per CTA OP# 2248 (CTA detail specification #5002 – latest revision) attached to wood post (per CTA Drawing P2-338).

SIDE VIEW (TYP.)

In Charge	S. Martin					CHICAGO TRANSIT AUTHORITY	PORTABLE RAIL SYSTEM SLOW ZONE ASSEMBLY SIGNPOSTS
Designed By							
Drawn By	P. Sheridan						
Checked By	C. Tilton						
Approved By	D. Penepacker	Revision	Date	Approved	Description		SCALE: 3/4" = 1'-0" DATE: 8/3/98 J.O. No.

SHEET NO 1 OF 1

DRG. No. P4-3378

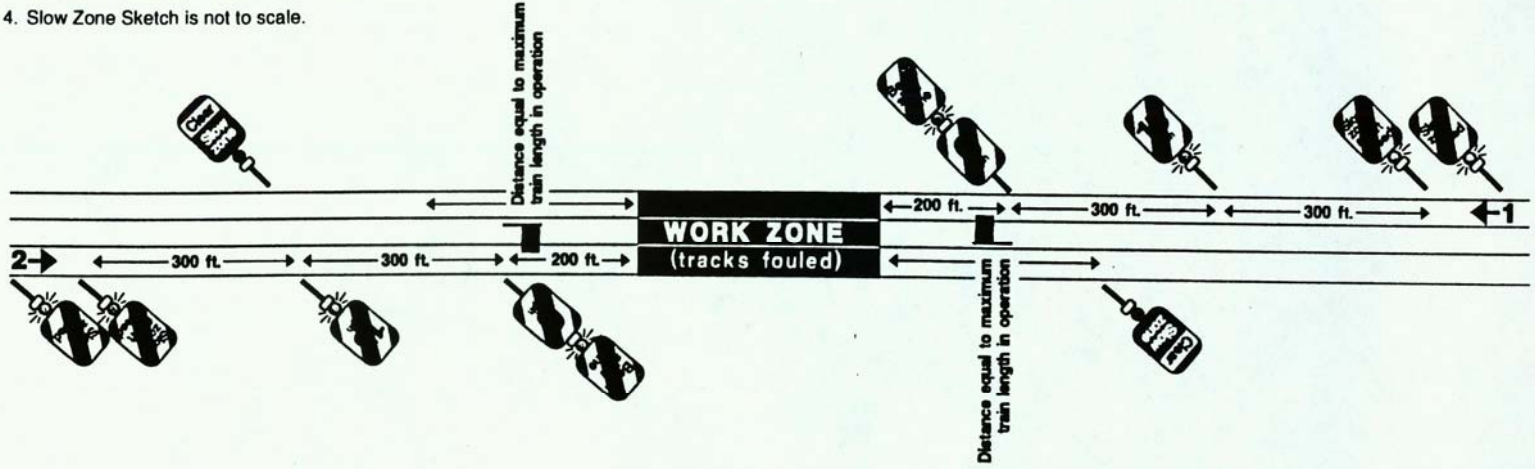
SLOW ZONE

2 TRACK AREA-WORKMEN & FLAGMEN PRESENT

WORK AREA IS ON ONE TRACK. BOTH TRACKS ARE FOULED.

NOTES:

1. Slow Zone established per Standard Operating Procedure 7041 "Slow Zones".
2. All distances denoted are minimum. Distances can be increased to ensure proper visibility & safety.
3. A pre-job inspection of all work sites is required by the person in charge of the work area.
4. Slow Zone Sketch is not to scale.



LEGEND

- Direction of train traffic
- Flagman with portable track trip positioned across from Begin Slow Zone Sign
- Flashing Amber Light
- Steady Green Light

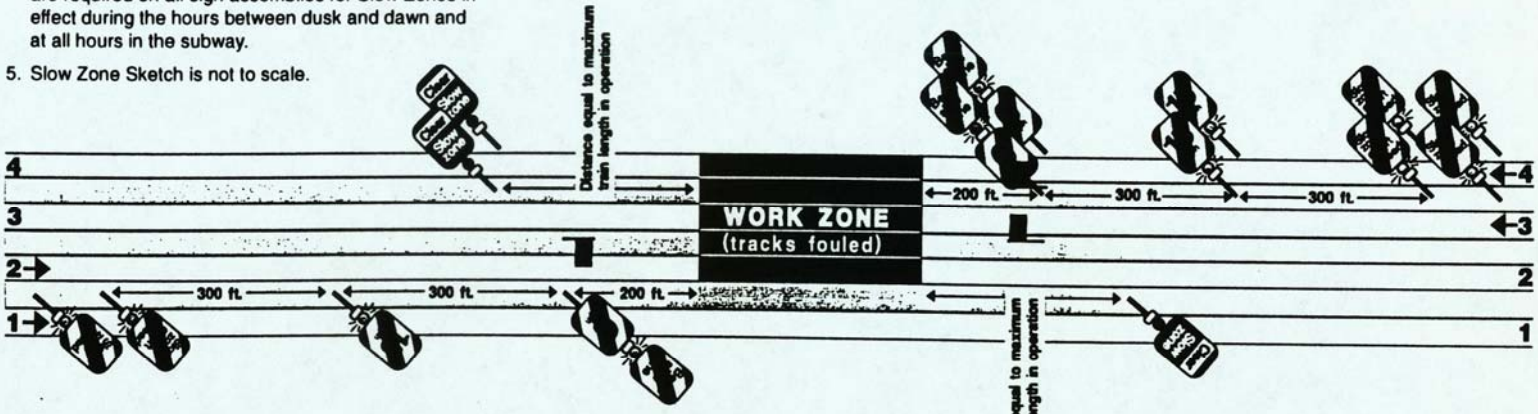
SLOW ZONE

4 TRACK AREA-WORKMEN & FLAGMEN PRESENT

WORK AREA IS ON TRACK #3.
TRACK #2 & #4 ARE ALSO FOULED.

NOTES:

1. Slow Zone established per Standard Operating Procedure 7041 "Slow Zones".
2. All distances denoted are minimum. Distances can be increased to ensure proper visibility & safety.
3. A pre-job inspection of all work sites is required by the person in charge of the work area.
4. Appropriate lights (flashing amber & steady green) are required on all sign assemblies for Slow Zones in effect during the hours between dusk and dawn and at all hours in the subway.
5. Slow Zone Sketch is not to scale.



LEGEND

- Direction of train traffic
- Flagman with portable track trip positioned across from Begin Slow Zone Sign
- Flashing Amber Light
- Steady Green Light

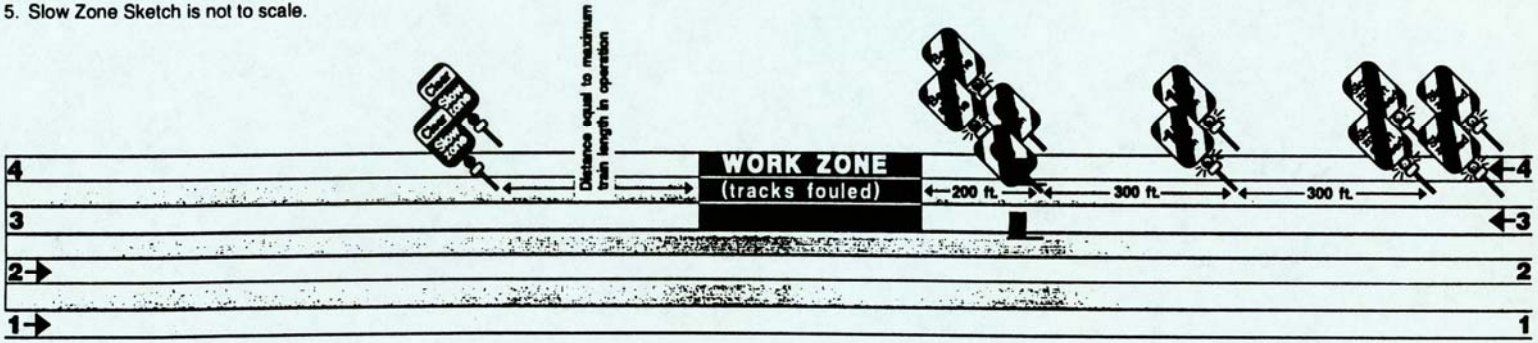
SLOW ZONE

4 TRACK AREA-WORKMEN & FLAGMEN PRESENT

WORK AREA IS ON TRACK #4.
TRACK #3 IS ALSO FOULED.

NOTES:

1. Slow Zone established per Standard Operating Procedure 7041 "Slow Zones".
2. All distances denoted are minimum. Distances can be increased to ensure proper visibility & safety.
3. A pre-job inspection of all work sites is required by the person in charge of the work area.
4. Appropriate lights (flashing amber & steady green) are required on all sign assemblies for Slow Zones in effect during the hours between dusk and dawn and at all hours in the subway.
5. Slow Zone Sketch is not to scale.



LEGEND

- Direction of train traffic
- Flagman with portable track trip positioned across from Begin Slow Zone Sign
- Flashing Amber Light
- Steady Green Light

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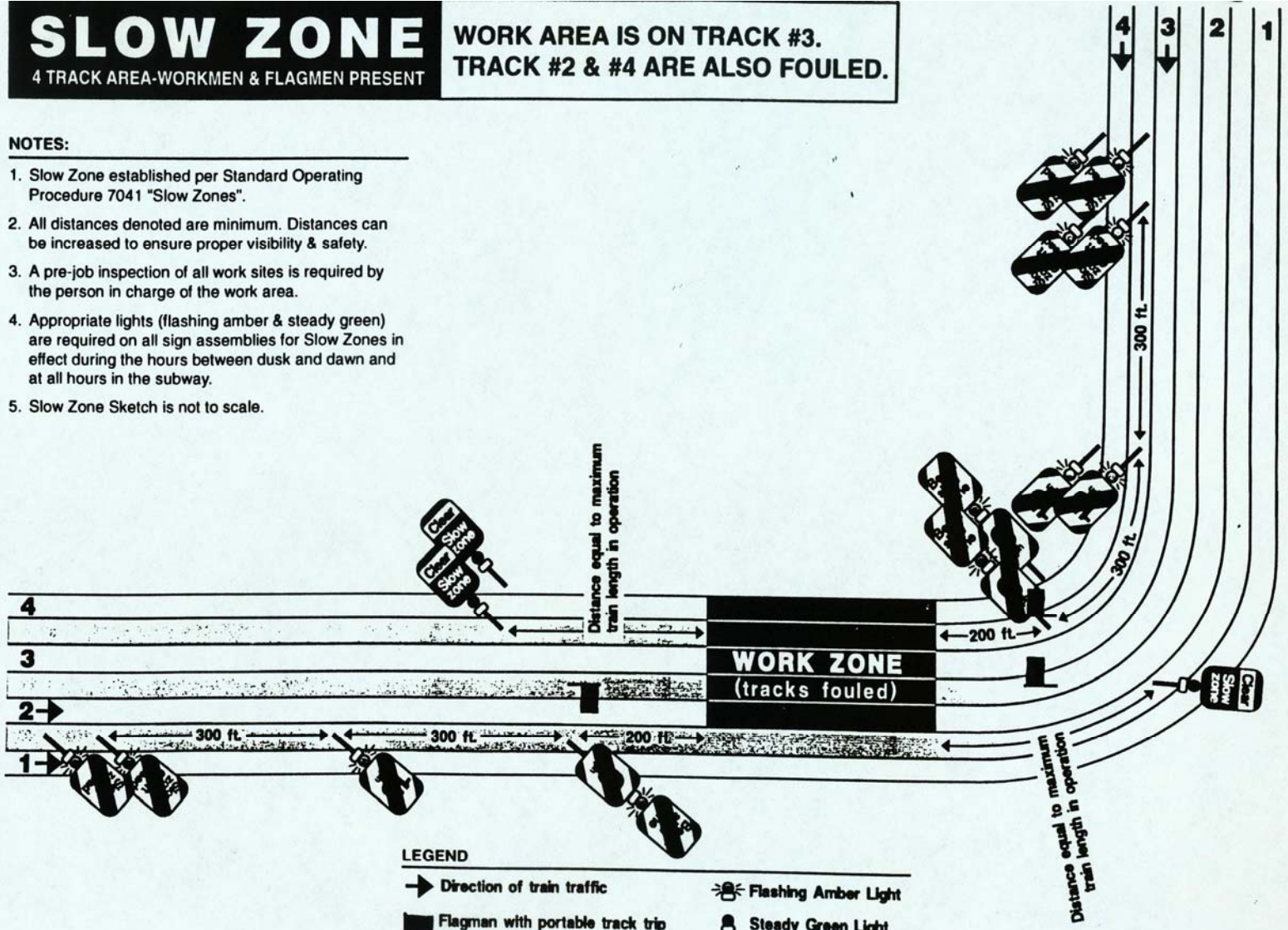
SLOW ZONE

4 TRACK AREA-WORKMEN & FLAGMEN PRESENT

WORK AREA IS ON TRACK #3.
TRACK #2 & #4 ARE ALSO FOULED.

NOTES:

1. Slow Zone established per Standard Operating Procedure 7041 "Slow Zones".
2. All distances denoted are minimum. Distances can be increased to ensure proper visibility & safety.
3. A pre-job inspection of all work sites is required by the person in charge of the work area.
4. Appropriate lights (flashing amber & steady green) are required on all sign assemblies for Slow Zones in effect during the hours between dusk and dawn and at all hours in the subway.
5. Slow Zone Sketch is not to scale.



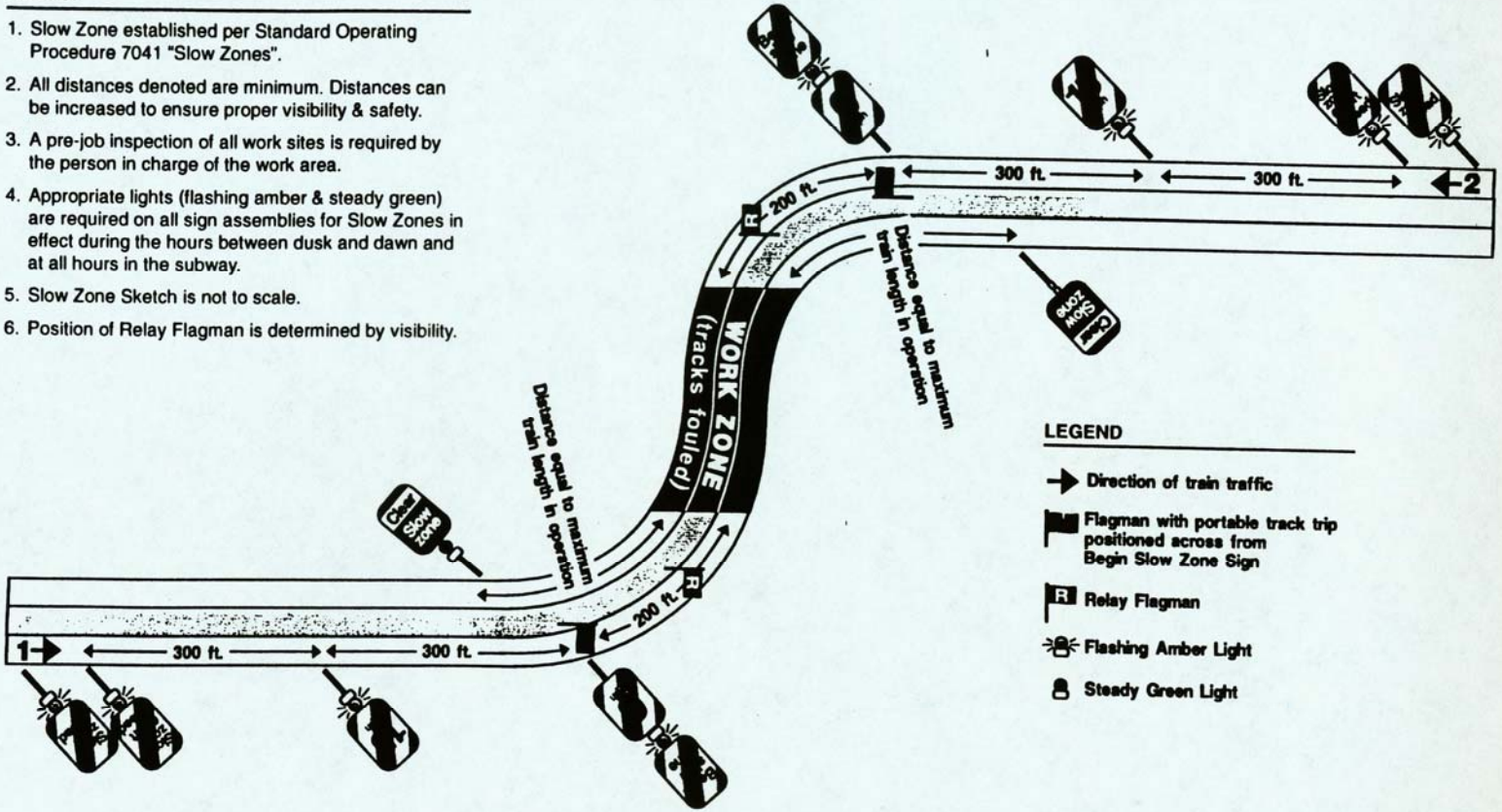
SLOW ZONE

2 TRACK AREA-WORKMEN & FLAGMEN PRESENT

WORK AREA IS ON ONE TRACK. BOTH TRACKS ARE FOULED.

NOTES:

1. Slow Zone established per Standard Operating Procedure 7041 "Slow Zones".
2. All distances denoted are minimum. Distances can be increased to ensure proper visibility & safety.
3. A pre-job inspection of all work sites is required by the person in charge of the work area.
4. Appropriate lights (flashing amber & steady green) are required on all sign assemblies for Slow Zones in effect during the hours between dusk and dawn and at all hours in the subway.
5. Slow Zone Sketch is not to scale.
6. Position of Relay Flagman is determined by visibility.



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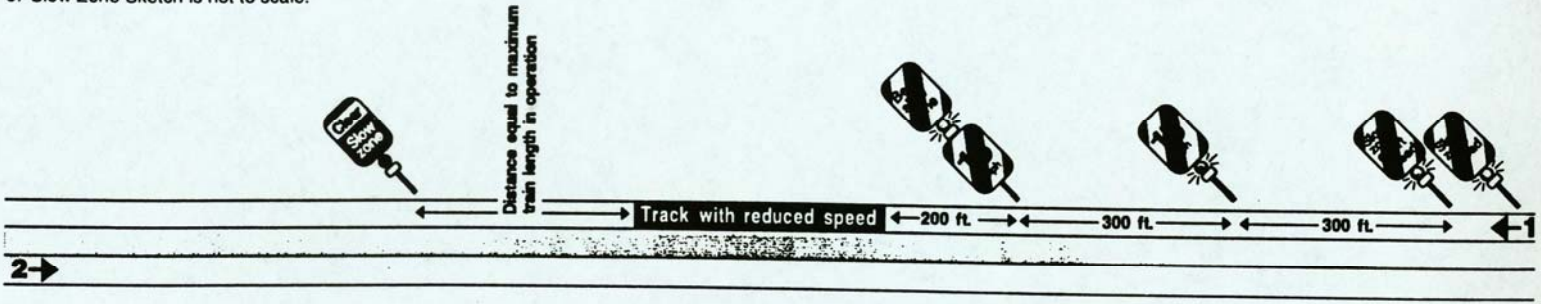
SLOW ZONE

2 TRACK AREA-NO WORKMEN & FLAGMEN

DUE TO TRACK CONDITION, REDUCED SPEED (15 MPH) IS REQUIRED ON TRACK #1, 24 HOURS A DAY.

NOTES:

1. Slow Zone established per Standard Operating Procedure 7041 "Slow Zones".
2. All distances denoted are minimum. Distances can be increased to ensure proper visibility & safety.
3. A pre-job inspection of all work sites is required by the person in charge of the work area.
4. Appropriate lights (flashing amber & steady green) are required on all sign assemblies for Slow Zones in effect during the hours between dusk and dawn and at all hours in the subway.
5. Slow Zone Sketch is not to scale.



LEGEND

- Direction of train traffic
- Flashing Amber Light
- Steady Green Light

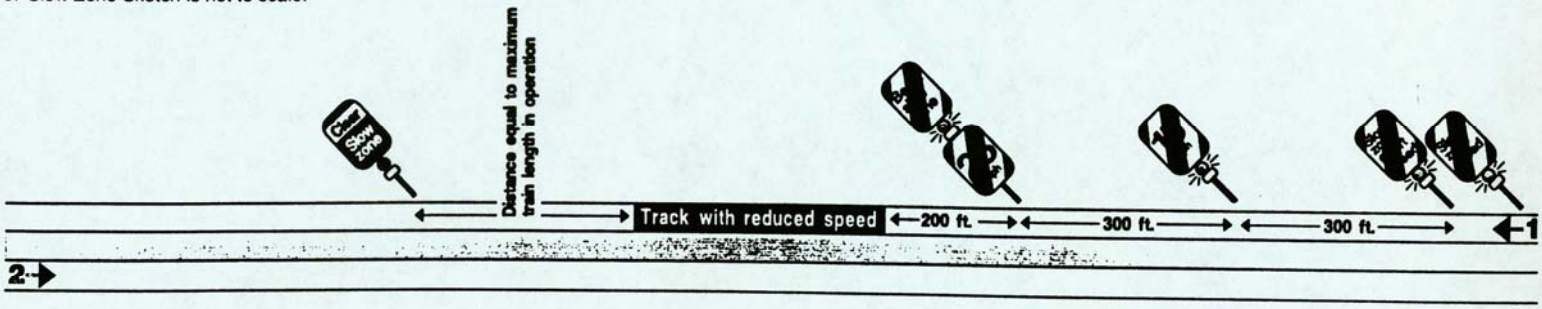
SLOW ZONE

2 TRACK AREA-NO WORKMEN & FLAGMEN

DUE TO TRACK CONDITION, REDUCED SPEED (25 MPH) IS REQUIRED ON TRACK #1, 24 HOURS A DAY.

NOTES:

1. Slow Zone established per Standard Operating Procedure 7041 "Slow Zones".
2. All distances denoted are minimum. Distances can be increased to ensure proper visibility & safety.
3. A pre-job inspection of all work sites is required by the person in charge of the work area.
4. Appropriate lights (flashing amber & steady green) are required on all sign assemblies for Slow Zones in effect during the hours between dusk and dawn and at all hours in the subway.
5. Slow Zone Sketch is not to scale.



LEGEND

- Direction of train traffic
- Flashing Amber Light
- Steady Green Light

SLOW ZONE EQUIPMENT LISTING

DESCRIPTION	ITEM #	U/M
SLOW ZONE SIGN ASSEMBLIES		
ASSEMBLY: "SLOW ZONE AHEAD"	1957020	pc
ASSEMBLY: "SLOW ZONE 600 FEET AHEAD"	1957021	pc
ASSEMBLY: "15 MPH"	1957022	pc
ASSEMBLY: "BEGIN SLOW ZONE/6 MPH"	1957023	pc
ASSEMBLY: "CLEAR SLOW ZONE"	1957024	pc
SLOW ZONE BRACKETS		
BRACKET: SLOW ZONE for ballasted track	1950201	pc
BRACKET: SLOW ZONE, angular for open decks	1950202	pc
BRACKET: SLOW ZONE, for open deck footwalks	1950203	pc
BRACKET: SLOW ZONE, for subway round handrail	1950204	pc
BRACKET: SLOW ZONE, for open deck fiberglass footwalk		
SLOW ZONE SIGNS		
SIGN: "SLOW ZONE AHEAD"	2107014	pc
SIGN: "SLOW ZONE 600 FEET AHEAD"	2107015	pc
SIGN: "BEGIN SLOW ZONE"	2107017	pc
SIGN: "CLEAR SLOW ZONE"	2107022	pc
SIGN: "6 MPH"	2107018	pc
SIGN: "10 MPH"	2107019	pc
SIGN: "15 MPH"	2107016	pc
SIGN: "25 MPH"	2107020	pc
SIGN: "35 MPH"	2107021	pc
SLOW ZONE MISCELLANEOUS EQUIPMENT		
STAFF: REPLACEMENT, predrilled for slow zone	1957025	pc
BATTERY: 6 Volt dry cell for lights	3141263	pc
LIGHT: AMBER, flashing, battery powered	3144017	pc
LIGHT: STEADY GREEN battery powered	3144018	pc

Title: **Flagging on the Right-of-Way**

Issued to: Flagman, Rail Service Supervisor (Operations), Track Gang Foreman (Maintenance)

Approved by: William R. Mosny
Chief Operating Officer

Supersedes: Flagging on the right-of-way, 7037 (12-04-00)

Any group of 3 or more people who will be on or near the right-of-way for more than one-half hour must operate under the protection of a flagman within an established slow zone. The department requesting a flagman is responsible for providing all sign/lamp assemblies and signpost mounting devices necessary for properly setting up the slow zone.

REPORTING FOR DUTY AT A TERMINAL (Operations Personnel)

Although no uniform is designated for flagmen, wear apparel that is both safe and appropriate for the job and weather.

- CTA-issued high-visibility safety vest
- Natural fiber outerwear, since synthetic fabrics may ignite from 600 volt arcing

Do **not** wear

- Shorts, cut-offs, sleeveless shirts, tank or halter tops
- Loose, ill-fitting, unfastened and/or unbuttoned clothing and belts with sashes or hanging pendants
- Long coats that may come in contact with third rail
- Clothing that restricts the wearer's vision (e.g. hoods) unless it can be worn in a way that vision remains unobstructed (e.g. with the hood down).

- Report to the clerk and transportation manager.

- Select, examine and test all necessary flagging equipment:

  - red flag (for use in daylight)
  - air horn with extra cannister
  - portable radio (previously issued)
  - portable track trip
  - flashlight (previously issued)
  - whistle (previously issued; as back-up if air horn malfunctions)
  - Dietz light (battery-operated flashing yellow light; for times or areas of limited visibility)

- When all equipment has been checked for proper operation, complete form *cta 3784 EQUIPMENT REPORT - FLAGMAN'S*, and leave the form with the clerk.

- Check the trainroom bulletin board and with the clerk for operating orders and/or bulletins regarding special train routings or other events scheduled at or affecting the flagging location. See the transportation manager for clarification.

- Obtain a time slip (form *cta 3533 TIME SLIP*) from the clerk.

- Perform a radio check (*10-40*). For specific instructions, refer to SOP 8200 *Radio Communication*.

- Proceed immediately via CTA service to the assigned work location.

  - Whenever possible, alight at the nearest station and walk to the work site.
  - Tools, supplies, materials and equipment that may be offensive to customers must not be transported on revenue service trains.
  - Flammable items must not be transported on revenue service trains.
  - Do not occupy seats to the exclusion of customers, nor occupy unused operating cabs in the train.
  - Do not occupy the head cab with the operator unless your specific job function requires it.
    - In cases where riding in the cab with the operator is necessary (e.g. to use the operator's radio), communicate the reason, starting point, ending point and run number to the controller and await verbal authority from the controller for the in-cab ride.

AT THE WORK LOCATION

Upon arrival at the work site, report to the work crew leader for instructions. The work crew leader is responsible for setting up the slow zone correctly, and has jurisdiction over the flagman.

- Call the controller to confirm arrival and to provide details regarding the exact location of the work crew, the number of people in the crew, any other work that is or will be performed near the work site, and the expected length of time the work crew will need a flagman.

- Check that the slow zone meets all the requirements of all applicable standard operating procedures.

> ***Note:*** ***If the slow zone has been set up improperly and the flagman and work crew leader cannot agree to correct it, the flagman will call the controller to request supervisory assistance. Once the controller has been notified:***
> - ***The workers and flagman must leave the right-of-way IMMEDIATELY.***
> - ***The workers and flagman must remain off of the tracks until a supervisor, instructor, or transportation manager arrives.***
> - ***The supervisor, instructor or transportation manager will evaluate the situation and make any necessary adjustments.***

INSTALLING THE PORTABLE TRACK TRIP

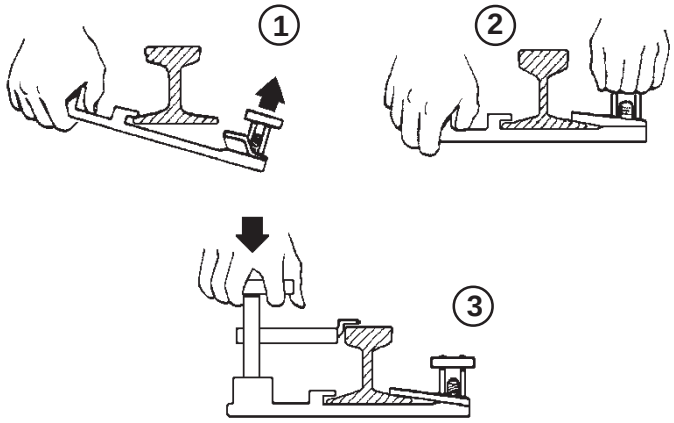
With the crew leader's assistance, select the location for installing the portable track trip.

- The location must provide secure footing.

- It must be directly across the track from the *Begin slow zone/6 mph* sign and both must be within 25 feet of the prescribed distance from the work area.

- At curves, hills, subway entrances, etc., provide rail operators with a view of the flagman's position that is as long and clear as allowable. Some circumstances will require two persons to *team flag* to provide ample warning.

Do not lean over the third rail or straddle it with your legs when installing the portable track trip base or when inserting the staff into the socket.



(1) Slide the portable track trip base under the running rail opposite the motor cab (when facing in the direction of travel). Move ballast as necessary to insert the base under the rail. The socket for the staff must be on the outside of the running rail.

(2) Mount the base onto the running rail by engaging the lip onto the outer base of the running rail. Secure the base by positioning the tightening plate (under the tightening handle) on top of the inner base of the running rail. Tighten the handle securely.

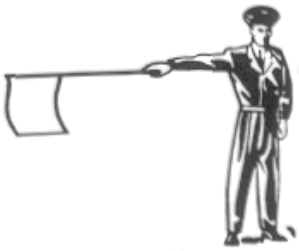
(3) Drop the staff into the socket with the tip of the trip resting on the running rail.

- When properly installed, the portable track trip, if run over, will bring the train to a stop. Also, if a train passes a trip, the wheels will permanently flatten the tip of the trip, providing proof of the train's having run the trip.

FLAGGING (Operations and Maintenance Personnel)

- Stand at track level next to the portable track trip, whenever clearance permits, even when flagging for workers on a platform or a work train.

- Stand in full view and face approaching trains.



- As a train approaches the *Slow zone 600 ft ahead* sign:

  - Sound one long blast on the air horn or whistle to warn workers.

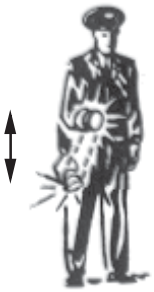
  - At the same time, raise the red flag at arm's length in a *horizontal position* across the track being governed to signal the train to reduce speed.

- During periods of darkness and in the subway, motion is necessary to ensure recognition.

- To signal the train to stop, swing the flag or flashlight horizontally at a right angle to the track.
- To signal the train to make an emergency stop, violently swing the flag or flashlight across the track.

Note: In an emergency, if a red flag or flashlight is not available, signals may be given with the arm only.

- When the train stops:
  - Wait for the work crew foreman to signal that workers, tools, and equipment are in the clear and that the train may proceed.
  - Remove the track trip staff, face the train and show the trip staff to the operator of the train. During daylight, remove the red flag from the operator's view, then signal to proceed by hand signal.
  - After dark or in the subway, after showing the trip staff to the operator, signal to proceed by raising and lowering the flashlight vertically.
  - If a speed other than the standard restricted speed (6 mph) is desired, indicate this to the operator by voice or hand signal before giving the proceed signal.



Note: Never signal to proceed using the red flag or any red object.

- If two flagmen are assigned to the same location (one for each direction of train travel) and two trains arrive simultaneously, the loop-bound train receives priority.
  - The flagman guarding the loop-bound track must signal the other flagman to detain his/her train by momentarily holding the red flag or outstretched arm (during daylight) or flashlight (at night or in the subway) over the track of the train to be detained (outbound).
  - Allow the loop-bound train to proceed only after you have received a signal from the other flagman acknowledging that your signal was received.

- If it appears that an approaching train is not going to stop:
  - Leave the portable track trip in the tripping position.
  - Use short blasts of the air horn or blow the whistle to warn the workers.
  - Stand clear of the train.
  - Move the red flag or flashlight (at night or in the subway) *violently* across the track to attract the operator's attention. Continue blowing the air horn or whistle as a warning.
- If the train does not stop or stops after hitting the portable track trip:
  - Note the run and head car numbers of the train and immediately call the controller.
  - Report the incident, request any necessary assistance, and order a replacement portable track trip.
- Immediately report any violation of speed restrictions or failure to obey signals to the controller. Provide the exact time, location, direction, run number and head car number.
- **If members of a work crew fail to face passing trains or otherwise jeopardize their safety or the safety of others, or if they unnecessarily delay trains, notify the work crew leader. If violations continue, call the controller.**

WHEN WORK ASSIGNMENT IS COMPLETED (Operations personnel)

- When the work crew leader indicates that the work for the day is done, complete the time slip and have the work crew leader sign it.
- If a slow zone is to remain in place, notify the controller.
- Notify the controller when the right-of-way is clear.
- Return to the terminal and report to the clerk. Indicate on the time slip the actual time spent at the work location. Do not use the flagging trick's scheduled start and finish times.
  - Follow the same directives as for riding CTA service to the work location (page 2, top).
- Report any defective equipment or unusual incidents.
- Turn in flagging equipment and time slip to the clerk.

SAFETY IS PART OF THE JOB

Follow all CTA-established rules relating to safe operation, as well as those rules relating to use of tools, materials, equipment and personal safety in performance of these procedures.

	Transit Operations Standard Operating Procedure	Publication Number: 7038 (06-21-09)	Page 1 of 2

Title: **Train Operation Through Slow Zones**

Issued to: Rapid Transit Operator, Rail Supervisor

Approved by: William R Mooney
Chief Operating Offivcer

Supersedes: Train Operation Through Slow Zones, 7038 (05-06-01)

A slow zone

- is a section of track marked with warning signs and lamps through which trains operate at reduced speed.
- is used to protect people working or to limit speed because of some condition on or near the track.

To approach or pass through a slow zone, operate as follows:

1. Begin reducing speed to 15 mph.

Sound horn to alert flagman (succession of short sounds).

2. Begin 15 mph speed limit.

Stand in the motor cab.

Be prepared to stop one car length before reaching the "Begin slow zone" sign.

3. Stop if signaled to do so by the flagman.

Open the window to listen for instructions.

When the flagman shows that the track trip has been removed and gives a "proceed" signal:

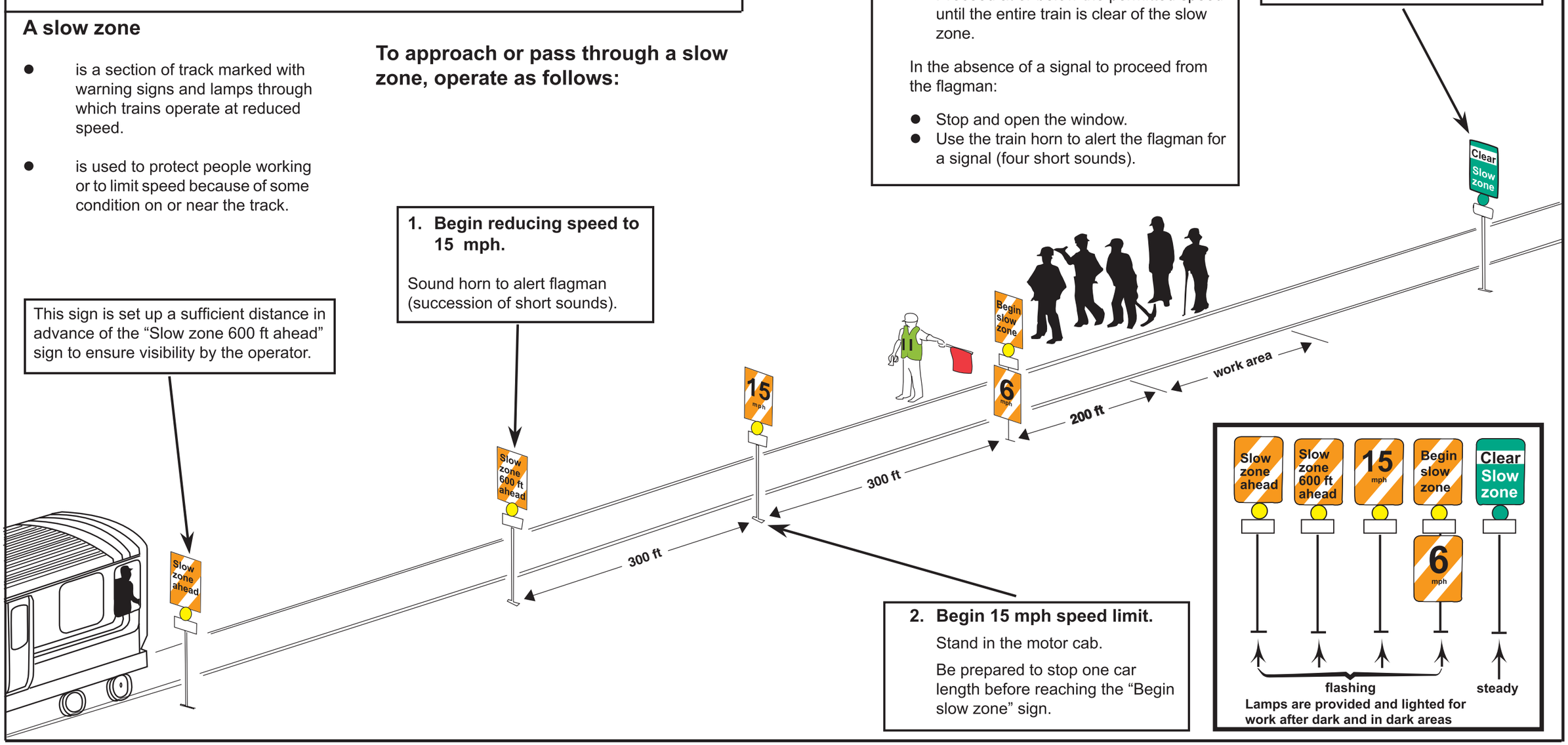
- Acknowledge by train horn (two short sounds).
- Observe the track ahead for obstructions and to ensure that all personnel are clear.
- Proceed at or below the permitted speed until the entire train is clear of the slow zone.

In the absence of a signal to proceed from the flagman:

- Stop and open the window.
- Use the train horn to alert the flagman for a signal (four short sounds).

4. Resume permitted speed once the head car of the train has reached this sign.

This sign is set up a sufficient distance in advance of the "Slow zone 600 ft ahead" sign to ensure visibility by the operator.



Standard Operation

1. Once the slow zone has been set up properly, the Foreman/Crew Leader instructs the workers and Flagman to begin work.
2. When a train reaches the *Slow zone 600 ft ahead* sign, the Flagman sounds the air horn to warn the work crew of the approaching train. Using the red flag held horizontally, or flashlight moved horizontally, over the affected track, the Flagman signals the train to reduce speed.
3. As quickly as possible, workers complete tasks sufficiently to ensure safe passage of the train.
4. Workers remove tools and materials that could interfere with train operation, move to positions of safety, and ***face the approaching train***.
5. The Operator stops the train at any point where signalled to do so. If the Operator has not received a proceed signal from the Flagman, the train must be stopped *no less than* 1 car length in advance of the *Begin slow zone* sign.
6. The Foreman/Crew Leader signals the Flagman when the work area is clear.
7. The Flagman then removes the track trip staff, shows it to the Operator, and signals the Operator to proceed.
8. The Operator proceeds at the designated speed until the motorcab passes the *Clear Slow zone* sign. Once the cab has passed the sign, the train may resume permitted speed.
9. The Flagman replaces the track trip staff as soon as the train clears his/her position.
10. Workers resume work after the train has cleared and it is safe to do so.

Removal of the Slow Zone

1. The Foreman/Crew Leader makes certain that all tools and materials have been removed or secured properly.
2. With the Flagman's protection, workers leave the site in single file. As necessary, the Foreman/Crew Leader designates a second Flagman to provide protection from both directions.
3. The Flagman removes the portable track trip when directed to do so by the Foreman/Crew Leader.
4. With Flagman protection, signposts and mounting devices are removed beginning with the *Clear Slow zone* sign and moving forward, in order, removing the *Slow zone ahead* sign last.
5. The Flagman notifies the Controller when the area is clear.

Note: If a slow zone is to remain after workers leave, the Flagman must notify the Controller, leave the signposts and stands in place, and mount an appropriate speed board on the "Begin slow zone" sign.

Title: Slow Zones

Issued to: All Rail Operations, Engineering and Facilities Maintenance personnel; Capital Construction and outside agency personnel as necessary

Approved by: Chief Transit Operations Officer

Supersedes: Slow zones, 7041 (05-24-09)

Slow Zone

- A section of track marked with warning signs and lamps through which trains operate at reduced speed
- Provides protection for people, trains, equipment and tracks
- Is set up when a group (three or more people) is scheduled to work on, across, or near a section of track for one-half hour or more.
- Is set up when conditions require, whether or not workmen are present

  Examples: track partially stripped; track needing realignment; spikes out; guard rail out; work being done under an elevated structure.

Responsibility for the Slow Zone

The department in charge of the scheduled work has jurisdiction over the slow zone. The same department remains responsible in the event the slow zone must be left unmanned (See *Note*, page 4).

The department with jurisdiction provides all marking devices and accessories.

- Sign/lamp units
- Signpost mounting devices
- Batteries for lamps

Before 1200 hours of the preceding business day, the department must initiate an order for a Flagman by notifying Rail Operations Capital Projects, CTA ext. 14534, which then generates a work order and informs the appropriate Terminal Clerk.

The Terminal Clerk assigns Flagmen for the next day's assignments if sufficient manpower is available and issues flagging equipment (See SOP 7037: *Flagging on the Right-of-Way*).

SAFETY IS PART OF THE JOB
Follow all CTA-established rules relating to safe operation, as well as those rules relating to use of tools, materials, equipment and personal safety in performance of these procedures.

Set-Up of the Slow Zone

- The Foreman/Crew Leader is responsible for setting up the slow zone as shown in the diagram and for calling the Controller when preparing to set up the slow zone.
- If necessary, the Foreman/Crew Leader will extend the distances shown to ensure visibility by train Operators.
- The Foreman/Crew Leader will send a worker against traffic a sufficient distance to serve as Flagman while the slow zone is being set up.
- The Foreman/Crew Leader and Transportation Manager will cooperate to keep the length of the work area to a safe minimum.
- The Foreman/Crew Leader will relocate sign posts, the Flagman and the portable track trip each time the work area progresses 25 feet.
- An additional slow zone will be set up on an adjacent track if it is necessary.
- The Foreman/Crew Leader will ensure that all lamps are working properly.
- Upon arrival, the Flagman will check the slow zone set-up for accuracy and safety.
- If the Flagman and Foreman/Crew Leader disagree as to whether the slow zone is set up properly, the Flagman will notify the Controller.
  - All workers and the Flagman must leave the right-of-way immediately.
  - All workers and the Flagman must remain off the tracks until a Supervisor, Instructor, or Transportation Manager arrives.
  - The Supervisor, Instructor or Transportation Manager will evaluate the situation and make any necessary corrections.
- If the *person in charge* at the slow zone deems the track to be unsafe, no trains may enter or pass through the slow zone until the hazard has been corrected.

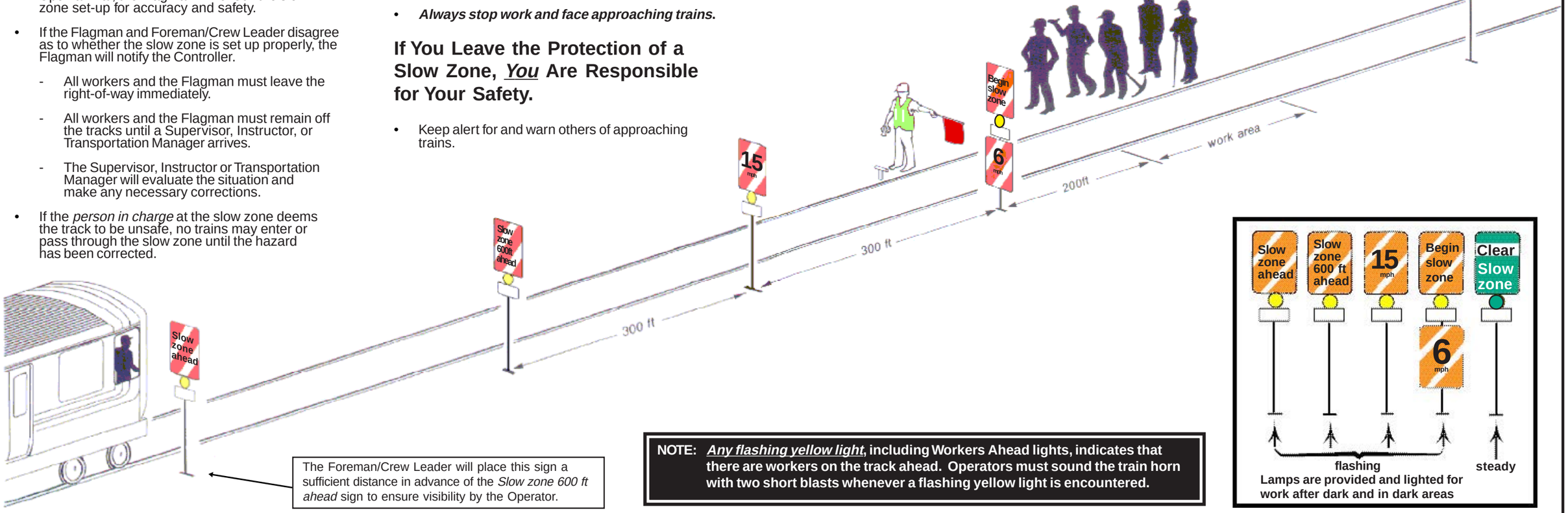
Safety Requirements for *All* Non-Operating Personnel

(Note Rail System Rule R8.24.3)

- Wear CTA approved high-visibility safety vest, hard hat and proper shoes. Do not wear backpacks or any item that covers the safety vest. (Flagmen are not required to wear a hard hat.)
- Enter the right-of-way only after being acknowledged and authorized by the Controller **first**.
- When leaving the right-of-way, notify the Controller when all personnel have left.
- Look both ways before stepping onto any track.
- Always step ***over*** rails - never on them.
- Avoid contact with the third rail.
- Do not touch any part of any train except for purposes of boarding or alighting.
- Watch for moving switch points.
- ***Always stop work and face approaching trains.***

If You Leave the Protection of a Slow Zone, *You* Are Responsible for Your Safety.

- Keep alert for and warn others of approaching trains.



The Foreman/Crew Leader will place this sign a sufficient distance in advance of the *Slow zone 600 ft ahead* sign to ensure visibility by the Operator.

The Foreman/Crew Leader will place this sign beyond the end of the work area at a distance equal to the maximum train length in operation.

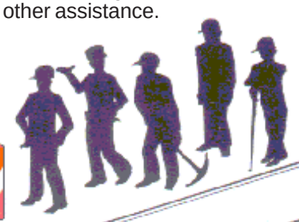
NOTE: *Any flashing yellow light*, including Workers Ahead lights, indicates that there are workers on the track ahead. Operators must sound the train horn with two short blasts whenever a flashing yellow light is encountered.

Lamps are provided and lighted for work after dark and in dark areas

- Stop work well in advance of the train's arrival and remain in full view of approaching trains.
- Slow or stop trains as safety requires.
- Signal the Operator to proceed only *after* the track is cleared of equipment and personnel.
- If it appears you will become trapped in an area with no clearance from a train, immediately lie face down until the train has passed.

Emergency Evacuation

- The Foreman/Crew Leader must prepare an emergency evacuation plan identifying a clear area for each person. Practice an orderly track evacuation periodically so each person is fully aware of his/her part in the plan. Several short blasts of the Flagman's warning horn is a signal to execute the emergency evacuation plan.
- The Foreman/Crew Leader must similarly prepare a plan and train the work crew for emergencies that would require medical or other assistance.



- In the absence of the Foreman, a work crew member shall be assigned responsibility for compliance with procedures.
- When work is being performed by a Contractor, the Contractor is responsible for ensuring that his Foreman complies with all procedures.
- Emergencies and violations must be reported by the Foreman or CTA Construction Inspector as soon as possible to the department involved and to the Controller.

Title: **Workers Ahead Warning System**

Issued to: Rail Operations Personnel and outside agency employees, as necessary

Approved by: William R Mosny
Chief Operating Officer

Supersedes: Workers Ahead Warning System, 8111 (04-28-02)

Introduction

The Workers Ahead (*WA*) warning system is designed to enhance the safety of persons working at track level in areas of limited visibility. The Authority has installed WA warning systems at several locations, but these installations do not relieve or reduce the responsibility of employees to protect themselves and to comply with pertinent safety rules and standard operating procedures. Whenever personnel are present on the right-of-way within a Workers Ahead warning zone, the WA Warning System must be activated. It must be used *in addition to* any slow zones which overlap or are located entirely within the Workers Ahead warning zone.

When the system is activated by an employee at track level, operators of approaching trains will encounter a flashing yellow wayside warning light beneath a sign labeled “BEGIN WA ZONE.” In cab signal territory *only*, when the system is activated, the cab signal indication of maximum allowable speed will be reduced below the normal allowable speed. Generally, in areas where cab signal allowable speed is normally set at (green) 55 mph, allowable speed will be reduced to (yellow) 35 mph or less. However, at some locations on the Orange Line, the allowable speed will be 15 mph.

Note: The speed-reducing feature is NOT in effect when allowable speed has already been reduced due to right-of-way conditions or a train ahead.

When the system is turned off, WA warning lights will be dark, normal speed limits will be in effect and operators may proceed at permitted speed. Rule R6.2 does not apply to these warning lights.

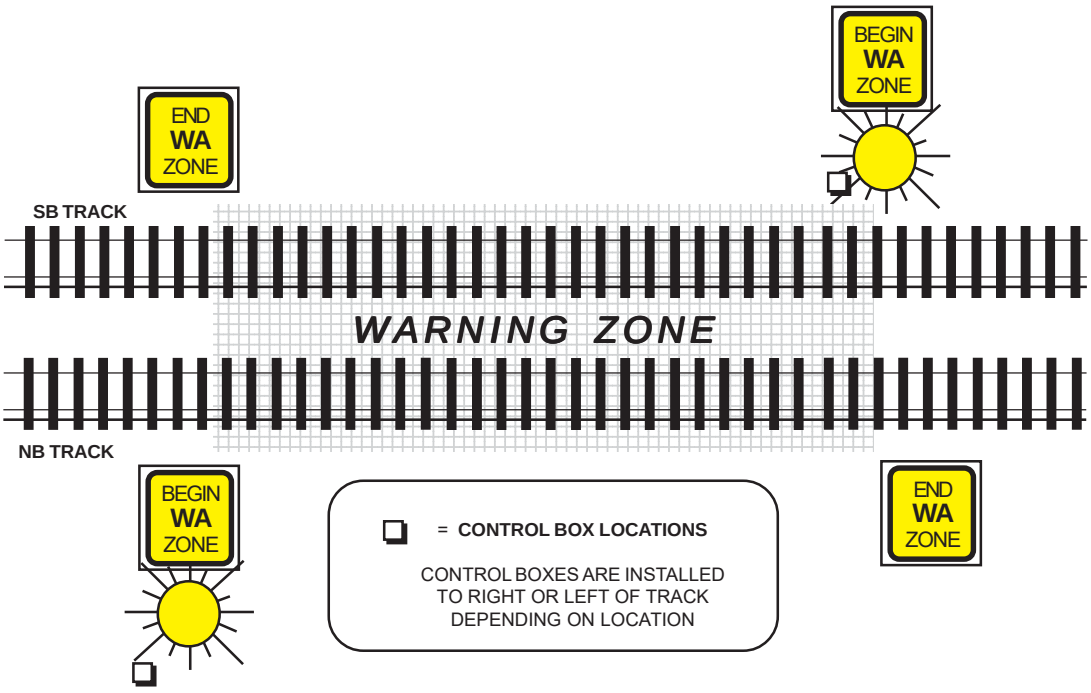
Operators approaching a flashing yellow WA warning light must:

- Reduce speed and sound horn (a succession of short sounds)
- Operate on sight, with extreme caution, expecting to encounter workers ahead through the limits of the WA warning zone.

Operators shall not operate past persons at track level until they receive a proper proceed signal and see that all persons and equipment are in the clear.

The end of the warning zone is identified by a yellow sign with wording “END WA ZONE” in black lettering.

Workers Ahead warning system controls can activate the warning system on one or more tracks to reduce the speed of train traffic **operating in normal direction only.**



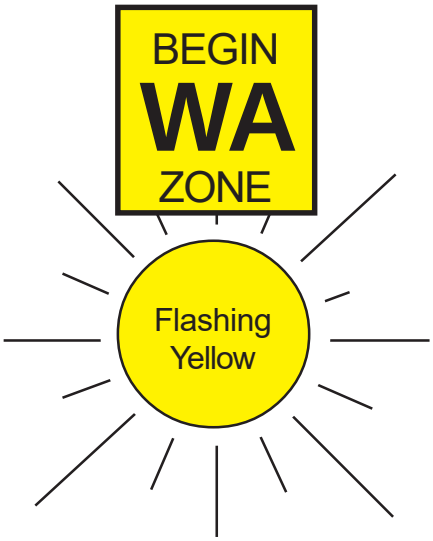
Activating the System

- Before entering the Workers Ahead warning zone at track level, check the Workers Ahead warning light to see if the system is turned on. If the system is already turned on, **leave it turned on**; it indicates that other workers are already in the WA zone. **Notify other workers present that you are also working in the WA zone.** If the system is turned off, unlock the control box and flip the toggle switch to the opposite position. Check to make sure that the red indicator light illuminates to indicate that the WA system is activated. Then close and lock the control box, if it is so equipped.

- Always verify that the WA warning lights are operating properly before beginning any work in the area. If it is not practical to visually check the warning light at the opposite end of the warning zone, flag down the first train that enters the warning zone. **Verify with the operator that the Workers Ahead warning light at the entrance to the warning zone is working properly.**

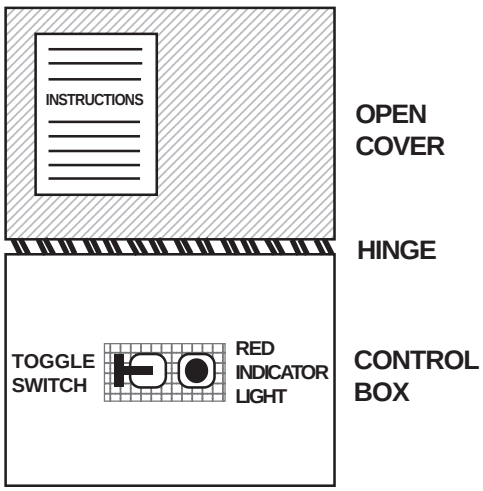
Note: If any warning light fails to illuminate and flash when the system is turned on, notify the rail controller of the defective warning light and await instructions. If necessary, flag a train to a stop and request that the operator report the defect to the controller.

Warning Light and Sign



- yellow plate with black lettering
- "BEGIN WA ZONE" marker and warning light located at the entrance to the warning zone
- the flashing yellow warning light will illuminate when the system is activated
- the light will be dark (off) when the system is turned off

Control Boxes



- painted blaze orange; located at both ends of the warning zone
- the toggle switch turns the system on or off; it controls all the WA warning lights at that location
- the red indicator light illuminates when the system is activated and is dark when the system is turned off
- the control box covers open with a switch lock key

End of warning zone

- yellow plate with black lettering
- "END WA ZONE" marker is located at the exit from the warning zone

Turning Off the System

- If other workers are present when you are leaving the WA zone, leave the system turned on. Multiple crews must coordinate responsibility for turning the system off. If you are sure that no other workers are present, turn the system off. Unlock and open the control box where you are leaving the WA zone and flip the toggle switch to the opposite position. The red indicator light inside the box and the yellow warning lights on the right-of-way will turn off. **Close and lock the control box with the switch lock provided.**

- Leave the WA zone; do not re-enter the WA zone without first re-activating the warning system.

Outside Agencies

- Representatives of outside agencies must be accompanied by at least one CTA flagman or other authorized CTA employee.

- WA system controls shall be operated *only* by CTA employees.

SAFETY IS PART OF THE JOB

Follow all CTA-established safety rules relating to the use of tools, materials, equipment and personal safety in the performance of these procedures.

cta	**Transit Operations** Standard Operating Procedure	**Publication Number:** **8130 (04-27-14)**	**Page 1 of 5**

Title: **Safety on Rapid Transit Tracks**

Issued to: CTA and outside agency personnel, as necessary

Approved by:

Chief Transit Operations Officer

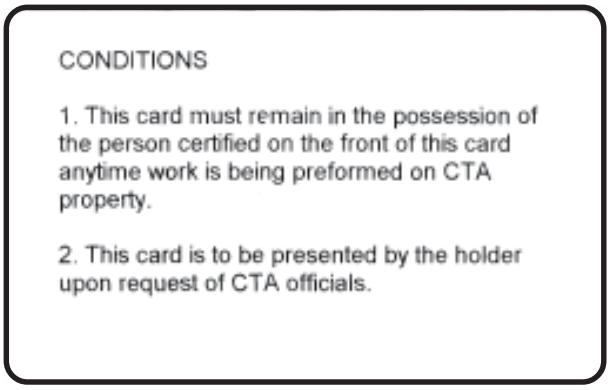
Supersedes: Safety on Rapid Transit Tracks, 8130 (07-12-09)

Introduction

When entering upon or working adjacent to the right-of-way, all personnel must follow established safety procedures including but not limited to those specified in General Safety Bulletin #3026, *CTA Employees on the Rail System Right-of-Way* (September 2007), and current Rail System Rule Book rules. The following guidelines will help you protect yourself and others whenever it is necessary for you to enter the rail system right-of-way.

***NOTE*: All CTA non-operating employees and employees of outside agencies who are assigned to work on or adjacent to CTA's rail system right-of-way must have successfully completed the Rail System Safety Tour and must carry a valid Rail Safety Tour Identification Card.**

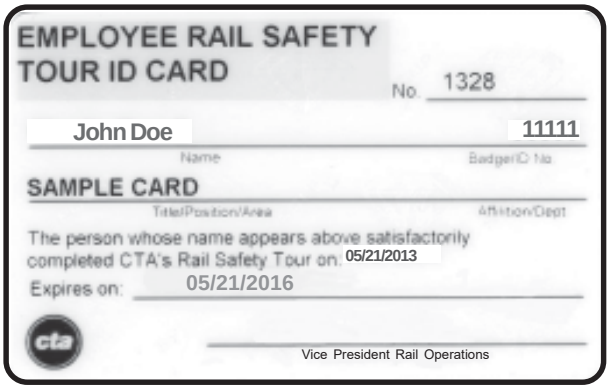

CHICAGO TRANSIT AUTHORITY
RAIL SAFETY TOUR IDENTIFICATION CARD
No. 5458 This Certification will
expire on 05/21/2014
John Doe
Name
99999
Badge/I.D. No.
Affiliation SAMPLE CARD
The personwhose name and photograph appear above satisfactorily completed CTA's Rail Safety Tour on 05/21/2013
Vice President Rail Operations

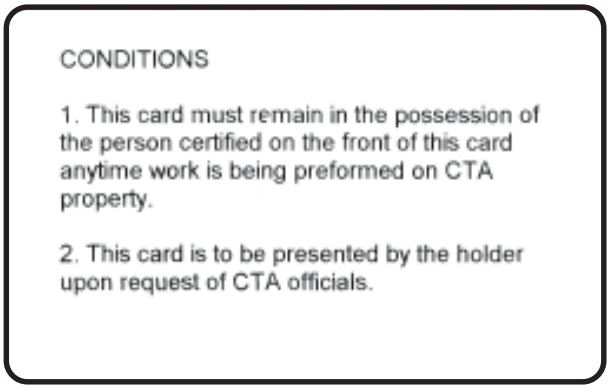

CONDITIONS

1. This card must remain in the possession of the person certified on the front of this card anytime work is being preformed on CTA property.

2. This card is to be presented by the holder upon request of CTA officials.

Outside Contractor/Agency Employee Rail Safety Tour Identification Card
(valid for one year from date of issue)


EMPLOYEE RAIL SAFETY TOUR ID CARD
No. 1328
John Doe
Name
11111
Badge/ID No.
SAMPLE CARD
Title/Position/Area
Affiliation/Dept
The person whose name appears above satisfactorily completed CTA's Rail Safety Tour on: 05/21/2013
Expires on: 05/21/2016
Vice President Rail Operations


CONDITIONS

1. This card must remain in the possession of the person certified on the front of this card anytime work is being preformed on CTA property.

2. This card is to be presented by the holder upon request of CTA officials.

CTA Employee Rail Safety Tour Identification Card
(valid for three years from date of issue)

Communication Before Entering or Working Adjacent to the Right-of-Way

- A group shall have a pre-entry safety discussion covering evacuation procedures and safety precautions.
- The group must have a CTA two-way radio.
- One person of the group must be designated as the primary contact with the Controller for calling on and off the right-of-way.

PEOPLE ACTIVELY WORKING ON THE RIGHT OF WAY MUST BE IN A GROUP OF AT LEAST TWO. THIS APPLIES TO ACTIVITIES SUCH AS TRAINING, INSPECTING, AUDITING AND REPAIRING. THE ONLY EXCEPTION IS FOR PERSONS RESPONDING TO A CALL FOR ASSISTANCE, SUCH AS A SUPERVISOR OR K202.

When the pre-entry discussion is completed, the designated contact person must notify the Controller via radio of the group's desire to enter the right-of-way. The designated contact person must call the group onto (and off of) the right-of-way *from a station* or *between two stations* (if entering or exiting the right-of-way at a non-station location).

On the proper route channel notify the Controller of: who you are; the number of people in your group; the area where the group will be on the right-of-way, including the direction of the track upon which the work will be performed; an estimate of how long the group expects to be on the right-of-way at the location; and your radio call number, if applicable.

If the two-way radio becomes non-operational, you must identify yourself and display your employee ID card to the Operator of the next train to approach the station and request the use of the Operator's radio to notify the Controller. If no radio is available, call the Controller from a kiosk telephone or platform telephone, if available.

To ensure that the Controller knows exactly where the group will be, and unless the work area is within the limits of a station, the work area must only be *between two adjacent stations* and must be stated as between those two adjacent stations.

Example:
K570: K570 to Control
Control: K570, your message
K570: K570 at 87th. Request permission to enter the right-of-way, northbound between 87th and 79th

Communication When Changing Location

If the group must change location, call the Controller again to call off the prior track area and to call on to the new area. Provide the name of the station through which the group is moving and the next *adjacent* station toward which the group will be proceeding on the right-of-way.

Example:
K570: K570 to Control
Control: K570, your message
K570: K570, I'm now off the tracks between 87th and 79th. I'm now at 79th. Request permission to enter the right-of-way northbound between 79th and 69th

Upon the completion of the assignment, notify the Controller (from the station at the end of the last work area) that work is complete and to call off the right-of-way.

Personal Protective Equipment

Whenever working on or adjacent to the rail system right-of-way, all members of the group must:

- Wear approved CTA high-visibility fluorescent safety vests, proper footwear, eyeglasses (if prescription; contact lenses are not permitted); and protective headwear, if required;
- Carry and use a flashlight in times or places of reduced visibility; and

The group must possess a working portable flashing yellow light when working in times or places of reduced visibility.

General Precautions

- Be alert; be conscious of hazards presented by the third rail and trains.
- Consider the 600 volt third rail to be energized at all times.
- Never hesitate to signal an Operator to slow down or stop if safety is involved, but do not delay service unnecessarily.
- Exercise caution while on the tracks.
  - Stop and look in both directions before crossing a track. Remain in the clear if a train is approaching. Expect trains to run in either direction, on any track, at any time.
  - Avoid walking on or crossing tracks unless necessary. Use the footwalk whenever possible.
  - Step ***over*** rails, never on them.
  - Watch for moving switchpoints. Never stand or place any part of your body on or in movable portions of switches, switchpoints or linkage.
  - Do not allow any part of your body, article of clothing, tools or equipment to contact the third rail or any part of a train.
  - Walk against the normal flow of train traffic whenever possible, so you can observe approaching trains.

Actions of Personnel on the Right-of-Way When Trains Approach

1. Stop what you are doing.
2. Call out “Railroad” to warn others who may not be aware of the approaching train.
3. Stand and face the train.
4. Signal the Operator to slow down or stop. Give signals well in advance. If in a group, designate one employee to give all signals.

5. Make certain all equipment is clear of train traffic.

6. Go to a position where you are clear of approaching trains. Make certain you can be seen by the Operator of any approaching train.

   - Do not step to an adjacent track unless you are sure it is clear and will remain clear until the train passes.

   - Do not stand between trains on curves or in areas of restricted clearance. If caught or trapped between trains, lie down on the footwalk, *making sure you don't contact the third rail.*

7. When you are certain that you and all equipment and personnel are in the clear, *face the train*, then signal the Operator to proceed. In areas of restricted clearance, do not allow two trains to pass on each side of you at the same time. Flag both trains to a stop. Then give a proceed signal to one train at a time. When two trains are traveling in opposite directions, the loopbound train should be given priority, whenever possible.

8. Remain stationary and watch the train until the entire train has passed.

9. Notify the Controller and your immediate supervisor if the Operator fails to respond to signals.

Actions of an Operator Approaching People On or Near Tracks

- Warn persons on the tracks by short horn blasts.

- Never operate past anyone on a footwalk or at track level without first receiving a proceed signal and making sure that all people and equipment are in the clear. Stand in the motorcab, open the motorcab window and proceed at restricted speed until the entire train is clear of everyone on or near the tracks.

- Acknowledge all signals with two short horn blasts.

- Obey all signals, lights and signs.

- Notify the Controller to report failure of persons at track level or on footwalks to signal correctly or to stop work and face the train.

Hand, Flag, Flashlight and Lantern Signals (see chart, page 5)

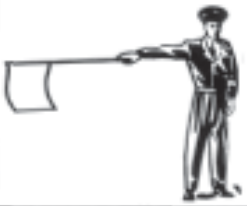
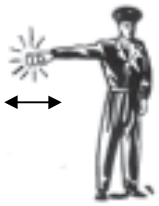
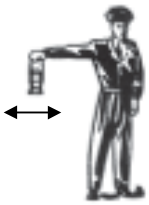
If your duties require you to give signals, you must ensure that you have the proper equipment, in good working order, ready for immediate use. Flags or lights of the prescribed colors must be used whenever normal operation cannot be maintained in a track area.

- Flags or hand signals must be used during daylight.

- Lights must be used during darkness, periods of low visibility, or in subways.

   - During periods of darkness and in the subway, motion is necessary to ensure recognition. When signalling with a light to reduce speed, slowly move the light back and forth horizontally at shoulder height to ensure that the operator sees and recognizes the signal.

- ***The proceed signal shall NEVER be given with a red flag or any red object.***

		**STOP or REMAIN STANDING-** Swung horizontally at right angle to track		
		**REDUCE SPEED-** Held horizontally at arm's length above track being governed		
	***NOTE: Proceed signal shall NEVER be given with a red flag OR ANY RED OBJECT.***	**PROCEED-Raised and lowered vertically above track being governed**	 ***Proceed signal shall be given with GREEN or WHITE light.***	
		**BACK-Swung vertically in a circle at half-arm's length at right angle to track**		

Note: **The relative speed with which a signal is given indicates the relative speed at which compliance with the signal is desired. Any object or hand waved violently by anyone on or near a track is a signal to stop immediately.**

SAFETY IS PART OF THE JOB

Follow all CTA-established rules relating to safe operation, as well as those rules relating to use of tools, materials, equipment and personal safety in performance of these procedures.

Title: **Test Train Procedures**

Issued to: All Rail Operations employees

Approved by: William R Mooney
Chief Operating Officer

Supersedes: None

INTRODUCTION

A test train is an out-of-service train used to test new or rebuilt structure, track, traction power, signals or station platforms for the verification of safe service.

When determined by the Chief Engineer, a test train is to be operated to check:

- The dynamic clearance envelope of the train.
- The live load response of track and/or structure.
- Traction power energy demand.
- Signal system operation.
- For any other condition prior to resuming revenue service.

PROCEDURE

- In a planned construction or track outage, test train arrangements are made in advance and will be provided for in the Rail Service Bulletin authorizing the construction or track outage.

- In an emergency, notify the Control Center Manager and request a test train.

- The type and quantity of any equipment required for the test will be specified by the Chief Engineer or his designee.

- The Chief Engineer or his designee shall be in charge of the operation of the test train and must approve the infrastructure for safe service.

- The Chief Engineer shall prescribe what, if any, special instrumentation or loading is to be carried with or attached to the test train for testing purposes. When instrumentation is to be attached to the train, it must be approved by the Chief Rail Equipment Engineer or his designee.

- All operational details for the test train will be prescribed by the Chief Engineer or his designee, including, but not limited to speed and number and direction of trips through the area to be tested.

- An employee with valid operating certification will operate the test train at the direction of the Chief Engineer or his designee.

- At the Chief Engineer's direction, other personnel must ride the test train, such as contractors or maintenance employees who may be required to make adjustments to the track, signal system, station, etc. prior to the resumption of revenue service.

SECTION 01 35 23
OWNER SAFETY REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

A. This Section specifies administrative and procedural safety requirements for the Project.

B. Related Sections:

1. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.
2. Section 01 35 00, Special Procedures

1.02 GENERAL REQUIREMENTS

A. Safety of passengers, pedestrians, property, CTA employees and all Contractor and Subcontractor employees working on the job site of this Project will be a primary responsibility and concern for the Contractor. The Contractor must maintain safe, clean and healthy worksites for the entire duration of the Project. All emergency exits must be kept clear at all times.

B. Comply with the applicable provisions of CTA's "Adjacent Construction Manual", the Illinois State Uniform Fire Prevention and Building Code, Occupational Safety and Health Administration (OSHA), the Environmental Protection Administration (Federal), Department of Environmental Conservation (State), Department of Environmental Protection (City), the National Fire Protection Association (NFPA) including National Electrical Codes, all other applicable rules and regulations, including Drug and Alcohol Laws. In case of conflict among the rules and regulations, the more stringent will apply.

C. Hold Safety Meetings, properly train new employees and monitor job site safety via inspection at the start and completion of each shift's work as well as monitoring the job site for this purpose throughout the day. The Contractor must also correct and report to the CTA and appropriate regulatory authorities any safety violations and convene investigative meetings which follow accidents.

D. Obtain and maintain Safety Data Sheets (SDS) for all materials to be stored, incorporated into or used in the Work. The SDS must be readily available whenever required, in a convenient location, in close proximity to where the material is stored. The Contractor's Safety Engineer/Supervisor and competent persons must have ready access to the SDS.

E. All debris must be cleaned from the work site before a work session may be considered complete. If the job site is not satisfactorily cleaned the CTA may clean the site with its own forces or through another contractor and all costs associated with cleaning will be the responsibility of the Contractor.

F. Notwithstanding any remedies for maintaining a safe, clean and healthy work site, in the event that the Contractor's work environment chronically provides a site such that, there are significant safety concerns, this may precipitate a Default request through CTA Purchasing.

G. Submit a Monthly Safety Report by the seventh day of each month which includes the following information:

1. Contract Name
2. Contract Number
3. General Contractor Name
4. Date
5. Total man-hours worked during the monthly reporting period by the General Contractor and all Subcontractors. Monthly hours must be broken out by General Contractor and Subcontractor to clearly show how many hours each company has worked, and then a grand total provided at the bottom report.
6. Total project hours to date worked by the General Contractor and all Subcontractors. Total project hours must be broken out by General Contractor and Subcontractor to clearly show how many hours each company has worked, and then a grand total provided at the bottom report.
7. The following items must be calculated for the General Contractor and all Subcontractors on a monthly basis. Items must be calculated and listed separately for the General Contractor and each Subcontractor, and then a grand total for each item must be included at the bottom of the report.

    a. OSHA Incident Rate
    b. OSHA Recordable Injuries – No Lost Time
    c. OSHA Recordable Injuries – Lost Time
    d. Total Recordable Injuries
    e. Incident Log

H. Submit a Monthly Project To-Date Safety Report by the seventh day of each month which must include all information required in 1.02 G. above summarized for the project to-date along with:

1. OSHA Incident Rate – Rate must be calculated for the General Contractor and all Subcontractors overall for the entire project.
2. Trainings – All training held to date of report must be listed
3. Unusual Occurrences – A list of the unusual occurrences that have occurred to date on the project which includes the date and type of unusual occurrence.

I. In addition to the foregoing information, all Contractor Safety Reports must include any other information required by any applicable federal, state and local health and safety laws, codes and regulations as may be amended from time to time, or as otherwise requested by the CTA. The format and delivery method of any Contractor Safety Reports must be subject to CTA approval.

1.03 DEFINITIONS

A. Accident: The National Safety Council defines an accident as an undesired event that results in personal injury or property damage.

B. First Aid Cases: According to OSHA Reporting Criteria per 29 CFR 1904.7 General Reporting Criteria, First Aid cases are (listed as a reportable is not included in calculating OSHA incident rate):

1. Using a non-prescription medication at non-prescription strength (for medications available in both prescription and non-prescription form, a recommendation by a

physician or other licensed health care professional to use a non-prescription medication at prescription strength is considered medical treatment for record keeping purposes).

2. Administering tetanus immunizations (other immunizations, such as Hepatitis B vaccine or rabies vaccine, are considered medical treatment).
3. Cleaning, flushing or soaking wounds on the surface of the skin.
4. Using wound coverings such as bandages, Band-Aids, gauze pads, etc.; or using butterfly bandages or Steri-Strips (other wound closing devices such as sutures, staples, etc. are considered medical treatment).
5. Using hot or cold therapy.
6. Using any non-rigid means of support, such as elastic bandages, wraps, nonrigid back belts, etc. (devices with rigid stays or other systems designed to immobilize parts of the body are considered medical treatment for record keeping purposes).
7. Using temporary immobilization devices while transporting an accident victim (e.g., splints, slings, neck collars, back boards, etc.).
8. Drilling of a fingernail or toenail to relieve pressure or draining fluid from a blister.
9. Using eye patches.
10. Removing foreign bodies from the eye using only irrigation or a cotton swab.
11. Removing splinters or foreign material from areas other than the eye by irrigation, tweezers, cotton swabs or other simple means.
12. Using finger guards.
13. Using massages (physical therapy or chiropractic treatment are considered medical treatment for record keeping purposes).
14. Drinking fluids for relief of heat stress.

C. Incident: An incident is an unplanned, undesired event that adversely affects completion of a task, including but not limited to near misses, incidents with property damage, events causing injury, fires, underground utility strikes, flagman issues, etc.

D. Incident Log: An incident log is a tabular listing of all incidents including the following information for each: date, time, location, job activity, brief incident description, number of employees involved and job classifications of employees involved.

E. Near Miss: Near misses describe incidents where no property was damaged and no personal injury sustained, but where, given a slight shift in time or position, damage and/or injury easily could have occurred.

F. OSHA Incident Rate: The OSHA incident rate is based on recordable injuries reported for a 50 person company working one year or 200,000 hours.

1. OSHA Incident Rate = Number of OSHA Recordable Injuries X 200,000/actual man-hours worked.

G. OSHA Recordable Injury or Illness: According to OSHA Reporting Criteria per 29 CFR 1904.7 General Reporting Criteria, a work-related injury or illness must be recorded if it results in one or more of the following:

1. Death
2. Days away from work.
3. Restricted work or transfer to another job.
4. Medical treatment beyond first aid.
5. Loss of consciousness.

6. A significant injury or illness diagnosed by a physician or other licensed health care professional.

1.04 SAFETY MANAGEMENT PROGRAM:

A. Develop and maintain a project-specific Safety Management Program (SMP) to: a) protect the lives and health of all persons, b) prevent damage to property and environment, and c) avoid work interruptions or any delay to train services due to accidents. The SMP Document must be a written plan laying out the management organization and strategy to assure high levels of job site safety for all performed tasks. It must define the personnel responsible for developing and assuring safe work practices for each major item of work or subcontract.

B. As part of the overall strategy, it must explain the methods to be used for providing the training and equipment so that each worker can be self-monitoring.

C. Within thirty (30) days of the date of the Notice to Proceed (NTP) the Contractor must submit their SMP to the CTA for review and comment. The SMP must comply with the requirements of this Section as well as all Federal, State and local regulatory requirements regarding workplace safety. Work on the Project must not be permitted to start until the full written plan, covering all required items has been submitted and approved.

1.05 SMP DOCUMENT ORGANIZATION

A. The SMP must be organized into the following sections and must include but not be limited to the following information and requirements:

1. Cover page to include name of Contractor, name of Project, Contract number, revision number, and date of revision, name and signature of Contractor's Safety Engineer approving the SMP.
2. Table of contents listing all Sections and Exhibits.
3. Safety Policy Statement signed by an Officer of Contractor's company that must include signatures of all Subcontractors, continuously as they are retained by the Contractor.
4. Organization chart of Contractor and Subcontractor personnel responsible for implementing the SMP and their duties and responsibilities. The chart must show the reporting relationship and integration of the safety Engineer with all personnel, including top-level managers, responsible for implementing the Safety Management Program.
5. Comprehensive Description of the Project.
6. Description of Contractor's Safety Engineer (CSE) Responsibilities (See Article 1.15), including the Safety Responsibilities of the Contractor's Project Management Team, Safety Supervisor(s) and Competent Persons. The Competent Person must be as defined by OSHA and Article 1.16.

B. The CSE, Safety Supervisor(s) and Competent Persons must affix to their hard hat a distinctive, easily seen decal, identifying them as Safety Engineer, Safety Supervisor or Competent Person. These will be provided by the CSE.

C. The Contractor must ensure that all Subcontractors and Suppliers comply with the Contractor's SMP, or submit their own program. If the Subcontractors and suppliers elect

to submit their own Safety Management Program it must be acceptable as to meeting the requirements of this Section by the Contractor's Safety Engineer/Supervisor. The Contractor must review the Subcontractor and Supplier's agreements to ensure the flowdown of all applicable safety requirements. Copies of these documents must be attached to the SMP.

D. The Contractor must submit an action plan for review, analysis and immediate action necessary to prevent recurrence of serious accidents or incidents (near misses). The Contractor must review and if necessary, revise the SMP based on the occurrence of serious accidents or incidents (near misses) and upon any changes in job conditions, or as required by the CTA.

E. Serious Accident is defined as an accident that results in any of the consequences listed below to one or more individuals or causes more than $5000 (estimated) in property damage:

1. Death.
2. Injury that can cause death.
3. Loss of a limb or sight.
4. Hospitalization.

F. Procedures for accident reporting and accident investigation including the accident report forms to be used. The SMP must include accident investigation guidelines and accident investigation decision chart for identifying root causes to prevent recurrences, and as required by Article 1.08.

G. Emergency Preparedness and Response (EP&R) Plan: the EP&R Plan must include, but not be limited to:

1. The identification of potential environmental accidents and emergencies associated with site specific construction activities.
2. Site security and control: The Contractor must outline its plan for site security including prevention of unauthorized entry onto the Project Site and prevention of vandalism. The plan must include all contractually required security items. This plan include where necessary: use of fencing, temporary enclosures, concrete barriers, surveillance cameras, and guard service and worker identification.
3. The response procedures to construction site environmental accidents and emergencies and for the prevention and mitigation of the Environmental Impacts that may be associated with them.
4. Evacuation and emergency escapes routes as applicable.
5. Telephone numbers of emergency agencies and key project personnel.
6. Periodic emergency preparedness drills including method to account for all personnel during an evacuation.
7. Notification to the CTA and all appropriate agencies.
8. Periodic reviews and revisions of the EP&R Plan, in particular after the occurrence of environmental accidents and emergency situations.

H. Orientation Program for New Employees. The SMP must include a detailed plan for the safety orientation of employees, including:

1. Description of project, and location of first aid/medical facilities.
2. Review of Safety Policy, including Drug & Alcohol Policy including preemployment drug testing and testing for cause.

3. Attendance requirements at “Just-in-time Training” Safety Meetings, and Briefings.
4. Project safety rules distributed to and signed for by every employee.
5. Emergency Preparedness and Response Plan.
6. Specific site hazards and safe working methods.

7. Review of hazardous materials communication program, (SDS).
8. Track Safety Training for work on or adjacent to tracks or energized rails, if applicable.
9. Electrical Hazard and Arc Flash Safety Training for work in proximity to energized electrical equipment, if applicable.
10. Accident/near miss/unsafe condition reporting.
11. PPE and Safety Procedures.
12. Worker Safety Incentive Program and safety deficiency point system.
13. Fire prevention.

I. Description of safety hazards expected to be encountered that are work related, site configuration hazards and/or environmental conditions. Examples for inclusion in this section, but not limited to, are follows:

1. Work Related Hazards

    a. Temporary Construction
    b. Cranes and Large Equipment
    c. Electrical Shock and Arc Flash
    d. Power Tools
    e. Compressed Gases Control
    f. Flammables
    g. Hazardous Chemicals/Spills
    h. Fire
    i. Lockout/Tag-out
    j. Falls From Elevation
    k. Weather Conditions
    l. Slips, Trips and Falls
    m. Material Delivery
    n. Cutting/Grinding/Chipping
    o. Unsafe Acts (other)

2. Site Configuration Hazards

    a. Access/Egress
    b. Underpinning/Excavation
    c. Public Protection/Rodent
    d. Support of Utilities
    e. Energized Electrical Equipment
    f. Open Excavations
    g. Material Storage
    h. Falling Objects
    i. Flying Objects
    j. Site Clean Up
    k. Noise Damage
    l. Maintenance & Protection of Traffic
    m. Site Security

n. Confined Spaces
o. Operating Track including Energized Contact Rail
p. Unsafe Conditions (other)
q. Walking / Working Surfaces
r. Impalement on Objects

3. Environmental Conditions

a. Asbestos Containing Material
b. Lead Based Paint
c. PCB Contaminated Equipment

1.06 MANAGEMENT OF SAFETY DOCUMENTS

A. The Contractor must include a system of maintaining compliance records and provide for their retention for a period of six years beyond Final Completion. Include samples of all document types. The types of compliance records must include but not be limited to:

1. Minutes of safety meetings.
2. Training records including schedule for refresher training and plans for Safety Briefing subject matter.
3. Safety Engineer's/Safety Supervisor's and Competent Person (as defined by OSHA) daily logs.
4. Accident records including OSHA Form 300, accident investigation reports for Contractor and all Subcontractors.
5. Permit List consisting of: Description of Permit, Permit Number, Date Issued, and Date of Expiration.

B. All compliance records and logs, as well as all reference documents such as cited in Paragraph.1.02.B, must be kept available (i.e., in the Contractor's Field Office) for the CTA's use and inspection. Copies of compliance records and reference documents must be provided to the CTA upon request.

1.07 SAFE WORK PLAN

A. A Safe Work Plan (SWP) is a written work plan, which identifies the tasks to be completed, including access/egress and set-up/breakdown under all expected environmental conditions. Also included is the method of work for completing these tasks, associated work hazards, and the corresponding equipment and methods that will be used to prevent loss for all contracted work, including that of Subcontractors.

B. The SWP document must provide the CTA with a defined plan of action for identified hazards and comprehensive prevention methods for exposures to workers, the public, and property. SWPs must address all foreseeable exposures to employees, the public, and property for Contract work, including all tiers of Subcontractors. The SWP must be used as basis for Contract coordination items and safety planning discussions in the Construction Management process.

C. The Contractor Safety Engineer (CSE) must submit a Job Hazard Analysis (JHA) document to the CTA for each primary work activity (see Subparagraph 1.07.G.1) at least two weeks prior to the start of that activity. Safe work plan document instructions are in Appendix A. If the JHA does not adequately address all expected, foreseeable hazards posed by the work, the CTA will require clarification or additional planning to ensure that

work proceeds safely. Work must not begin until the JHA has been submitted, reviewed and commented upon and revised accordingly and a presentation is made to the CTA by the Competent Person(s) involved, showing how the plan will be effectively implemented, to the satisfaction of the CTA.

D. The basis for the SWP risk control procedures must be:

1. 29 CFR 1926 (Code of Federal Regulations, Department of Labor citation for the Construction Industry Laws under OSHA).
2. Applicable CTA Safety Rules and Regulations, including those in the CTA Adjacent Construction Manual, which are part of the contract.
3. Applicable Mine Safety and Health Regulations.
4. Construction related standards from:

    a. American National Standards Institute (ANSI)
    b. National Fire Protection Association (NFPA)
    c. American Conference of Governmental industrial Hygienists (ACGIH).

E. Absence of an applicable standard or regulation must not prevent the Contractor from providing appropriate controls within a SWP.

F. SWP Document Format Requirements - The SWP Document must be structured to correlate with the five (5) week look-ahead document, which is currently used in the Contractor's Detailed Schedule of Work. By maintaining parallelism in document formats, a consistent, cohesive effort will effectively merge safety into the construction management process, helping to safely reach or exceed project production goals.

G. Each heading on the five (5) week look-ahead must be identified and described in the SWP with corresponding sub areas or tasks when necessary. The following headings must be used for the SWP.

1. PRIMARY ACTIVITY (5 week look ahead heading) Describe scope of work.
2. TASK/SUB ACTIVITY DESCRIPTION(S) as necessary.
3. EQUIPMENT AND METHOD OF CONSTRUCTION: List major equipment that will be used and how it will perform the task or sub-activity.
4. HAZARD DESCRIPTION: Describe one foreseeable hazard present as a result of task or sub-activity.
5. SAFETY CONTROLS/LOSS PREVENTION: Describe controls and procedures that will be implemented to reduce or eliminate the foreseeable hazard described above; reference attachments as necessary. When controls are compliance based, such as for confined space entry, all applicable compliance information must be submitted or appropriately referenced. Of particular concern are training items that must be done to educate the employees about exposures- Tool box meetings held to discuss the hazard should be identified. More formal training (offsite, confined space, trenching competent person, etc.) should be listed and documentation referenced or provided. Reinforcing training must be included in the plan to be given at regular intervals.
   Note: Methods of Controlling Hazards. Priority must be given as follows in controlling hazards. 1.) Elimination of the hazard. 2.) Engineering controls. 3.) Provision of Personal Protective Equipment (PPE). 4.) Management controls/training, such as a safety monitor for falls exposures.

6. Repeat the Hazard Description and Safety Control sections until all hazards are covered for a given Task/Sub Activity and discuss hazards and safety controls as appropriate.
7. Work proceeding while an SMP is not in place must have the SWP include Emergency Preparedness and Response Plan, Fitness for Duty requirements and Safety Deficiencies Consequences.

1.08 ACCIDENT REPORTING AND INVESTIGATION

A. Immediately notify the CTA of all accidents involving personal injury and damage to property and all near misses. Submit a copy of the CTA's Supervisor's Accident Investigation Report and/or Unusual Occurrence Report (UOR)/Incident Report to the CTA no later than twenty-four hours following each accident. Near misses must be reported in writing to the CTA and "a lessons learned" session must be held.

B. In the event of a Serious Accident as defined in Paragraph.1.05.E, the Contractor must convene an investigative meeting for the purpose of determining the cause of the accident and actions to be taken by the Contractor to prevent a recurrence of such accidents. The Safety Engineer/Supervisor must chair, and a Contractor corporate representative as well as the CTA, at a minimum, must attend said meeting. The Contractor must notify the CTA of the Investigation meeting in sufficient time to allow the CTA to notify the CTA's Construction Manager Safety Management and others who may attend the meeting.

1.09 UNSAFE CONDITIONS

A. An Unsafe condition is a condition that gives rise to the imminent possibility of serious injury to workers or the public, of serious damage to property or the environment, or of affecting the safe movement of trains. When an Unsafe Condition exists at the Site, work must be stopped in the affected area until the condition is corrected. If the Contractor does not take corrective action immediately, or with the time period specified by the CTA, the CTA reserves the right to take whatever action is required to correct the Unsafe Condition.

1.10 FITNESS FOR DUTY

A. Contractor must ensure that his supervisory staff and the supervisory staff of Subcontractors perform a fitness for duty inspection of all workers when they report for work and throughout the day. Should a worker be found to demonstrate incapacity because of drugs, or intoxication they must be immediately removed from the Project for the entire Project duration.

1.11 EMPLOYEE CONDUIT

A. The CTA reserves the right to refuse access to the Project Site or require immediate removal from the Project Site any individual violating or alleged to have violated site safety or security regulations and Contractor agrees to obtain consent of its Subcontractors to a similar provision, and Contractor agrees to hold the CTA harmless for taking such actions.

1.12 SAFETY TRAINING AND MEETINGS

A. Safety Training – The following training must apply to all tasks:

1. "Just in Time Training" is defined as that training that must be held one week or less before any primary work activity is to be performed for the first time by the Contractor. These sessions must include:

    a. The same training presentation of the SWP given to and accepted by the CTA must be given by the Competent Person(s), to all workers before they begin these tasks.
    b. The presentation must include a step-by-step analysis of the work's hazards and all hazard control methods.
    c. Review all applicable SDS forms for all materials/ products to be used for these tasks, discussing PPE, handling precautions, first aid and emergency responses.
    d. The CSE, his Safety Supervisor(s), and the Engineer's representative as a minimum must attend.

2. If new persons come onto the job site to perform tasks for which previous "Just in Time Training" was given, additional sessions of this same training must be given before those persons begin work.

3. If existing personnel who have been on site doing other tasks are switched to new tasks, these persons must be given the training for the new tasks before they begin work.

    a. An easily identifiable hardhat decal system as well as training logs must be set up and maintained to assure the CTA that properly trained personnel are performing a task.
    b. Bi Weekly Sessions must be held and more frequently if required by the CTA or Safety Engineer, for the duration of the Project. The duration of each meeting must be not less than ½ hour and all employees of the Contractor and Subcontractors must attend every meeting. The Contractor must notify the CTA at least 1 week in advance of each scheduled safety meeting so that representative of the CTA may attend. Minutes of each meeting, including a signed list of attendees, must be prepared by the Contractor and furnished to the CTA within three (3) working days after the meeting. Each meeting must include general safety items and discussion of safe working methods and applicable rules required for the safe performance of work scheduled during the 2week period following the meeting. Each meeting must include review of parts of the Safety Management Programs and discussion of recent revisions. Just in time training can be included in these sessions if the time limit provision of Subparagraph 1.12.A.1 is satisfied. Also, scheduled reinforcement retraining can be included.
    c. An employee failing to attend a Safety Training Sessions will not be permitted to perform any work which requires safety precautions as were discussed in the missed safety meeting, until he/she has received the same instruction, if needed, just in time training or schedule retraining.
    d. By the 5th day of work on site(s) employee orientation training must be given to new employees, to include all items covered in Paragraph 1.05.H
    e. For additional safety training requirements involving work on or adjacent to operating tracks see Section 01 35 00, Special Procedures.

1.13 SAFETY MEETINGS

A. The Contractor's Project Manager and Safety Engineer must attend a Safety Kickoff Meeting, which will be convened by the CTA within 45 days of the Notice to Proceed. The purpose of the meeting is to discuss the Project related Safety issues including the Contractor's Safety Management Program and the responsibilities of the Safety Engineer.

B. Safety Walk-thru: On a monthly basis or more frequently as determined by the CTA, the CTA will have a safety walk through attended by the Contractor, Contractor's Safety Engineer, the CTA, and anyone the CTA deems appropriate. The CSE must bring all active SWPs and SDS's on the walk-thru, for reference. The walk-thru must include a visit to the Contractor's field office where the CSE must provide the daily safety log and other safety related records for the CTA's review. The CTA must record the activities and observations that were noted during the walk-thru, including listing all those in attendance.

1. During the walk-thru, effective implementation of all appropriate SWP's will be reviewed and safety issues and findings identified, as well as Safety deficiencies affecting the work site safety.
2. During the meeting immediately after the walk-thru, the observations will be reviewed and corrective actions identified. Also outstanding findings identified in the interim between walk-thru will be addressed.

1.14 SAFETY DEFICIENCIES

A. Safety Deficiencies will be generated by the CTA and sent to the Contractor's Project Manager. A Safety Deficiency Notice will be issued by the CTA for Contractor action and subsequent verification of corrective action. These deficiencies will be classified as follows.

B. Imminent – Any Unsafe Condition that has the potential to result in a Serious Accident or any major violation of the safety specifications of this Contract. The insurance of an Imminent Deficiency will result in a stop work order for the Site until the condition is corrected. Imminent Deficiencies must be corrected immediately. Examples of Imminent Deficiencies include but are not limited to:

1. Failure to have an approved Safety Engineer on Site.
2. Failure to provide required safety training to workers.
3. Failure to provide required public protection.
4. Failure to provide fall protection where workers or the public are exposed to falls greater than 6 feet.
5. Failure to provide required PPE.
6. Unsafe Excavations.

C. Precautionary – Any Unsafe Condition that is not immediately threatening to workers, the public, or any minor violation of the safety specifications of this Contract. The issuance of a Precautionary Deficiency will result in a stop work order for the affected work until the condition is corrected. Precautionary Deficiencies must be corrected within 24 hours of written notice. Examples of Precautionary Deficiencies include but are not limited to:

1. Inadequate Housekeeping.
2. Failure to enforce PPE.

3. Failure to have Safety Data Sheets on site for hazardous materials.
4. Improper storage of materials or worksite cleanliness as defined in Paragraph 1.29.A will be a mandatory precautionary finding.

D. Nuisance – Minor violations of safety policies and procedures that do not result in Unsafe Conditions. Nuisance Deficiencies must be corrected within 48 hour of written notice.

E. Any Deficiency classified Imminent or Precautionary, repeated by the same person, crew or foreman within any 3 month period will required the person(s) involved to be removed from the jobsite for at least one day. A total of three such repeated occurrences would result in mandatory permanent removal of the person(s) from the job site with the responsible Competent Person sent home for a day. Three such actions and the Competent Person must be permanently removed and declared Incompetent.

1.15 SAFETY ENGINEER

A. The Contractor must employ and assign 2 (two) full-time Safety Engineers exclusively to this Project within 2 weeks from Contact award until its physical completion. The Safety Engineer's sole responsibility will be the management of all safety matters, including those specified in this Section. The Safety Engineer must participate in the development of the Safety Management Program (see Article 1.04), must approve the Program (evidenced by his signature) for use on this Project, must continually monitor the Contractor's implementation of, and adherence to, the Program and must revise the program when required by field conditions or the Engineer. The Safety Engineer will be subject to the CTA's continuing approval.

B. The Safety Engineers must possess a current Certificate certifying that the Safety Engineer has successfully completed the 30-hour OSHA course on Construction Safety and Health (29 CFR 1926). The CTA may accept the other safety certifications or safety training in lieu of the foregoing. The Safety Engineer must have not less than 10 years of safety or safety related experience, must be familiar with the work being performed. The Contractor must submit a resume documenting the qualifications of the proposed candidate to the Engineer for approval. The CTA, prior to approval, may interview the candidate for Safety Engineer. The resume must include for a 5-year period, a description of the duties, responsibilities, accomplishments and safety record of preceding assignments from which the candidate has gained safety-engineering experience. The Contractor must not change the approved Safety Engineer without submitting the proposed replacement's resume and receiving the CTA's approval.

1. Contractors Safety Engineer (CSE) – The Contractor must submit in writing signed by the owner/president of the Contractor stating their authority and responsibilities and specifying that the CSE will report to him or Corporate Management and not be subordinate to the Project Manager for matters of safety.

C. To assure continuous safety coverage wherever or whenever the Safety Engineer is not present; Safety Supervisors must be assigned by the Contractor to each additional shift, weekend and holiday work, or additional major work site (more than 25 people or $5 million) for multiple major work site projects.

D. The Contractor must submit the names and duty tours of the proposed Safety Supervisors who will be subject to the CTA's continuous approval.

E. The Safety Supervisor's sole responsibility will be the full-time management of all safety matters under his/her jurisdiction, exclusively for this project.

F. Safety Supervisors must have successfully completed the 30-hour OSHA course on Construction Safety and Health (29 CFR 1926). In addition, if this worksite contains Asbestos Removal, the Safety Supervisor must possess a valid Asbestos Inspectors License. The CTA may accept other safety certifications or safety training in lieu of the foregoing. The Safety Supervisor must be familiar with the work being performed, must be competent to instruct others, and be familiar with CTA Rules and Regulations. The Contractor must submit a resume documenting the qualifications of the proposed candidate to the CTA for approval. The CTA prior to approval may interview the candidate Safety Supervisor. The resume must include for a 5-year period, a description of the duties, responsibilities, accomplishments and safety record of preceding assignments from which the candidate has gained safety-engineering experience. The Contractor must not change the approved Safety Supervisor without receiving the CTA's approval of the replacement.

G. The Safety Engineer must maintain a daily site Safety Log for all project site safety matters. All safety related activities including safety deficiencies and corrective actions taken at each worksite must be included in the Log. This Log must be signed daily by the Safety Engineer and/or the Safety Supervisor on each shift. The Log must be maintained on site and be available for the CTA's use and inspection. This Log must accompany the Safety Engineer to any Management Safety Meetings the CTA may hold, for review by the CTA. Whenever the Safety Engineer is not present, (vacation, holiday, jury duty, day off, etc.) the responsibilities of maintaining the daily Safety Log must be that of the assigned Safety Supervisor.

H. In the event an unsafe condition, the CTA or Safety Engineer must order the work to be stopped and the unsafe condition immediately corrected.

I. Provide continuous Safety coverage during the performance of the Work. The Safety Engineer must assign an additional Safety Supervisor or a Competent Person for each work location. Failure to have a Safety Engineer, Safety Supervisor or Competent Person (see Article 1.16) on the job at any location at which work is being performed may result in a stoppage of work at that location (which will not be deemed an excusable delay). A written report, explaining the reason for the Contractor failing to provide the Safety Engineer, Safety Supervisor or Competent Person, prepared by a principal of the Contractor, must be received by the CTA within 5 working days of such occurrence. This violation will be considered an imminent safety deficiency.

J. The Safety Engineer and Safety Supervisors must enforce all aspects of this Specification and the Contractor's SMP and SWPs.

K. The Safety Engineer must comply with the following requirements for all work to be performed under a Power & Way Bulletin:

1. Submit a site-specific safety plan for all work to be performed and indicate safety responsibility delegation for all times when the Safety Engineer will not be present at the work site.
2. Perform a pre-bulletin walk-through of the work sites, and identify all area/site hazards.
3. Identify/implement protective measures to address the findings of the walk-through to assure public/worker safety during the signal bulletin work.

1.16 COMPETENT PERSONS

A. Competent Person – Per 29CFR Part 1926.32 (f):
One who is capable of identifying existing and predictable hazards in the surroundings or working conditions, which are unsanitary, hazardous, or dangerous to employees and who has authorization to take prompt corrective measures to eliminate them.

B. Competent Persons must be designated by the Safety Engineer to oversee safety and must be assigned for each work location not covered by the Safety Engineer or Safety Supervisors and made known to the CTA. Competent Persons are the Contractors' persons responsible for safety matters in an individual group performing work at individual work locations. They may be Subcontractor personnel and have other Project responsibilities in addition to their safety function. They must be familiar with the work being performed, must have appropriate OSHA related training, be familiar with the hazards to be encountered at the particular Work Site, must be capable of being designated as the OSHA defined "Competent Person". They must have the authority to stop the work if an unsafe condition develops or an unsafe act is occurring. An interview will be required with the Engineer to establish their competency.

C. Competent Persons may have other duties but must spend at least 50 percent of their time on safety assurance unless otherwise required by Federal Law. They must provide the CSE with a daily report of work activities, training performed, safety checks made, near misses, SDS's on hand, safety findings and actions taken. These reports must be submitted to the CSE the morning of the following workday, which will keep them on file and available for the Engineer's review.

1.17 PERSONAL PROTECTIVE EQUIPMENT (PPE)

A. Mandatory items must be worn at all times while on the Project Site. These PPE requirements include:

1. Eye Protection - Grinding or chipping must require a face shield.
2. Head Protection – SEI certified hard hats meeting the ANSI Z89.1 1997 requirements for Type 1 Class E protection must be properly worn, and maintained – (no bump caps or cowboy-type hard hats).
3. High Visibility Safety Vests – All Contractor employees exposed to vehicular traffic or motorized equipment must wear a CTA-approved safety vest. Only arcrated high visibility vests are to be worn inside a CTA Substation.
4. Acceptable work shoes – Shoes should be in good condition without breaks or splits, at least six inches high, non-conductive (preferably leather with safety toe), and be completely laced or buckled. The shoe must have defined heels that are no more than one inch high (sneakers/gym shoes are prohibited). The sole should be at least ¼" thick at all points and provide good traction under slippery conditions.
5. Acceptable clothing for heavy construction work (no tank tops, or short trousers of any type).
6. Arc-Rated protective clothing must be worn at all times, by all personnel, when inside an energized substation. At minimum, Hazard Risk Category 2 (8 Cal / cm2 or greater) clothing is required, but higher rating clothing may be warranted for specific tasks.
7. Other PPE as required by Contractor's work or OSHA.

1.18 SAFETY REQUIREMENTS FOR WORK PERFORMED ALONG THE RIGHT OF WAY (ROW)

A. The Contractor must ensure that all of his employees and those of his subcontractors fully understand and comply with the provisions of applicable CTA Flagging Rules and CTA Safety Rules, before working on or adjacent to any operating track.

B. All jobsite personnel, including but not limited to the Safety Engineer and Safety Supervisor(s), all Contractor's and Subcontractor's foremen, all Contractor and Subcontractor management personnel engaged in on-site operational, safety or quality oversight and all employees that will perform work on, above or adjacent to the CTA right-of-way, including but not limited to work on any platform work area must have successfully completed the CTA's Rail Safety Training and hold a current, valid Rail Safety Tour Identification Card prior to commencement of work and be thoroughly familiar with CTA railroad operations. Attendance at the CTA's Rail Safety Training must be completed once every year. The required attendance by Contractor's and Subcontractor's employees at the CTA's Rail Safety Training must in no way diminish or modify Contractor's obligations as otherwise set forth in this Contract to provide complete and adequate safety training to such personnel. The Safety Engineer must maintain a list of all employees (including Subcontractors) having valid Rail Safety Tour Identification Cards, and must submit the list to the CTA quarterly. The list must contain all "employees" names, social security numbers, job function/classification, employer, date of attendance, and date of expiration.

C. In the event the Work is being performed under a Bulletin with 3rd rail power off, the Contractor must ascertain from the CTA the exact limits where the power was removed. The Contractor must disseminate this information to all Contractor and Subcontractor employees working within the work area.

D. Safety Meetings and new employee safety training required by this Section must include instruction and discussion of applicable CTA flagging and track work-related Safety Rules, and review of the SMP, and SWP.

E. The Contractor must take immediate and appropriate corrective action in all cases of violation of safety rules, and must promptly report all such incidents to the CTA. Action taken to correct rule violations will be subject to the approval of the CTA. Such action could include the ordering of additional instruction, the prohibition of work on or adjacent to CTA operations for a specified period of time, the appearance at a hearing held by the CTA suspension of discharge of employees, or such other remedies deemed suitable by the CTA.

F. Failure of the Contractor to meet these safety requirements to the satisfaction of the CTA may result in the suspension of all work on or adjacent to operating tracks (which will not be deemed excusable delay), or such other actions as the CTA may direct.

G. All items being installed along the ROW must be checked by the Contractor to assure there are no incursions of the installations into the car clearance envelope, prior to installation, and upon completion, prior to returning the track to service.

H. Three working days prior to the start of a Bulletin the Contractor's Safety Engineer/Supervisor must certify to the CTA that all required safety equipment and materials are available at the site of the work, have been inspected and found to be in working order and in good condition. For extended Bulletins such certification must be

reaffirmed on a weekly basis. Work will be stopped in the absence of the Safety Engineer/Supervisor certification and/or reaffirmation.

1.19 SAFETY REQUIREMENTS FOR WORK PERFORMED IN ELECTRICAL SUBSTATIONS

A. The Contractor must comply with all requirements as defined in OSHA 29 CFR 1910.269 and 1926 Subpart V, any current CTA Standard Operating Procedures pertaining to operation in and around CTA substations, and all other applicable rules and regulations.

B. Within fourteen (14) days of the date of the Notice to Proceed (NTP) the CTA and the Contractor will conduct an on-site meeting at all affected locations to identify existing characteristics and conditions of electrical lines, equipment, substation operation and any pertinent environmental conditions.

C. Qualified Person - Per NFPA 70E (Article 100):
One who has demonstrated skills and knowledge related to the construction and operation of electrical equipment and installations and has received safety training to identify and avoid the hazards involved.

D. The Contractor must provide Substation Safety training to all Contractor employees and Subcontractor employees prior to performing any work in or near a CTA substation, and as required by Article 1.12. The Contractor must provide trained employees with a means of easy identification on the jobsite, such as a hardhat sticker.

E. The Contractor must maintain an up-to-date log of all Contractor and Subcontractor employees working in the substation(s) including the most recent completion date of each employee's Substation Safety Training and must provide a copy of such log to the CTA upon request.

F. The Contractor must maintain a daily sign in/sign out sheet for all personnel entering and exiting the substation.

G. A CTA Substation Attendant must be present for all work inside a CTA Substation.

H. The Contractor must ensure that daily job briefings are performed at the beginning of every shift and whenever new personnel arrive on site during a shift. The CTA Substation Attendant must be included in the daily job briefing.

I. Only CTA's Substation personnel are allowed to rack out and rack in breakers or perform electrical switching in a non-emergency situation.

J. Only trained, authorized and Qualified Personnel (as defined above) are allowed to work inside a CTA substation. All individuals must be listed on the log.

K. All personnel not meeting the terms of Qualified Personnel requiring access to the substation must receive the Substation Safety Training and be escorted and activities monitored by a qualified, authorized, and trained person where required.

L. The Contractor must provide a daily job board that identifies expected hazards to be encountered during the work shift. Examples of items to be included on job board are but not limited to:

1. Work to be performed

2. Energized equipment
3. Hazards
4. Environmental conditions
5. Special precautions
6. PPE required

M. The Contractor must work under the CTA's Lock-out/Tag-out procedures. The Contractor and their subcontractors will be allowed to implement their own procedures under the jurisdiction of the CTA.

N. CTA reserves the right to ensure that the processes that the Contractor utilizes in a substation do not bypass any safety devices and/or protection currently in place.

O. The Contractor will ensure that all chemicals, material, equipment and tools have been properly selected for the hazards associated with working inside the substation. All items will be subject to the CTA's approval.

P. CTA reserves the right to approve all processes utilized by the Contractor to identify safety concerns for personnel inside the substation and to prevent damage to any existing equipment.

1.20 SAFETY REQUIREMENTS FOR CRANE OPERATION

A. Where a crane is operated in such a location that any part of the crane or its load in any position of boom or swing may come within 10 feet of a live power line or contact rail then:

1. The power line or contact rail must be de-energized, or
2. The power line or contact rail must be insulated or isolated, and
3. The crane must be grounded with Number 2 AWG or larger single conductor, 600 volt covering, and resistance of 25 ohms or less.
4. The power line and contact rail must be protected from damage in an approved manner.

B. The following restrictions must be adhered to where crane booms are extended across tracks:

1. Each track crossed must be flagged in accordance with Section 01 35 00, Special Procedures.
2. Crane booms must not be moved near a stationary or moving train.
3. No materials moved over a train.
4. Materials moved must be secured in an approved manner.

C. Contractor must furnish the CTA with copies of the following documentation indicating compliance with applicable local CTA restriction pertaining to the use of cranes:

1. Certification (approved by a PE) of pavement and ground support and submittal of grillage design and details.
2. Current Annual Inspection of the Hoisting Machinery as specified in the ANSI B 30.5 Standard.
3. CTA's approval for crane usage near and over tracks.

4. Certification by an Illinois licensed Professional Engineer, where required, for allowing transportation of crane over a specific route. Submit to required authorities.
5. Secure the required permits, allowing the use and transportation of the crane.
6. License of crane operator.
7. All other local and CTA restriction where applicable.

D. Contractor must use tag lines, qualified persons to rig all loads.

E. Contractor must not hoist over a building unless city requirements are met.

F. Cranes must be equipped with seat belts for the operator and for the driver, and a 5BC fire extinguisher must be supplied.

G. Contractor's rope chains, rope, and slings must have manufacturer's safe working load attached and inspected by a competent person and certified as per law.

H. Lift plans must be prepared for all crane picks. The plan must indicate at a minimum the following:

1. Anytime a pick is in excess of 75% the rated capacity of the crane or at any time more than one crane is being used, it is a Critical Lift. All parts of the critical lift are required to be approved by a professional engineer before the start of the lift.
2. The competent person in charge of rigging.
3. Communication methods that will be used during the pick(s).
4. Crane(s) that will be used, their rated capacities, where they will be placed and any other pertinent information.
5. Sling selection, including how it has been determined that rigging equipment and hardware being used are of strong enough capacity so that the pick can be made safely.
6. Hitch selection, including how it was determined that the hitch selection (basket, vertical, hitch) will be the best option for the pick being made.
7. load control – tag lines or other methods must be mentioned so it is known how the load will be controlled during the pick.
8. Site-specific information – any site-specific safety issue and safeguards that will be implemented to protect workers from these hazards (environmental conditions, power lines, etc.).

1.21 CONTRACT EQUIPMENT

A. All operators of powder-actuated tools must be certified in their use in accordance with the manufacturer's instructions. A Chicago Fire Dept. Certificate of Fitness may be required.

B. Ground Fault circuit interrupters must be used on all electrical circuits providing permanent or temporary power to the project.

C. Lockout/tag out must be applied to all energy sources when work is required on live equipment and /or systems.

1.22 SAFETY REQUIREMENTS FOR CONFINED OR ENCLOSED SPACES

A. The Contractor may be required to enter confined or enclosed space locations. Confined or enclosed space locations are as defined in OSHA 29 CFR 1910.146 and the Contractor must ensure that all the requirements for entering a confined space are met.

B. The Contractor must ensure that all personnel entering confined or enclosed spaces are trained in and follow precautionary work practices for entry into confined or enclosed spaces.

C. The Contractor must provide confined or enclosed space entry protection to all personnel authorized to enter the confined or enclosed space.

1.23 WELDING AND CUTTING

A. The Contractor must supply a list of certified operators and fire watch personnel who will be performing cutting and welding and evidence of their training and certification.

B. All welding and cutting apparatus, equipment and operation must be in accordance with the standards and recommendations set forth in the current edition of ANSI Z49.1, “Safety in Welding and Cutting” and the requirements of this Section.

C. Daily Inspection and Operation: Welding apparatus and equipment must be inspected daily, prior to use. Defective apparatus and equipment must not be used and removed from service until repaired or replaced. Gas welding and cutting equipment must be listed by Underwriters Laboratories (UL) or by Factory Mutual (FM).

D. Pressure reducing regulators must be used only for the gas for which they were designed. Except for opening the valve slightly to remove dust or dirt, gas must not be released from a cylinder under pressure without attaching the pressure-reducing regulator to the cylinder valve. Acetylene regulators must not be adjusted to permit a discharge greater than 15 lb/in2 (gauge).

E. Cylinder valves must be closed and the gas supply shut off when work is suspended. Torch valves must be checked for leaks at the start of the shift. Only friction lighters or other approved devices must be used to light torches.

F. Approved fire extinguishing equipment must be located at welding and cutting operations and other areas as designated by the CTA or the contractor’s Safety Engineer. Fire extinguishers rated at 10 ABC or larger must be immediately available whenever welding or cutting is being carried out.

G. All oxygen, acetylene, or other fuel gas-oxygen combinations used in cutting or welding must have reverse flow check valves installed or otherwise built into the torch barrel.

H. Only properly marked and identified hose in good condition and specifically manufactured for oxyacetylene service must be used for gas welding and cutting.

I. Arc Welding Cables: Splices or repaired insulation must not be permitted within 10 feet of the electrode holder. Cables must be positioned so as not to interfere or create obstructions on walkways, scaffolds, stairs or ladder. Splices must be equal to or greater than the original insulation on the cable.

J. Portable Welding Screens or Shields must be used to protect other workers and/or the public in the immediate area.

K. Fire Watches: When welding, cutting or heating is such that normal fire prevention precautions are not considered adequate, Fire Watches must be assigned and maintained for a minimum of 30 minutes following the completion of the work to ensure that no possibility of fire exists. The Fire Watch must be provided with the necessary fire protection equipment and trained in its use.

1.24 COMPRESSED GAS CYLINDER STORAGE

A. All compressed gas cylinders must be transported and properly stored in a safe manner. All cylinders will be considered to be either in transport, storage or use. Cylinders in storage must have the proper protective cap in place and the cylinders must be stored upright and secured against movement. Improperly stored cylinders shall be immediately removed from the work area. Excessive or unreasonable storage of cylinders on the site is prohibited. Compressed gas cylinders may not be stored in stations or on or near the ROW, or anywhere in subway tunnels.

B. Compressed gas cylinders must be transported and used in portable welding carts with the cylinders securely chain to the cart. Valve protector caps must be in place except when the cylinders are in use. Stored compressed gas cylinders, (full or empty) must be chained or secured in an upright position to a firm base and protected from sources of heat. An operable dry chemical fire extinguisher rated not less than 2 ¾ pounds of chemical must be mounted on each portable welding cart in use.

C. Compressed fuel cylinders must be stored at least 20 feet from oxygen cylinders unless separated by a noncombustible wall at least five feet in height. Compressed gas cylinders and liquid petroleum cylinders must be properly identified and have a valid hydrostatic test date noted on or attached to the cylinder.

1.25 FIRE PROTECTION AND PREVENTION

A. Open flames and smoking must be prohibited within 100’ of explosive or flammable materials.

B. Notification of Intent: In addition to notifying the CTA, permission of the Chicago Fire Dept. (or appropriate Fire Departments serving the area) must be obtained before shutting off water servicing a fire hydrant.

C. Maintaining Access: Prior written permission of the Chicago DOT (or appropriate authority outside of Chicago), and Fire Dept. must be obtained before blocking roadways, hydrants, post indicator valves, and of access to firefighting equipment.

D. Fire Watches: The Contractor’s Safety Engineer must designate, as required for the Work, appropriately trained personnel to act as firewatchers. Firewatchers must:

1. Be Familiar with hazards that exist in the work area.
2. Be trained in the operation of each type of fire extinguisher on the worksite.
3. Designate one or more assembly areas for personnel and ensure that each person is accounted for in the event of fire or other such emergency.
4. Be provided the means to communicate any emergency.

E. Flammable Liquids: Flammable Liquids must be stored in Factory Mutual (FM) approved safety cans equipped with self-closing lids and flame arrestors. Storage of flammable

materials in buildings or sheds at the site must have prior written permission by the CTA. Flammable liquid fuels may not be stored in substations, stations or in subway tunnels.

F. Fire Alarms: Work stoppage and shutdown of equipment must be mandatory upon alarm of fire. Personnel must report to the designated assembly area(s).

G. Temporary Construction: All temporary structures must be constructed of properly identified fire rated material.

1.26 FALL PROTECTION

A. The Contractor must enforce a fall protection policy with zero tolerance for noncompliance. It is required to have fall protection for all work areas where a worker or other person is exposed to an unprotected fall from elevation or into an excavation greater than six feet. In the event that providing this protection is not feasible or creates a greater hazard, such as directly adjacent to rail traffic, the CTA may at its discretion allow for a task specific variance from this policy. Requests for a task under the variance must be provided in writing with justification for relief. The CTA's acceptance must be received in writing prior to starting the specific task under the variance.

B. For work along railroad bridges and elevated structures the requirements of 49 CFR 214.101 must be adhered to.

1.27 SPILL PREVENTION, LEAKAGE CONTAINMENT AND CLEAN-UP

A. The Contractor must provide for the immediate reporting of each release of hazardous materials into the environment to the CTA. Such emergencies may involve; spills of petroleum products, solvents, PCB containing oil, or other hazardous materials; the release of hazardous dusts, fumes or vapors into the atmosphere; any fire involving hazardous materials; or the discovery of hazardous material on site.

B. The Contractor is responsible for immediately reporting any spills or releases into the environment to the appropriate regulatory authorities. The Contractor must provide the CTA with all spill numbers and other pertinent information. The Contractor must be named as the Responsible Party in such instances.

C. Remediation of spills must be performed immediately by the Contractor using a licensed spill clean-up contractor and all costs of the remediation must be at no additional expense to the Contracting Party or the CTA. Removal, transportation, and disposal of the contaminated materials must be performed by the Contractor subject to the terms and conditions of the Contract.

1. The Contractor must provide for the immediate reporting of each release of hazardous materials into the environment to the CTA. Such emergencies may involve; spills of petroleum products, solvents, PCB containing oil, or other hazardous materials; the release of hazardous dust, fumes or vapors into the atmosphere; any fire involving hazardous materials; or the discovery of hazardous materials on the site.
2. The Contractor is responsible for immediately reporting any spills or releases into the environment to the appropriate regulatory authorities. The Contractor must provide the CTA with all spill numbers and other pertinent information. The contractor must be named as the Responsible Party in such instances.

3. Remediation of spills must be performed immediately by the Contractor using a licensed spill clean-up contractor and all cost remediation will be at no additional compensation. Removal, transportation, and disposal of the contaminated materials must be performed by the Contractor subject to the terms and conditions of the Contract.
4. All equipment containing liquid systems (including, but not limited to dozers, backhoes, loaders, drill rigs, trucks, hoists, hi-lifts and cranes) must be inspected daily to ensure that all liquid containing systems are leak free, that hoses, tubing and hydraulic lines are all in good operating condition, and that all plugs, stoppers, valves, etc. are properly sealed for leak free operation. Systems that cannot be maintained leak free must have leakage rates maintained As Low As Reasonably Achievable (ALARA). All leakage must be contained. Any spillage must be cleaned up promptly to prevent any release into the environment. Spill Kits must be maintained on site.

1.28 MOTOR VEHICLES AND MOBILE CONSTRUCTION EQUIPMENT

A. Construction equipment of the Contractor, whether owned or rented, and the equipment of all Subcontractors must be suitable for safe and efficient performance of the work. The Contractor must inspect and remove from the work any such equipment, which is unsafe, and the Contractor must either repair or replace such equipment at no additional cost and without delay in the completion of the Work.

B. Each Contractor must maintain the equipment per the manufacturer's recommendations and guidelines. Modification of equipment affecting its safety must not be performed unless approved by the manufacturer, by written documentation, available to the CTA.

C. Vehicle and equipment Operators must inspect and test essential controls and safety equipment before placing the vehicle or equipment in motion. Operators must report any unsafe or unsatisfactory conditions(s) to their supervisor before continuing to operate the equipment or vehicle. Unsafe equipment or vehicles must not be operated until properly repaired.

D. The Contractor must assure that all vehicle and equipment operators are both trained and authorized for the type of equipment they intend to operate. Reckless or unsafe operation is not permitted. Self-propelled equipped with backup lights and a reverse signal alarm. The alarm must produce a 0.2 to 0.5 second audible warning immediately upon and during backward movement of the vehicle on which it is mounted and at regular intervals thereafter of not more than two seconds, throughout the backward movement. The alarm must automatically cut out when backward movement ceases. Sound intensity must range from 90 to 100 dB (A) at a distance of five feet from the alarm or greater if ambient noise levels require. Actuation must be automatic by direct connection to any part of the equipment that moves or acts in a manner distinctive only of rearward movement of the vehicle, with no manual controls between the source of actuation and the alarm. The use of the alarm must be in addition to requirements for signalmen.

E. The Contractor or Subcontractors must not allow the use of any earthmoving, compacting, or any other mechanized equipment having an obstructed view to the rear unless the equipment has reverse signal alarm distinguishable from the surrounding noise level; or the equipment is backed up only when an observer signals that it is safe to do so.

F. Outriggers, wheel blocks and any other stabilizing devices recommended by the manufacturer of the equipment must be in place before beginning any operation with that piece of equipment.

G. Vehicle loads must be secure, and no vehicle is to be loaded beyond its rated capacity.

H. The driver must assure safe passage of the vehicle and load under power lines and other overhead obstructions.

I. Vehicle drivers must not permit any person to ride on vehicles or equipment that is not specifically designed for carrying passengers.

J. All mechanized equipment in use must be checked at the beginning of each shift to ensure that all parts, equipment, and accessories that affect the safe operation are in proper operating condition and free from defects and leaks. All defects must be corrected before the equipment is placed into service.

1.29 SIGNS, SIGNALS, BARRICADES AND PROTECTION OF THE PUBLIC

A. Provide, erect and continuously maintain in a safe manner, substantial, durable and effective barricades, bridging, ramps, floor coverings, sidewalks, guardrails, traffic control devices and warning signs.

B. Barricades must be designed to protect the public and others on site from potential exposures created by the work. This may include the use of welding screens to protect against welding flash, the use of solid barricades tarps to protect against flying objects created by cutting, chipping or grinding, or the use of full sealed enclosure to protect against exposures to hazardous vapors, fumes, or dusts.

C. Barricades must be a minimum of 4 feet in height and be maintained in a continuous unbroken line along the work area. Eight-foot high barricades or fences will be required in areas with moderate to heavy pedestrian traffic or in areas where site security will be a concern.

D. Barricades must be rigid and capable of preventing unauthorized entry into the work area. Caution tape or unsupported fencing is not considered a rigid barricade.

E. Barricades must be designed to withstand the environmental forces that can be reasonably anticipated in the work area and be secured against movement by wind, runoff, and related environmental conditions.

F. Barricades must be maintained in a clean and smooth condition so as not to cause cuts, nicks, splinters, or snag clothing. Solid barricades must be painted and maintained to the satisfaction of the CTA.

G. Furnish, place and maintain adequate lights and warning signals.

H. Provide qualified flag persons and watch persons necessary to properly maintain the barricades.

I. All required barricades; bridging or other temporary construction should be removed by the Contractor when the device is no longer required.

J. All required barricades, bridging or other temporary construction should be constructed of properly identified fire rated materials.

K. Cover, plates, and bridging used to protect holes must be constructed so as to reduce potential slip and rip hazards. All covers and plates must be secured against movement. Cover, plates, and bridging must be installed in accordance with ADA Accessibility Guidelines for Buildings and Facilities (Appendix A to 36 CFR Part 1911). All such covers, plates and bridging must be solid and coated with slip resistant materials so that the surface is at least as slip resistant as the surrounding walking surfaces. The perimeter of floor covers and plates must be painted yellow or another contrasting color approved by the CTA.

1.30 WORKSITE MAINTENANCE

A. The Contractor must keep the Work Site in a clean, sanitary and orderly condition requiring that:

1. All debris is constantly concentrated so as to not create a safety hazard and is picked up daily, stored in metal waste containers and removed at least weekly.
2. All used lumber must have nails hammered flat or removed and placed in a waste container immediately upon disassembly.
3. All loose material, such as rock, masonry ruble, and soil generated from excavation, demolition or removals must be stored in neat piles until removed or reused.
4. All stored materials must be bound, contained, racked, piled and/or stacked neatly in such a fashion that the material is clear of all work and emergency egress aisles and is secure from falling, tipping, breaking, spilling or sloughing.
5. All non-construction trash is not allowed to accumulate, is picked up on a constant basis and removed daily.
6. All debris, loose and stored materials are kept at least 6 feet from any building edge, floor opening, excavation, or below ground chambers opening, and is prevented from entering curb or drain inlets or other piping system.
7. All combustible for flammable waste items other than lumber are removed daily. The Contractor must assign dedicated laborer(s) to this work site for the duration of the project through Substantial Completion and completion of all on-site punchlist items and must ensure that public passageways adjacent to or through work zones are kept at all times clean, dry and free from dust. In addition, dedicated laborer(s) have the following responsibilities but not limited to:

    a. Maintain a clean and safe work site.
    b. Coordinate cleaning areas adjacent construction zones with the CTA.
    c. Remove graffiti from construction barricades.
    d. Ensure that Contractor’s field office and tool rooms are clean and safe.
    e. Maintain all temporary sanitary conveniences.
    f. Maintain and keep clean all finished surfaces prior to acceptance.
    g. Maintain copies of all current construction keys used on site and stored to a second locked box.
    h. One dedicated laborer on site must possess a working cellular telephone to enable unrestricted emergency communication with the CTA Control Center (312)432-8040.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of OWNER SAFETY REQUIREMENTS will not be measured for payment

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of this section will be considered incidental to this contract.

END OF SECTION

(Appendix to Follow)

(EXAMPLE: BLASTING ACTIVITY LISTED IN A 4-WEEK LOOK AHEAD)

Appendix A: Safe Work Plan Document Instructions

I) PRIMARY ACTIVITY: Blasting-North Wall Ledge
Approximately 150 cubic yards of Manhattan gneiss expected to be removed. It is anticipated that 30 separate blasts will be required to remove this material

II) SUB ACTIVITIES:

- Drilling- East to West
- Blasting- Twice per day after initial holes drilled
- Mucking out- Post inspection by blaster, after each blast

A. EQUIPMENT AND METHOD OF CONSTRUCTION:
Equipment

- ✓ 3 IR Drill Rigs
- ✓ IR Compressors, and hoses
- ✓ Blasting related tools (Tamping rod, non-conductive piercer, etc.)
- ✓ Explosives as established by blaster
- ✓ 2 Yd bucket on Komatsu plus teamster
- ✓ Available haul vehicles plus teamsters
- ✓ Appropriate stemming material 4 12-by-12 mats
- ✓ Dynahoe hoe-ram (as necessary)
- ✓ Method of Construction
- ✓ Standard drill and blasting of rock formation

B. HAZARD DESCRIPTIONS AND CONTROL METHODS:

i) HAZARD DESCRIPTION
Drillers exposed to noise, dust since silica content of rock is 35 percent.

ii) SAFETY CONROLS/LOSS PREVENTION
Respirators provided Hearing protection mandatory per Hearing Conservation Program and effective Dust Control Procedures put in place.

iii) HAZARD DESCRIPTION
Unintended explosion, undesired explosion or storage hazards.

iv) SAFETY CONTROLS/LOSS PREVENTION
Blaster Licensed in Chicago. Certificate reviewed. Shot layout reviewed, Maximum pounds per delay anticipated at 4 lbs. But a scaled distance to be developed with results of initial blasts. No boulder shots-a hoe ram will be brought in. No overnight storage of caps or explosives. Post blast area survey after every blast. See attached blasting warning signals info sheet.

v) HAZARD DESCRIPTION
Site employees, public, and XYZ bldg. Exposed to fly rock.

vi) SAFETY CONTROLS/LOSS PREVENTION
Mats are to be used in conjunction with stemming. Mats flipped after each blast. Proper drill pattern and related shot design Low poundage to be used will limit possibility of mat blow off, Entire foundation excavation area to be evacuated before each blast. No teamsters in equipment in hole during blast.

Toolbox talks to be provided to site employees about blasting procedures that affect them.

vii) HAZARD DESCRIPTION
Vibration exposures pose a threat to the XYZ building.

viii) viii) SAFETY CONTROLS/LOSS PREVENTION
Seismographs to be set-up 50 feet from XYZ structure 10 feet inside the property line. Tell tales/settlement circuit to be established. Meeting scheduled for 8-1708 (?) to cover with building owner and 2 tenants. Engineering survey is to be proposed at that time. General survey before general excavation started.

ix) HAZARD DESCRIPTION
Site employees exposed to backing haul vehicles near South wall forming operations.

x) SAFETY CONTROLS/LOSS PREVENTION
All alarms will be operational. To be confirmed on a regular basis by site supervision-Checklist item before release from monthly preventative maintenance at shop, May choose to use a spotter/flagger if necessary.

xi) HAZARD DESCRIPTION
Personnel exposures and controls.

xii) SAFETY CONTROLS/LOSS PREVENTION
- Hard Hats will continue to be required.
- As summer progresses, proper clothing requirements (No shorts, proper shoes, shirts) will be enforced.
- Portable water will be provided and consumption encouraged via toolbox talk about heat stroke exposures.
- Safety Vests will be utilized by all employees exposed to traffic.

Submittal Approvals

Item No.	Submittal	Approval By (Engineer or Designer)
1.	Safety Management Program (SMP)	Construction Manager
2.	Job Hazard Analysis (JHA)	Construction Manager
3.	Safety Engineer's resume	Construction Manager
4.	Safety Supervisor's resume	Construction Manager
5.	Installation of Flexible Warning Barrier	Construction Manager
6.	Construction of Temporary Enclosure/Structure	Construction Manager

END OF SECTION APPENDIX

SECTION 01 35 24
FTA SAFETY AND SECURITY CERTIFICATION REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

A. This Section specifies administrative and procedural requirements for the Project.

B. Related Sections:

1. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.
2. Section 01 35 00, Special Procedures
3. Section 01 35 23, Owner Safety Requirements
4. Appendix I, Safety Certification Process Plans

C. This project is subject to FTA's safety certification process, as defined in the Handbook for Transit Safety and Security Certification, November 2002 and other documentation. FTA designated Illinois Department of Transportation (IDOT), Office of Intermodal Project Implementation as the State Safety Oversight (SSO) for Illinois. CTA prepared a Public Transportation Agency Safety Plan (PTSAP) and will have certain safety oversight and certification responsibilities for this project.

1.02 GENERAL REQUIREMENTS

A. The Safety and Security Certification (SSC) process is defined in the following process plans and documents which are included in Appendix I:

1. Safety and Security Certification Plan (SSCP)
2. Safety and Security Management Plan (SSMP)
3. Preliminary Hazards Analysis (PHA)
4. Threats and Vulnerabilities Analysis (TVA)*
5. Certifiable Elements List / Certifiable Items List (CEL/CIL)
6. Design Criteria Conformance Checklist (DCCC)

* The TVA contains Security Sensitive Information (SSI) controlled under 49 CFR parts 15 and 1520. It will be provided to the contractor following contract award and approval of the contractor's SSI procedures. This document is not included in Book 3 specifications.

B. The contractor will be an active participant in the Safety and Security Certification (SSC) process, as defined in the reference documents, and will need to interface with CDOT, CDOT's consultant construction management team, CTA, CTA's program managers, CDOT's or CTA's agents, IDOT SSO, FTA, and various committees established by these entities for the safety certification process. The contractor must contribute to updates to the plans identified in Section 1.02A1, related specification sections, and any other plans or documents created for the SSC process, as required, to satisfy CDOT, CTA, FTA, and IDOT SSO. In cases where these SSC process plans assign a responsibility to the contractor, the contractor must fulfil that responsibility.

C. Following the process identified in the SSCP, the contractor must develop the test or verification criteria, subject to approval, for each element and item listed in the CEL/CIL or comment upon the method developed by CTA or CDOT. Objective verification of compliance will be needed, with possibilities including test results, documented visual observation, construction submittals, photographs, etc., and the contractor will be responsible for collecting this documentation and submitting to the Commissioner for CDOT, CTA, CDOT or CTA agent, IDOT SSO, and FTA certification and concurrence. Coordination with the aforementioned entities or established committees may also be necessary to achieve safety certification, and the contractor must update documentation as required to satisfy all of the certifying, reviewing, and concurring agencies.

D. The contractor must prepare and maintain a schedule of SSC activities and submittals, subject to the schedule creation and updating requirements of Book 1 and tied to the overall project schedule. Timely submittal of SSC documentation to the Commissioner will be required in advance of opening or reopening system or station areas for public access or revenue service. It is the contractor's responsibility to submit this documentation with enough time to permit CDOT, CTA, IDOT SSO certification and certification concurrence in advance of opening or reopening system or station areas for public access or revenue service. Delays in certification or certification concurrence caused by delayed contractor documentation submittals will not relieve the contractor from the milestones in Book 2. It is recommended that the documentation and request for certification be completed as various elements, sub-elements, and items are completed.

E. When certification of particular elements or items is incomplete, Temporary Use Notices (TUNs) may be required to enable CTA operations, as detailed in the SSCP. The contractor must create or participate in the creation, review, and approval of these TUNs as required.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of FTA SAFETY CERTIFICATION REQUIREMENTS will not be measured for payment

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of this section will be considered incidental to this contract.

END OF SECTION

SECTION 01 35 91

HISTORIC TREATMENT PROCEDURES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Contractor shall provide all labor and materials for general protection and treatment procedures for designated historic fabric for the following specific work:
   1. Removal and salvage of historic canopy structure and historic platform railing, and all associated ornament and connections, etc.

B. Related Sections:
   1. Section 02 42 96 Historic Removal and Dismantling
   2. Section 05 03 71 Historic Decorative Metal Cleaning
   3. Section 05 03 74 Historic Cast Iron Repair

1.2 DEFINITIONS

A. Consolidate: To strengthen loose or deteriorated materials in place.

B. Dismantle: To disassemble and detach items by hand from existing construction to the limits indicated, using small hand tools and small one-hand power tools, so as to protect nearby historic surfaces; and legally dispose of dismantled items off-site, unless indicated to be salvaged or reinstalled.

C. Existing to Remain: Existing items that are not to be removed or dismantled.

D. Historic: Spaces, areas, rooms, surfaces, materials, finishes, and overall appearance which are important to the successful preservation and restoration as determined by the Architect. Designated historic fabric is prevalent throughout.

E. Match: To blend with adjacent construction and manifest no apparent difference in material type, species, cut, form, detail, color, grain, texture, or finish; as approved by the Architect.

F. Reconstruct: To remove existing item, replicate damaged or missing components, and reinstall in original position.

G. Refinish: To remove existing finishes to base material and apply new finish to match original, or as otherwise indicated.

H. Reinstall: To protect removed or dismantled item, repair and clean it as indicated for reuse, and reinstall it in original position, or where indicated.

I. Remove: Specifically for historic spaces, areas, rooms, and surfaces, the term means to detach an item from existing construction to the limits indicated, using hand tools and hand-operated power equipment, and legally dispose of it off-site, unless indicated to be salvaged or reinstalled.

J. Repair: To correct damage and defects, retaining existing materials, features, and finishes while employing as little new material as possible. Includes patching, piecing-in, splicing, consolidating, or otherwise reinforcing or upgrading materials.

K. Replace: To remove, duplicate, and reinstall entire item with new material. The original item is the pattern for creating duplicates unless otherwise indicated. New material/item shall match original in color, texture, material, species, finish, dimension and all other features.

L. Replicate: To reproduce in exact detail, materials, and finish, unless otherwise indicated.

M. Reproduce: To fabricate a new item, accurate in detail to the original, and in either the same or a similar material as the original, unless otherwise indicated.

N. Restore: To consolidate, replicate, reproduce, repair, and refinish as required to achieve the indicated results.

O. Retain: To keep existing items that are not to be removed or dismantled.

P. Reversible: New construction work, treatments, or processes that can be removed or undone in the future without damaging historic materials, unless otherwise indicated.

Q. Salvage: To protect removed or dismantled items and deliver them to Owner ready for reuse.

R. Stabilize: To provide structural reinforcement of unsafe or deteriorated items while maintaining the essential form as it exists at present; also, to reestablish a weather-resistant enclosure.

S. Strip: To remove existing finish down to base material, unless otherwise indicated.

1.3 MATERIALS OWNERSHIP

A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Owner that may be encountered during removal and dismantling work remain Owner's property. Carefully dismantle and salvage each item or object.

B. Coordinate with Comissioiner, who will establish special procedures for dismantling and salvage if required.

1.4 SUBMITTALS

A. Qualifications of Historic Treatment Specialists and Historic Removal and Dismantling Specialists, per 1.5 Quality Assurance below.

B. Historic Treatment Program: **Submit before work begins,** no later than five days **before** the preconstruction meeting.

C. Construction Schedule for Historic Treatments: Indicate for the entire Project the following for each activity to be performed in historic spaces, areas, and rooms, and on historic surfaces:

1. Detailed sequence of historic treatment work, with starting and ending dates, coordinated with Owner's continuing operations and other known work in progress.
2. Coordination of Owner's and others' continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
3. Equipment Data: List gross loaded weight, axle-load distribution, and wheel-base dimension data for mobile and heavy equipment proposed for use. Do not use such equipment in any of the structures without Contractor's professional engineer's certification that the structure can support the imposed loadings without damage.

D. Preconstruction Documentation: Show preexisting conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by historic treatment operations by photography or other means as approved.

E. Fire-Prevention Plan: General Contractor shall prepare a written plan for preventing fires during the Work, including placement of fire extinguishers, fire blankets, rag buckets, and other fire-prevention devices during each phase or process. Coordinate plan with Owner's fire-protection equipment and requirements. Include each fire watch's training, duties, and authority to enforce fire safety. Submit before work begins.

F. Schedule of Salvaged Items: Schedule items to be salvaged, complete with the plans and elevations locating the removed objects. Clearly label elements prior to removal, and photographic documentation thereof, prior to removal.

G. Inventory of Salvaged Items: After removal or dismantling work is complete, submit an updated schedule of salvaged items that lists salvaged items with photographic documentation of the material prior to packaging, and as stored.

1.5 QUALITY ASSURANCE

A. Historic Treatment Specialist is defined as: An experienced firm regularly engaged in historic treatments similar in nature, materials, design, and extent to this work as specified in each section, and that has completed a minimum of five recent projects with a record of successful in-service performance that demonstrate the firm's

qualifications to perform this work. All such specialists MUST be familiar with the Secretary of the Interior's Standards for Preservation.

1. Field Supervisor Qualifications: Full-time supervisors experienced in historic treatment work similar in nature, material, design, and extent to that indicated for this Project. Supervisors shall be on Project site during times that historic treatment work is in progress. Supervisors shall not be changed during Project except for causes beyond the control of the Contractor.
2. Worker Qualification: Persons who are experienced in historic treatment work of types they will be performing.

B. Historic Removal and Dismantling Specialist Qualifications: A qualified historic treatment specialist. General selective demolition experience is not sufficient experience for historic removal and dismantling work.

C. Historic Treatment Program: General Contractor shall prepare a written plan for historic treatment for the whole Project, including each phase or process and protection of surrounding materials during operations. Describe in detail materials, methods, and equipment to be used for each phase of work. Show compliance with indicated methods and procedures specified in this and other sections.

1. Dust and Noise Control: Include locations of proposed temporary dust- and noise-control partitions and means of egress from occupied areas coordinated with continuing on-site operations and other known work in progress.
2. Debris Hauling: Include plans clearly marked to show debris hauling routes, turning radii, and locations and details of temporary protective barriers.

D. Mockups: Prepare mockups of specific historic treatment procedures specified throughout Division 4 through Division 9 to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Typical Removal Work
   a. Dismantle typical wall area as shown on Drawings.
   b. Remove historic window and trim per 08 52 20
2. Excrement Removal: Remove excrement from an area approximately 5 sq. ft. for each type of building flooring substrate material.

   a. Test chemicals and methods on samples of adjacent building materials for possible adverse reactions. Do not use chemicals and methods known to have deleterious effect.
   b. Allow a waiting period of not less than seven days after completion of removal work to permit a study of mockup for deleterious effects.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

E. Regulatory Requirements: Comply with governing EPA notification regulations before beginning removal and dismantling work. Comply with hauling and disposal regulations of authorities having jurisdiction.

F. Standards: Comply with ANSI/ASSE A10.6.

G. Historic Treatment Preconstruction Conference: Conduct conference at Project site.

1. General: Review methods and procedures related to historic treatment including, but not limited to, the following:

a. Review manufacturer's written instructions for precautions and effects of historic treatment procedures on materials, components, and vegetation.
b. Review and finalize historic treatment construction schedule; verify availability of materials, equipment, and facilities needed to make progress and avoid delays.
c. Review qualifications of personnel assigned to the work and assign duties.
d. Review material application, work sequencing, tolerances, and required clearances.
e. Review areas where existing construction is to remain and requires protection.

2. Removal and Dismantling:

a. Inspect and discuss condition of construction to be removed or dismantled.
b. Review requirements of other work that relies on substrates exposed by removal and dismantling work.

1.6 STORAGE AND PROTECTION OF HISTORIC MATERIALS

A. Salvaged Historic Materials:

1. Clean only loose debris from salvaged historic items unless more extensive cleaning is indicated.
2. Pack or crate items after cleaning; cushion against damage during handling. Label contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area on-site as designated by Owner.
5. Protect items from damage during transport and storage.

B. Historic Materials for Reinstallation:

1. Repair and clean historic items as indicated and to functional condition for reuse.
2. Pack or crate items after cleaning and repairing; cushion against damage during handling. Label contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment unless otherwise indicated. Provide connections, supports, and miscellaneous materials to make item functional for use indicated.

C. Existing Historic Materials to Remain: Protect construction indicated to remain against damage and soiling from construction work. Where permitted by Commissioner, items may be dismantled and taken to a suitable, protected storage location during construction work and reinstalled in their original locations after historic treatment and construction work in the vicinity is complete.

D. Storage and Protection: When taken from their existing locations, catalog and store historic items within a weathertight enclosure where they are protected from wetting by rain, snow, condensation, or ground water, and from freezing temperatures.

1. Identify each item with a nonpermanent mark to document its original location. Indicate original locations on plans elevations, sections, or photographs by annotating the identifying marks.
2. Secure stored materials to protect from theft.

1.7 PROJECT CONDITIONS

A. General Size Limitation in Historic Spaces: Materials, products, and equipment used for performing the Work and for transporting debris, materials, and products shall be of sizes that clear surfaces within historic spaces, areas, rooms, and openings, including temporary protection, by 12 inches or more.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with removal and dismantling work.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Commissioner. Owner will remove hazardous materials under a separate contract.

    a. In the case of asbestos, stop work in the area of potential hazard, shut off fans and other air handlers ventilating the area, and rope off area until the questionable material is identified. Re-assign workers to continue work in unaffected areas. Resume work in the area of concern after safe working conditions are verified.

E. Storage or sale of removed or dismantled items on-site is not permitted.

1.8 COORDINATION

A. Coordinate historic treatment procedures in this section with public circulation patterns at Project site. Public circulation patterns cannot be closed off entirely, and in places can be only temporarily redirected around small areas of work. Plan and execute the Work accordingly.

PART 2 - PRODUCTS - (Not Used)

PART 3 - EXECUTION

3.1 HISTORIC REMOVAL AND DISMANTLING EQUIPMENT

A. Removal Equipment: Use only hand-held tools except as follows or unless otherwise approved by the Architect on a case-by-case basis:

1. Light jackhammers are not permitted.
2. Large air hammers are not permitted.

B. Dismantling Equipment: Use manual, hand-held tools, except as follows or otherwise approved by the Architect on a case-by-case basis:

1. Hand-held power tools and cutting torches are permitted only as submitted in the historic treatment program. They must be adjustable so as to penetrate or cut only the thickness of material being removed.
2. Pry bars over 18 inches long and hammers weighing over 2 lb are not permitted for dismantling work.

3.2 EXAMINATION

A. Preparation for Removal and Dismantling: Examine construction to be removed or dismantled to determine best methods to perform removal and dismantling work safely and effectively. Examine adjacent work to determine what protective measures will be necessary. Make explorations, probes, and inquiries as necessary to determine condition of construction to be removed or dismantled and location of utilities and services to remain that may be hidden by construction that is to be removed or dismantled.

1. Verify that affected utilities have been disconnected and capped.
2. Inventory and record the condition of items to be removed and dismantled for reinstallation or salvage.
3. Before removal or dismantling of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.
4. Engage a professional engineer to survey condition of structure to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures as a result of removal and dismantling work.

B. Survey of Existing Conditions: Record existing conditions by use of measured drawings and preconstruction photographs.

C. Perform surveys as the Work progresses to detect hazards resulting from historic treatment procedures.

3.3 PROTECTION, GENERAL

A. Ensure that supervisory personnel are on-site and on duty when historic treatment work begins and during its progress.

B. Protect persons, motor vehicles, surrounding surfaces of building, building site, plants, and surrounding buildings from harm resulting from historic treatment procedures.

1. Use only proven protection methods, appropriate to each area and surface being protected.
2. Provide barricades, barriers, and temporary directional signage to exclude public from areas where historic treatment work is being performed.
3. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during course of historic treatment work.
4. Contain dust and debris generated by removal and dismantling work and prevent it from reaching the public or adjacent surfaces.
5. Provide shoring, bracing, and supports as necessary. Do not overload structural elements.
6. Protect floors and other surfaces along haul routes from damage, wear, and staining.
7. Provide supplemental sound-control treatment to isolate removal and dismantling work from other areas of the building.

C. Temporary Protection of Historic Materials:

1. Protect existing historic materials with temporary protections and construction. Do not deface or remove existing materials.
2. Do not attach temporary protection to historic surfaces except as indicated as part of the historic treatment program and approved by Commissioner.

D. Comply with each product manufacturer's written instructions for protections and precautions. Protect against adverse effects of products and procedures on people and adjacent materials, components, and vegetation.

E. Utility and Communications Services:

1. Notify the Owner, Commissioner, and authorities having jurisdiction, owning or controlling wires, conduits, pipes, and other services affected by the historic treatment work before commencing operations.
2. Disconnect and cap pipes and services as required by authorities having jurisdiction, as required for the historic treatment work.
3. Maintain existing services unless otherwise indicated; keep in service, and protect against damage during operations. Provide temporary services during interruptions to existing utilities.

F. Existing Drains: Prior to the start of work in an area, test drainage system to ensure that it is functioning properly. Notify Commissioner immediately of inadequate drainage or blockage. Do not begin work in an area until the drainage system is in working order.

1. Prevent solids such as stone or mortar residue from entering the drainage system. Clean out drains and drain lines that become sluggish or blocked by sand or other materials resulting from historic treatment work.
2. Protect drains from pollutants. Block drains or filter out sediments, allowing only clean water to pass.

3.4 PROTECTION DURING APPLICATION OF CHEMICALS

A. Protect motor vehicles, surrounding surfaces of building being restored, building site, plants, and surrounding buildings from harm or damage resulting from applications of chemical cleaners and paint removers.

B. Cover adjacent surfaces with protective materials that are proven to resist chemicals selected for Project unless chemicals being used will not damage adjacent surfaces as indicated in historic treatment program. Use covering materials and masking agents that are waterproof, UV-resistant, and will not stain or leave residue on surfaces to which they are applied. Apply protective materials according to manufacturer's written instructions. Do not apply liquid masking agents or adhesives to painted or porous surfaces. When no longer needed, promptly remove protective materials staining.

C. Do not apply chemicals during winds of sufficient force to spread them to unprotected surfaces.

D. Neutralize and collect alkaline and acid wastes and legally dispose of off Owner's property.

E. Collect and dispose of runoff from chemical operations by legal means and in a manner that prevents soil contamination, soil erosion, undermining of paving and foundations, damage to landscaping, or water penetration into building interior.

3.5 PROTECTION FROM FIRE

A. General: Follow fire-prevention plan and the following.

1. Comply with NFPA 241 requirements unless otherwise indicated. Perform duties entitled "Owner's Responsibility for Fire Protection."
2. Remove and keep area free of combustibles including, rubbish, paper, waste, and chemicals, except to the degree necessary for the immediate work.

    a. If combustible material cannot be removed, provide fire blankets to cover such materials.

3. Prohibit smoking by all persons within the Project work and staging areas.

B. Heat-Generating Equipment and Combustible Materials: To the greatest extent possible, do not use heat generating equipment.
1. Comply with the following procedures while performing work with heat-generating equipment or highly combustible materials, including welding, torch-cutting, soldering, brazing, paint removal with heat, or other operations where open

flames or implements utilizing high heat or combustible solvents and chemicals are anticipated.

2. As far as practical, restrict heat-generating equipment to shop areas outside project site.
3. Do not perform work with heat-generating equipment in or near rooms or in areas where flammable liquids or explosive vapors are present or thought to be present. Use a combustible gas indicator test to ensure that the area is safe.
4. Use fireproof baffles to prevent flames, sparks, hot gasses, or other high-temperature material from reaching surrounding combustible material.
5. Prevent the spread of sparks and particles of hot metal through open windows, doors, holes, and cracks in floors, walls, ceilings, roofs, and other openings.
6. Fire Watch: Before working with heat-generating equipment or highly combustible materials, station personnel to serve as a fire watch at each location where such work is performed. Fire watch personnel shall have the authority to enforce fire safety. Station fire watch according to NFPA 51B, NFPA 241, and as follows.

    a. Train each fire watch in the proper operation of fire-control equipment and alarms.
    b. Prohibit fire-watch personnel from other work that would be a distraction from fire-watch duties.
    c. Cease work with heat-generating equipment whenever fire-watch personnel are not present.
    d. Have fire watch perform final fire-safety inspection each day beginning no sooner than 30 minutes after conclusion of work at each area of the Project site to detect hidden or smoldering fires and to ensure that proper fire-prevention is maintained.
    e. Maintain fire-watch personnel at each area of the Project site until 60 minutes after conclusion of daily work.

C. Fire Extinguishers, Fire Blankets, and Rag Buckets: Maintain fire extinguishers, fire blankets, and rag buckets for disposal of rags with combustible liquids. Maintain each as suitable for the type of fire risk in each work area. Ensure that nearby personnel and the fire watch are trained in fire-extinguisher and blanket operation.

D. Sprinklers: Where sprinkler protection exists and is functional, maintain it without interruption while operations are being performed. If operations are performed close to sprinklers, shield them temporarily with guards.

1. Remove temporary guards at the end of work shifts, whenever operations are paused, and when nearby work is completed.

3.6 GENERAL HISTORIC TREATMENT

A. Ensure that supervisory personnel are present when historic treatment work begins and during its progress.

B. Halt the process of deterioration and stabilize conditions, unless otherwise indicated. Perform work as indicated on Drawings. Follow the procedures in subparagraphs below and procedures approved in historic treatment program.

1. Retain as much existing material as possible; repair and consolidate rather than replace.
2. Use additional material or structure to reinforce, strengthen, prop, tie, and support existing material or structure.
3. Use reversible processes wherever possible.
4. Use historically accurate repair and replacement materials and techniques unless otherwise indicated.
5. Record existing work before each procedure (preconstruction) and progress during the work with digital preconstruction documentation photographs.

C. Notify Commissioner of visible changes in the integrity of material or components whether due to environmental causes including biological attack, UV degradation, freezing, or thawing; or due to structural defects including cracks, movement, or distortion.

1. Do not proceed with the work in question until directed by Commissioner.

D. Where missing features are indicated to be repaired or replaced, provide features whose designs are based on accurate duplications rather than on conjectural designs, subject to the approval of Commissioner.

E. Where Work requires existing features to be removed or dismantled and reinstalled, perform these operations without damage to the material itself, to adjacent materials, or to the substrate.

F. Identify new and replacement materials and features with permanent marks hidden in the completed work to distinguish them from original materials. Record a legend of identification marks and the locations of the items on Record Drawings.

3.7 HISTORIC REMOVAL AND DISMANTLING

A. General: Have removal and dismantling work performed by a qualified historic removal and dismantling specialist. Ensure that historic removal and dismantling specialist's field supervisors are present when removal and dismantling work begins and during its progress.

B. Perform work in accordance with the historic treatment program.

1. Provide supports or reinforcement for existing construction that becomes temporarily weakened by the work, until the work is completed.
2. Perform cutting by hand or with small power tools wherever possible. Cut holes and slots neatly to size required, with minimum disturbance of adjacent work.
3. Do not operate air compressors inside building, unless approved by Commissioner in each case.
4. Do not drill or cut columns, beams, joints, girders, structural slabs, or other structural supporting elements, without having Contractor's professional engineer's written approval for each location before such work is begun.
5. Do not use explosives.

C. Water-Mist Sprinkling: Use water-mist sprinkling and other wet methods to control dust only with adequate, approved procedures and equipment that ensure that such water will not create a hazard or adversely affect other building areas or materials.

D. Unacceptable Equipment: Keep equipment that is not permitted for historic removal or dismantling work away from the vicinity where such work is being performed.

E. Removing and Dismantling Items On or Near Historic Surfaces:

1. Use only dismantling tools and procedures within 12 inches of historic surface. Do not use pry bars. Protect historic surface from contact with or damage by tools.
2. Unfasten items to be removed, in the opposite order from which they were installed.
3. Support each item as it becomes loosened to prevent stress and damage to the historic surface.
4. Dismantle anchorages.

F. Masonry Walls:

1. Remove masonry carefully and erect temporary bracing and supports as needed to prevent unexpected collapse of materials being removed.
2. Dismantle top edge and sides before removing wall. Stop removal work and immediately inform the Commissioner if any structural elements above or adjacent to the work show signs of distress or dislocation during any phase of removal work.
3. Remove wall in easily managed pieces.
4. During removal, the Contractor is responsible for the stability of the partially remaining wall. Notify the Commissioner of the condition of temporary bracing for wall if work is temporarily stopped during the wall's removal.

G. Anchorages:

1. Remove anchorages associated with removed items.
2. Dismantle anchorages associated with dismantled items.
3. In non-historic surfaces, patch holes created by anchorage removal or dismantling in accordance with the requirements for new work.
4. In historic surfaces, patch or repair holes created by anchorage removal or dismantling in accordance with Section specific to the historic surface being patched.

3.8 EXTENT OF HISTORIC REMOVAL AND DISMANTLING

A. As shown on drawings.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of HISTORIC TREATMENT PROCEDURES shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of HISTORIC TREATMENT PROCEDURES shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. ARCHITECTURAL WORK: 09000

END OF SECTION 01 35 91

SECTION 01 38 00

CONSTRUCTION PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions, and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Employ a professional photographer to take construction record photographic documentation periodically during course of the Work.

B. The photographer shall visit the site for the purpose of taking photographic documentation as scheduled and approved by the Commissioner.

C. The Commissioner may cancel and reschedule site visits due to inclement weather at no additional cost to CDOT.

D. Employ Web-Based Photographic Documentation Service Provider: A firm specializing in providing photographic equipment, Web-based software, and related services for construction projects, with record of providing satisfactory services similar to those required for Project.

1.03 DEFINITIONS

A. UAV: Unmanned Aerial Vehicle.

1.04 INFORMATIONAL SUBMITTALS

A. Qualification Data: For photographer and Web-based photographic documentation service provider.

B. Key Plan: Submit key plan of Project site with notation of vantage points marked for location and direction of each photograph and video recording. Indicate elevation of construction.

1.05 REQUIRED PHOTOGRAPHIC DOCUMENTATION

A. Pre-Construction Photographs
   1. Provide photographic views of existing (pre-construction) conditions at station site as directed by the Commissioner to a cost specified in the Additional Special Conditions.
   2. The Commissioner may direct that pre-construction photographs be taken at any time during the duration of the Project as work is scheduled to begin on different tasks.
   3. Provide a minimum of 100 photographs.

B. Construction Photographs:
   1. Photograph project from 20 different views each month during construction, as directed by the Commissioner.
   2. Provide 2 prints of each view of the pre-construction and construction photographs enclosed in 2 separate binders with double-faced plastic sleeves. Each month furnish binders to Commissioner.

C. Time-Lapse Sequence Construction Photographs: Take photographs as indicated, to show status of construction and progress since last photographs were taken.
   1. Frequency: Take photographs 8am, noon, and 4pm on each day.
   2. Vantage Points: Following suggestions by Commissioner and Contractor, photographer to select vantage points. During each of the following construction phases, take not less than two of the required shots from same vantage point each time to create a time-lapse video sequence as follows:
      a. Commencement of the Work, through completion of subgrade construction.
      b. Above-grade structural framing.
      c. Exterior building enclosure.
      d. Interior Work, through date of Substantial Completion.

D. Digital files:
   1. High resolution digital files shall be furnished uploaded to Web- based photographic documentation service provider's Web site.
   2. Obtain the photographer's agreement prior to employment to furnish additional prints to CDOT at commercial rates applicable at time of purchase.
   3. Time lapse video must be available to CTA for opening day video loop on station monitors.

E. Web-Based Photographic Live Video Stream Documentation: Transmit simultaneous video streams at full rate.
   1. Stream video recordings to approved Web-based photographic documentation service provider’s Web site.
   2. Identification: For each recording, provide the following information:
      a. Name of Project.
      b. Name and contact information for photographer.
      c. Name of Contractor.
      d. Date(s) and time(s) video recording was recorded.
      e. Description of vantage point, indicating location, direction (by compass point), and elevation of construction.

1.06 QUALITY ASSURANCE

A. Drone & Operator Requirements:
   1. Provide a FAA registered operator for commercial aerial UAV services.
   2. Provide a FAA registered UAV weighing between 0.55 lbs. to 55.0 lbs.
   3. UAV capable of utilizing Global Positioning System.
   4. UAV capable of Omnidirectional Obstacle Sensing System.

B. Aerial Photo Requirements:
   1. Camera capable of providing high quality photos (greater than 12MP) in formats of: JPEG, DNG (RAW), JPEG + DNG, etc.

C. Aerial Video Requirements:
   1. High quality video capable of providing high resolution (i.e. 4K: 3840x2160 24/25/30p @ 100 Mbps).

PART 2 - PRODUCTS

2.01 PHOTOGRAPHIC MEDIA

A. Color: date encoded high-quality 35 mm digital prints.
   1. Finish: Smooth surface, glossy.

2. Size: 8"x 10".

B. Identify each print on back, listing:
   1. CDOT Project Number with picture sequential number
   2. Project Name
   3. Date:
   4. Description/Key Plan
      a. Orientation of view
      b. Date and time of exposure
      c. Key plan in lower right-hand corner permanently affixed.
      d. Name and address of photographer.

2.02 WEB-BASED PHOTOGRAPHIC LIVE VIDEO STREAM DOCUMENTATION

A. Project Camera: Provide fixed exterior camera installation, mounted to provide unobstructed view of construction site from location approved by Commissioner. Coordinate with property owner, as required, to enable the installation and access, including submittal of installation details to property owner.

   1. Provide two fixed-location cameras, with the following characteristics:
      a. Static view
      b. Capable of producing minimum 5.0-megapixel pictures.
      c. The outdoor camera system shall consist of a weatherproof at minimum constructed housing, HD streaming camera to be mounted on a fixed pole, wall, parapet or ceiling.
      d. The camera shall provide live and continuous video.
      e. The camera shall upload HD video over a wireless cellular modem, a wireless point-to-point system or a RJ-45 hardwired connection to a DSL or cable modem.
      f. The content shall be sent to a secure, password protected website with an Interface and Online Software features provided by the Vendor as a Managed Service.
      g. The system shall operate on 120 VAC.
      h. Provide power supply, active high-speed data connection to service provider's network, and static public IP address for each camera.
   2. Repair any damage to private property or mounting locations caused by the camera, mounting apparatus, or contractor access to the location.

B. Web-Based Image Access: Password-protected access for Project team administered by Contractor, providing current image access and archival image access by date and time, with images downloadable to viewer's device.

2.03 INTERFACE AND ONLINE SOFTWARE

A. Remote Access: Contractor's System Vendor shall provide an internet-based interface and online software as a managed service, to allow the viewing of all high-definition digital still images captured and stored and live video, from any location with internet access via a secure password protected website.
   1. Maintain images on the System Vendor's website for reference available at all times during the life of the project and for not less than 60 days after completion.

B. Online Interface Features:
   1. Software delivered by Vendor as a Managed Service.
   2. Displays Company logo and project name.
   3. Capable of viewing actual live video.
   4. Picture in Picture to view live video, while viewing high-definition images.

5. Calendar based navigation system for selecting specific images.
6. Multifunction image browsing.
7. A multi-view screen to view all of the cameras on a project at the same time.
8. Share image tools: save, print, email and post to message board or mobile devices.
9. Time lapse features include — Instant time lapse play back by day, week, month or year.
10. Account security features include — Four levels of password protection, IP address block/permission and SSL protection of the user login password.
11. All Images are the Copyright of CDOT and Protected on Secure Servers Owned and Operated by the System Vendor.

PART 3 - EXECUTION

3.01 CONSTRUCTION PHOTOGRAPHS

A. Factual presentation.

B. Correct exposure and focus.
   1. High resolution and sharpness
   2. Maximum depth-of-field
   3. Minimum distortion.

C. Take views as directed and in the presence of the Commissioner.

D. Provide a drone-based video upon Final Completion.

3.02 WEB-BASED PHOTOGRAPHIC LIVE VIDEO STREAM DOCUMENTATION

A. Maintain cameras and Web-based access in good working order according to Web-based construction photographic documentation service provider's written instructions until final completion. Provide for service of camera and related networking devices and software.

B. Termination and Removal: Removal of camera system when instructed by the Commissioner.

C. Camera system including associated appurtenances and mounting equipment are property of CDOT.

3.03 DELIVERY OF PRINTS

A. Deliver two sets of prints and the digital files with each Application for Payment.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The Work of CONSTRUCTION PHOTOGRAPHS will not be measured for payment.

4.02 PAYMENT

A. No separate payment will be made for the work covered in this section. Payment for the work of this section will be considered incidental to this contract.

END OF SECTION

SECTION 01 40 00

QUALITY REQUIREMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book I Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
   1. Specific quality assurance and control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
   2. Specified tests, inspections, and related actions do not limit Contractor's other quality assurance and control procedures that facilitate compliance with the Contract Document requirements.
   3. Requirements for Contractor to provide quality assurance and control services required by Commissioner or authorities having jurisdiction are not limited by provisions of this Section.

C. Furnish a complete written description of the Contractor's Quality Control Program for the project. Itemize the procedures to be followed for each separate category of Work and arrange the description of the separate categories so as to correspond with the Sections of the Specifications.

D. Related Sections:
   1. Construction Photographic Documentation: Section 01 38 00.
   2. Divisions 02 through 41 Sections for specific test and inspection requirements.

1.03 DEFINITIONS

A. Quality Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Commissioner.

C. Mockups: Full-size, physical assemblies that are constructed on-site. Mockups are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Approved mockups establish the standard by which the

completed Work will be judged.

D. Laboratory Mockups: Full-size, physical assemblies that are constructed at testing facility to verify performance characteristics.

E. Preconstruction Testing: Tests and inspections that are performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.

F. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.

G. Source Quality Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.

H. Field Quality Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

I. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency. Testing Agency shall be responsible for setting up, conducting, and interpreting tests with a report. Reports shall include an executive summary at the beginning that includes every non- conformance item and specifically notes each item’s deviation from the Project requirements.

J. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
   1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.

K. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of 5 previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

L. Witness Test/Witness Testing: Testing at a Testing Agency’s facility or at a manufacturing plant that is intended to be witnessed by the Commissioner.

M. Specialty Work: Work as specified in various sections, coordinated by a Contractor’s Specialty Coordinator, and as indicated on drawings as Platform Specialty Work and Bridge Specialty Work.

1.04 CONFLICTING REQUIREMENTS

A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Commissioner for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum

quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Commissioner for a decision before proceeding.

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

B. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
1. Specification Section number and title.
2. Description of test and inspection.
3. Identification of applicable standards.
4. Identification of test and inspection methods.
5. Number of tests and inspections required.
6. Time schedule or time span for tests and inspections.
7. Entity responsible for performing tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality control service.

C. Reports: Prepare and submit certified written reports that include the following:
1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections. Description of the Work and test and inspection method. Identification of product and Specification Section.
6. Complete test or inspection data.
7. Test and inspection results and an interpretation of test results.
8. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
9. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
10. Name and signature of laboratory inspector. Recommendations on retesting and reinspecting.

D. Permits, Licenses, and Certificates: For Commissioner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.06 QUALITYASSURANCE

A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in- service performance.

C. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well

as sufficient production capacity to produce required units.

D. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

E. Professional Structural Engineer Qualifications: A Structural Engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.

F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
   1. Requirement for specialists shall not supersede building codes and regulations governing the Work.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
   1. NRTL: A nationally recognized testing laboratory according to 29CFR1910.7.
   2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

H. Factory Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer’s products that are similar in material, design, and extent to those indicated for this Project.

I. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
   1. Contractor responsibilities include the following:
      a. Provide test specimens representative of proposed products and construction.
      b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
      c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
      d. Build site assembled test assemblies and mockups using installers who will perform same tasks for Project.
      e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
      f. When testing is complete, remove test specimens, assemblies, mockups, and laboratory mockups; do not reuse products on Project.
   2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality assurance service to Commissioner, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

J. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using

materials indicated for the completed Work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by Commissioner.
2. Notify Commissioner seven days in advance of dates and times when mockups will be constructed.
3. Demonstrate the proposed range of aesthetic effects and workmanship.
4. Obtain Commissioner's approval of mockups before starting work, fabrication, or construction.
    a. Allow seven days for initial review and each re-review of each mockup.
5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
6. Demolish and remove mockups when directed, unless otherwise indicated.

K. Laboratory Mockups: Comply with requirements of preconstruction testing and those specified in individual Sections in Divisions 01 through 41.

L. Travel expenses related to Mockup reviews, Witness testing, Factory inspections, Plant visits, etc.

1. If facilities that the Commissioner is to visit are within the City of Chicago Metropolitan area pay for transportation expenses for 4 representatives of the Commissioner while engaged in the review process.
2. If facilities are out of the City of Chicago Metropolitan area pay for living, lodging, and transportation expenses for 4 representatives of the Commissioner while engaged in the review process. Living expenses shall include transportation, meals, hotel (similar or equal in quality to Holiday Inn Hotels) and a rental car.
3. List of facilities to visit include:
    a. Steel reinforcement fabrication plants.
    b. Cast-in-Place concrete batch plants.
    c. Precast manufacturing plants
    d. Cast Connex manufacturing plant.
    e. Steel fabrication plants.
    f. Stainless steel fabrication plants.
    g. Forming system manufacturing plant.
    h. Hot dip galvanization plants.
    i. Steel decking manufacturing plant.
    j. Nonslip surface flooring manufacturing plant.
    k. Glass (float plant).
    l. Glass (heat treatment plant).
    m. Glass fabrication plants.
    n. Panel system manufacturing plants.
    o. Stone paving plants.
    p. Escalator manufacturing plants.
    q. Elevator manufacturing plants.
    r. Nail laminated timber manufacturing plants.
    s. Lighting Manufacturer Plants
    t. UPS Manufacturer Plants
    u. Traction Power Switchgear (Circuit Breaker) Plants
    v. AC Switchgear Plants
    w. Cable Manufacturer Plants

1.07 CONTRACTOR'S ADMINISTRATION STAFF

A. General: Furnish a competent and adequate staff as necessary for the proper administration, coordination, supervision, and superintending of the Work. Key members of this staff shall not

be changed without the consent of the Commissioner unless such members prove to be unsatisfactory to the Contractor and cease to be employed in a similar capacity by the Contractor.

B. Contractor's Coordinating Engineer: Furnish the services of a qualified engineer, who shall be responsible for coordinating the Work with the various trades, including the review of the shop drawings, eliminating conflicts or interferences between the various trades, checking for completeness of the shop drawings, and directing changes in the Work as may be required to affect compliance with the Contract Documents. Coordinating Engineer must submit evidence of having previous experience in coordinating these areas of Work on projects of similar scale and complexity for comparable rapid transit projects for major transit operators and will be required to participate in the construction progress meetings as directed by the Commissioner. Submit resume for review and approval by the Commissioner prior to commencing work.

C. Contractor's Specialty Coordinator: Furnish the services of a qualified manager, who shall be responsible for coordinating the Specialty Work with the various trades, including the review of the shop drawings for the Specialty Work, eliminating conflicts or interferences between the various trades of the Specialty Work, checking for completeness of the shop drawings and directing changes in the Specialty Work as may be required to affect compliance with the Contract Documents. Submit evidence of Specialty Coordinator having previous experience in coordinating these areas of Specialty Work on projects of similar scale and complexity. Submit resume for review and approval by the Commissioner prior to commencing work.

D. Contractor's Project Manager: Prior to commencement of the Work, select a project manager who shall have full responsibility for the prosecution of the Work, with full authority to act in all matters as necessary for the proper coordination, direction, and technical administration of the Work. The Project Manager must submit evidence of having previous experience on projects of similar scale and complexity for comparable rapid transit projects for major transit operators and will be required to participate in the construction progress meetings as directed by the Commissioner. Submit resume for review and approval by the Commissioner prior to commencing work.

1.08 CONTRACTOR'S ASSISTANCE TO THE COMMISSIONER

A. Refer to requirements for inspection and testing by the Commissioner as specified in the SPECIAL CONDITIONS. The activities of the Commissioner's testing laboratories are solely at the discretion of the Commissioner and in no way relieve the Contractor of sole responsibility for maintaining the Quality Control Program.

B. The Commissioner's testing laboratories will perform independent inspections and tests, interpret, and evaluate the results for compliance with the Contract Documents, record observations, and submit reports.

1.09 QUALITY CONTROL

A. Commissioner Responsibilities: Where quality-control services are indicated as Commissioner's responsibility, Commissioner will engage a qualified testing agency to perform these services.
   1. Commissioner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
   2. Payment for these services will be made from testing and inspecting allowances, as authorized by Change Orders.
   3. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the

Contract Sum will be adjusted by Change Order.

B. Tests and inspections not explicitly assigned to Commissioner are Contractor's responsibility. Unless otherwise indicated, provide quality control services specified and those required by authorities having jurisdiction. Perform quality control services required of Contractor by authorities having jurisdiction, whether specified or not.
   1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality control services.
      a. Contractor shall not employ same entity engaged by Commissioner, unless agreed to in writing by Commissioner.
   2. Notify testing agencies at least 48 hours in advance of time when Work that requires testing or inspecting will be performed.
   3. Where quality control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality control service.
   4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
   5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Manufacturer's Field Services: Where indicated, engage a factory authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 01 33 00 Submittal Procedures.

D. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

E. Testing Agency Responsibilities: Cooperate with Commissioner and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
   1. Notify Commissioner and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
   2. Determine the location from which test samples will be taken and in which in- situ tests are conducted.
   3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
   4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality control service through Contractor.
   5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
   6. Do not perform any duties of Contractor.

F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
   1. Access to the Work.
   2. Incidental labor and facilities necessary to facilitate tests and inspections.
   3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
   4. Facilities for storage and field curing of test samples.
   5. Delivery of samples to testing agencies.
   6. Preliminary design mix proposed for use for material mixes that require control by testing agency.

7. Security and protection for samples and for testing and inspecting equipment at Project site.

G. Coordination: Coordinate sequence of activities to accommodate required quality assurance and control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
   1. Schedule times for tests, inspections, obtaining samples, and similar activities.

H. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality control services required by the Contract Documents. Submit schedule within 30 days of date established for the Notice to Proceed.
   1. Distribution: Distribute schedule to Commissioner, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.10 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Commissioner will engage a qualified testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Commissioner, and as follows:
   1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
   2. Notifying Commissioner and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
   3. Submitting a certified written report of each test, inspection, and similar quality control service to Commissioner with copy to Contractor and to authorities having jurisdiction.
   4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
   5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
   6. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 TEST AND INSPECTION LOG

A. Prepare a record of tests and inspections. Include the following:
   1. Date test or inspection was conducted.
   2. Description of the Work tested or inspected.
   3. Date test or inspection results were transmitted to Commissioner.
   4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Commissioner’s reference during normal working hours.

3.02 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.

B. Protect construction exposed by or for quality control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality control services.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The Work of QUALITY CONTROL will not be measured for payment.

4.02 PAYMENT

A. No separate payment will be made for the Work covered in this section. Payment for the Work of QUALITY REQUIREMENTS will be included in the applicable Line Item contract lump sum price as shown in the Schedule of Prices.

END OF SECTION

SECTION 01 43 41
SPECIAL MOCKUPS

PART 1 - GENERAL

1.01 RELATED WORK

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions, and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Work included: supply and install special mockups for locations or processes as identified in the specifications and/or drawings, including but not limited to:

1. Design of mockup and supporting structures, including temporary support.
2. Fabrication and installation of mockup.
3. Provide complete materials and systems within mockup extents.
4. Coordination of trades.
5. Field painting.
6. Field modifications.
7. Testing as required.
8. Demolition and removal.

1.03 DESIGN REQUIREMENTS

A. The mockups shall be constructed of actual components and materials for the intended area, shall be fully glazed, with proposed glazing materials, and shall demonstrate the general scope and essence of the proposed systems in terms of architectural design concept, principal dimensions, and major architectural elements. The mockups will be reviewed by the Commissioner for coordination of elements, constructability, and esthetic effect.

B. Properly design the special mockups and supporting structure to withstand wind pressures, loading deflections, shrinkage, and thermal movements within the tolerances specified for the finished work.

C. Obtain and pay for permits required for the Work.

D. The special mockups shall be representative of actual building conditions, conform to accepted details of construction, incorporate accepted materials and finishes, including supporting structure where required, and be fully glazed. Provide sufficient glass for initial testing and retesting as may be required.

E. Build the special mockups on site, or at a location to be approved by the Commissioner. The assembly shall be fabricated and installed under the supervision of the fabricators' and installers' foremen. If off-site mockups are approved, Contractor shall include travel expenses for four Commissioner Representatives to visit and review. Assume two site reviews per off-site mockup.

F. Testing shall be performed on mockups according to requirements in "FIELD QUALITY CONTROL" Article.

G. Subject to compliance with requirements, approved mockup components may become part of the completed Work if approved by the Commissioner and are undamaged at time of Substantial Completion, and if making mockup part of the completed work does not introduce aesthetic differences or additional joints and seams that are not per original design.

1.04 PERFORMANCE REQUIREMENTS

A. Delegated Design:

1. Design, engineer, fabricate, and install special mockups work in compliance with specified standards, performance requirements, material selections and requirements of this and related sections.
2. Include engineering analysis by a qualified Engineer, using structural performance requirements and design criteria indicated herein.

B. In general, performance requirements specified for the actual building also apply to special mockups and vice versa. Variations in criteria over the surface of the building, such as wind pressure, shall be taken into account in testing of mockups. Where certain performance is required for specific test conditions of mockups and samples, that same performance is also required of the actual building, for natural conditions equivalent to or less severe than the test conditions.

C. Compliance with the specified performance requirements shall be established by testing of the full scale special mockups.

1.05 ACTION SUBMITTALS

A. Product Data: for items specified and included within mockup.

B. Shop Drawings: Include full size details of the mockups, profiles, materials, interface with other trades, and information regarding joints and fasteners.

C. Samples:

1. 12 inch x 12-inch sample assembly.
2. 4 inch x 4-inch pieces of non-standard colors selected by Commissioner.

D. Material List: Include list of materials and systems to be part of Special Mockups.

1.06 INFORMATIONAL SUBMITTALS

A. Manufacturer's Literature: Application and installation instructions.

B. Test and inspection reports: For special mockups. Show compliance with performance requirements.

C. Qualification Data: For Engineer and for Testing Agency.

D. Design Calculations: Submit calculations prepared by a qualified Engineer, showing compliance with the specified performance criteria. Calculations will not be reviewed by the Commissioner but are for informational purposes only. Test reports are not an acceptable substitute for design calculations.

1.07 QUALITY ASSURANCE

A. Fabricator/Installer Requirements: Same as those of the final construction.

B. Engineer Qualifications: Structural Engineer licensed in the State of Illinois and experienced in providing engineering services of the kind indicated that have resulted in the successful installations, similar in material, design, and extent to that indicated for this Project.

1.08 DELIVERY, STORAGE AND HANDLING

A. Build Special Mockups at a suitable location proposed by Contractor and approved by Commissioner.

PART 2 - PRODUCTS

2.01 MATERIALS

A. See the referenced specification sections.

B. Types, sizes, colors, patterns, products, and manufacturers are indicated on the Drawings. Furnish trim shapes as required by conditions, angles, corners, bullnose, and other shapes required by installation conditions.

2.02 FABRICATION

A. Methods of fabrication, assembly, and installation, unless otherwise indicated, shall be identical to the actual building. The Contractor shall be responsible to guarantee satisfactory performance as herein specified.

B. Include items for attaching components to supporting structure and supplementary parts and materials to complete the installation. Glazing members shall be removable for interchanging glass panels in the field.

2.03 FINISHES

A. Provide special mockup members free of scratches and serious blemishes affecting the finish system.

B. Finishes shall be in accordance with the related sections requirements.

C. Where indicated in the drawings, or as required by the Commissioner, mockup shall include alternate finishes for Commissioner's selection and approval.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Assemble components at the location approved by the Commissioner, utilizing anchoring methods, arrangement and allowances for expansion and contraction, proper joints and intersections, glazing, and sealing as required to obtain a rigid and weather resistant installation.

B. The mockups shall be constructed under the supervision of the fabricator's and installer's foremen.

C. Completed work shall be plumb, level, and true.

3.02 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified Testing Agency to perform tests and inspections.

B. Field Quality-Control Testing: Perform the following tests:

1. Gutter and Downspout Capacity Test: In accordance with the Municipal Code of Chicago Storm Drainage requirements, based on 200 percent of requirements (calculations shall assume double the actual roof area).
2. Water-Spray Test: A minimum of two tests areas, designated by the Commissioner, shall be tested according to AAMA 501.2.

C. Structural-Sealant Adhesion: Test structural sealant according to recommendations in ASTM C 1401, Destructive Test Method A, "Hand Pull Tab (Destructive)," Appendix X2.

1. Test a minimum of 12 areas.
2. Repair installation areas damaged by testing.

D. Assemblies will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

F. Repair leaks and other defects. Retest as directed by the Commissioner. Repair or replace other work damaged by such leaks.

3.03 DEMOLITION AND REMOVAL

A. When directed by the Commissioner, demolish and remove the mockups and supporting structure. Dispose of debris off the site.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 01 43 41, Special Mockups will not be measured for payment.

4.02 PAYMENT

A. No separate payment will be made for the Work covered in this section. Payment for the work of Section 01 43 41, Special Mockups will be included in the applicable line item contract lump sum price as shown in the Schedule of Prices.

END OF SECTION

SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book I Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section specifies requirements for temporary services and facilities, including utilities, construction and support facilities, security and protection, and decorative structural barricade scaffolding.

B. Temporary utilities required may include but are not limited to:

1. Water supply.
2. Temporary electric power and light.
3. Telephone service
4. Storm and sanitary sewer.
5. Temporary Fire Protection.

C. Temporary construction and support facilities required may include but are not limited to:

1. Temporary heat and light.
2. Field offices, parking and storage sheds.
3. Sanitary facilities, including drinking water.
4. Dewatering facilities and drains.
5. Temporary enclosures.
6. Hoists and temporary elevator use.
7. Temporary project identification signs and bulletin boards.
8. Waste disposal services.
9. Rodent and pest control.
10. Construction aids and miscellaneous services and facilities.
11. Temporary roads and paving.
12. Temporary signage and wayfinding.

D. Security and protection facilities required may include but are not limited to:

1. Barricades, scaffolding, warning signs, lights.
2. Enclosure for the site.
3. Security and protection for materials and construction stored or in place.
4. Environmental protection.
5. Protection and diverting of vehicular and pedestrian traffic.
6. Fire Protection.

1.03 SUBMITTALS

A. Temporary Utilities: Submit reports of tests, inspections, meter readings and similar procedures performed on temporary utilities.

B. Implementation and Termination Schedule: Submit a schedule indicating implementation and termination of each temporary utility within 15 days of the date established for commencement of the work.

1.04 QUALITY ASSURANCE

A. Regulations: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction, including but not limited to:

1. Building code requirements.
2. Health and safety regulations.
3. Utility company regulations.
4. Police, fire department and rescue squad rules.
5. Environmental protection regulations.
6. Local regulations for construction site cleanliness, including Chapter 7-28 of the Municipal Code of Chicago.
7. Local regulations for closure of lanes and streets from traffic.
8. Local regulations for closure of sidewalks to pedestrian traffic.

B. Standards: Comply with NFPA Code 241, "Building Construction and Demolition Operations", ANSI A 10 Series standards for "Safety Requirements for Construction and Demolition", and NECA Electrical Design Library "Temporary Electrical Facilities".

1. Refer to "Guidelines for Bid Conditions for Temporary Job Utilities and Services", prepared jointly by AGC and ASC, for industry recommendations.
2. Electrical Service: Comply with NEMA, NECA and UL standards and regulations for temporary electrical service. Install service in compliance with National Electric Code (NFPA 70) and current local codes.

C. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits, including permits required for installation of temporary facilities, enclosures, and barricades in public right of ways.

1.05 PROJECT CONDITIONS

A. Upon execution of the contract, the Contractor shall meet with and advise the affected utilities of the start of construction and verify and coordinate with the utilities any conditions of conflict or interference.

B. Temporary Utilities: Prepare a schedule indicating dates for implementation and termination of each temporary utility. At the earliest feasible time, when acceptable to the Commissioner, change over from use of temporary service to use of the permanent service.

1. It is hereby understood by the Contractor that no use shall be made whatsoever of the existing utilities at the site for the Contractor's own use or use in connection with the work, including electric power, lighting, gas, water, sewers and toilet facilities.

C. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Take necessary fire prevention measures. Do not overload facilities, or permit them to interfere with progress. Do not allow hazardous, dangerous or unsanitary conditions, or public nuisances to develop or persist on the site.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General: Provide new materials; if acceptable to the Commissioner, undamaged previously used materials in serviceable condition may be used. Provide materials suitable for the use intended.

B. Decorative Scaffolding Barricades:
1. Provide heavy duty, steel tube framing and translucent protective roof, of a design not requiring cross bracing.

C. Lumber and Plywood:

1. For job-built temporary offices, shops and sheds within the construction area, provide as a minimum UL labeled, fire-treated lumber and plywood for framing, sheathing and siding.
2. For signs and directory boards, provide exterior type, Grade B-B High Density Concrete Form Overlay Plywood conforming to PS-1, of sizes and thickness indicated.
3. For fences and vision barriers, provide exterior type plywood, 1/2" thick or greater.
4. For safety barriers, sidewalk bridges and similar uses, provide exterior type plywood, 5/8" thick or greater.
5. Plywood used for temporary partitions shall be exterior, CDX or better grade. The use of oriented strand board (OSB) will not be permitted for partitions.
6. Any sharp edges, protruding fasteners, splinters, or structural instability for conditions will be corrected by the contractor immediately.
7. All interior partitions shall be made of plywood. No fence panels will be allowed inside stations.

D. Roofing Materials: Provide as a minimum UL Class "A" standard weight asphalt shingles complying with ASTM D 3018, or UL Class "C" mineral surfaced roll roofing complying with ASTM D 249 on roofs of job-built temporary offices, shops and sheds.

E. Paint: Remove or cover graffiti.

1. For job-built temporary offices, shops, sheds, fences and other exposed lumber and plywood, provide exterior grade acrylic-latex emulsion over exterior primer.
   a. Surface must be recoated every 6 months.
   b. Remove all graffiti within 24 hours.
2. For sign panels and applying graphics, provide exterior grade alkyd gloss enamel over exterior primer.

F. Tarpaulins: Provide water-proof, fire-resistant, UL labeled tarpaulins with flame-spread rating of 15 or less. For temporary enclosures provide translucent nylon reinforced laminated polyethylene or polyvinyl chloride fire retardant tarpaulins.

G. Water: Provide potable water approved by local health authorities.

H. Open-mesh Fencing: Provide 0.192 inch diameter, galvanized 2 inch chain link fabric fencing 8 feet high with galvanized steel pipe posts, 1-1/2" I.D. for line posts and 2-1/2" I.D. for corner posts.

1. Security enclosures: Provide 9 gage, galvanized 2 inch, chain link security fabric 8 feet high with galvanized barbed wire top strands and galvanized steel pipe posts, 1-1/2" I.D. for line posts and 2-1/2" I.D. for corner posts.
2. Damaged construction panels shall be replaced within 48 hours from notification of contractor. Unacceptable conditions include, but are not limited to, bent/broken frames, unraveled or torn wire fabric or missing hardware.
3. All fence panels to be covered with green construction fencing fabric.
4. Green Fabric: Panels that have been tagged with graffiti shall be replaced, cleaned or painted. If painted, paint with matching green paint only.
5. Mesh fabric/fence screen will need to cover the entire wire mesh fabric on temporary panel. Fabric shall be woven to permit no less than 85% view obstruction through fabric. All fabric is to be replaced every 4 months.

I. Lighting that has been obscured/blocked by temporary enclosures shall be improved with additional temporary incandescent /fluorescent lighting located on the affected side of the enclosure.

2.02 EQUIPMENT

A. General: Provide new equipment; if acceptable to the Commissioner, undamaged previously used equipment in serviceable condition may be used. Provide equipment suitable for use intended.

B. Water Hoses: Provide 3/4" heavy-duty, abrasion-resistant, flexible rubber hoses 100 feet long, with pressure rating greater than the maximum pressure of the water distribution system; provide adjustable shutoff nozzles at hose discharge.

C. Electrical Outlets: Provide properly configured NEMA polarized outlets to prevent insertion of 110-120 volt plugs into higher voltage outlets. Provide receptacle outlets equipped with ground fault circuit interrupters, reset button and pilot light, for connection of power tools and equipment.

D. Electrical Power Cords: Provide grounded extension cords; use "hard service" cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords, if single lengths will not reach where construction activities are in progress.

E. Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered glass enclosures, where exposed to breakage. Provide exterior fixtures where exposed to moisture.

F. Heating Units: Provide temporary heating units that have been tested and labeled by UL, FM or another recognized trade association related to the type of fuel being consumed.

G. Temporary Offices: Include in the construction price the cost to provide, install, maintain, and remove upon completion one (1) temporary construction office with lockable

entrances, operable windows and serviceable finishes. Installation by the Contractor shall include furnishing, installing and removal upon completion of supports for the temporary office suitable for the loads, forces, and conditions anticipated. Location of temporary office shall be approved by the Commissioner.

1. Contractor's Office: Provide and maintain in neat and serviceable condition, a temporary construction office as headquarters for the work. Locate the construction office where directed by the Commissioner. Provide the office with heating, air conditioning, and adequate number of operating screened windows, doors with cylinder locks, and electric lights, and meeting accommodations for up to eight individuals at a time, all as approved by the Commissioner. Provide equipment and connections for phone, fax, internet, printer, scanner and copier. Remove the temporary office facility upon final completion and restore the area to its original condition.
2. Contractor shall pay for telephone and Edison service installation and connections. Contractor shall pay for all monthly utility and water charges and provide or pay for weekly cleaning services to be performed in this area through the entire job.

H. Temporary Toilet Units: Provide self-contained single-occupant toilet units of the chemical, aerated recirculation or incinerating type, properly vented and fully enclosed with a glass fiber reinforced polyester shell or similar non-absorbent material.

I. First Aid Supplies: Comply with governing regulations.

J. Fire Extinguishers: Provide hand-carried portable UL-rated, class "A" fire extinguishers for temporary offices and similar spaces. In other locations provide hand-carried, portable, UL-rated, class "ABC" dry chemical extinguishers, or a combination of extinguishers of NFPA recommended classes for the exposures.

1. Comply with NFPA 10 and 241 for classification, extinguishing agent and size required by location and class of fire exposure.

K. Posting Permits: Provide weather-proof, glass enclosed, outdoor bulletin board near construction office for posting all permits during entire construction period.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve the project adequately and result in minimum interference with performance of the work. Relocate and modify facilities as required.

B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not move until facilities are no longer needed, or are replaced by authorized use of completed permanent facilities.

3.02 TEMPORARY UTILITY INSTALLATION

A. General: Engage the appropriate local utility company to install temporary service or connect to existing service. Where the company provides only part of the service,

provide the remainder with matching, compatible materials and equipment; comply with the Company's specifications.

1. Arrange with the company and existing users for a time when service can be interrupted, where necessary, to make connections for temporary services.
2. Provide adequate capacity at each stage of construction. Prior to temporary utility availability, provide trucked-in services.
3. Obtain easements to bring temporary utilities to the site, where the Agency's easements cannot be used for that purpose.
4. Use Charges: Cost or use charges for temporary facilities are not chargeable to the Commissioner, and will not be accepted as a basis of claims for a Change Order.

B. Water Service: Install water service and distribution piping of sizes and pressures adequate for construction until permanent water service is in use.

1. Sterilization: Sterilize temporary water piping prior to use.

C. Temporary Electric Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload protected disconnects, automatic ground fault interrupters and main distribution switch gear.

1. Power Distribution System: Install wiring where least exposed to damage. Where permitted, wiring circuits not exceeding 125 volts, AC 20 ampere rating and lighting circuits may be non-metallic sheathed cable where overhead and exposed for surveillance. The circuits installed shall be the minimum number required by building codes.

D. Temporary Lighting: Whenever overhead floor or roof deck has been installed, provide temporary lighting with local switching.

1. Install and operate lighting that will fulfill security and protection requirements, without operating the entire system, and will provide adequate illumination for construction operations and traffic conditions.

E. Temporary Telephones: Provide temporary telephone service for all personnel engaged in construction activities, throughout the construction period. Install telephone on a separate line.

1. At each telephone, post a list of important telephone numbers.

F. Sewers and Drainage: If sewers are available, provide temporary connections to remove effluent that can be discharged lawfully. If sewers are not available for the discharge of effluent, provide containers to remove and dispose of effluent off the site in a lawful manner.

1. Filter out excessive amounts of soil, construction debris, chemicals, oils and similar contaminants that might clog sewers or pollute waterways before discharge.
2. Connect temporary sewers to the municipal system as directed by the sewer department officials.

3. Maintain temporary sewers and drainage facilities in a clean, sanitary condition. Following heavy use, restore normal conditions promptly.
4. Protect site from puddling or running water.

3.03 TEMPORARY CONSTRUCTION AND SUPPORT FACILITIES INSTALLATION

A. Locate field offices, storage sheds, sanitary facilities and other temporary construction and support facilities where approved by the Commissioner.

1. Maintain temporary construction and support facilities until final completion or earlier, as approved by the Commissioner.

B. Provide non-combustible construction for offices, shops and sheds located within the construction area, or within 30 feet of building lines. Comply with requirements of NFPA 241.

C. Temporary Heat: Provide temporary heat required by construction activities, for curing or drying of completed installations or protection of installed construction from adverse effects of low temperature or high humidity. Select safe equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce the ambient condition required and minimize consumption of energy.

D. Heating Facilities: Except where use of the permanent system is authorized, provide vented self-contained LP gas or fuel oil heaters with individual space thermostatic control.

1. Use of gasoline burning space heaters, open flame, or salamander type heating units is prohibited.

E. Storage and Fabrication Sheds: Install storage and fabrication sheds, sized, furnished and equipped to accommodate materials and equipment involved, including temporary utility service. Sheds may be open shelters or fully enclosed spaces.

F. Sanitary facilities include temporary toilets, wash facilities and drinking water fixtures. Comply with regulations and health codes for the type, number, location, operation and maintenance of fixtures and facilities. Install where facilities will best serve the project's needs.

1. Provide toilet tissue, paper towels, paper cups and similar disposable materials for each facility. Provide covered waste containers for used materials. Service units at least twice weekly.

G. Toilets: Install self-contained toilet units. Shield toilets to ensure privacy. Use of pit-type privies will not be permitted.

H. Drinking Water Facilities: Provide containerized tap-dispenser bottled-water type drinking water units, including paper cup supply.

I. Temporary Lifts and Hoists: Provide facilities for hoisting materials. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities. The use of elevator for construction materials or personnel is not permitted.

J. Project Identification and Temporary Signs: Provide project identification signs in accordance with design on Drawings CX120 – CX121 and other signs at each active worksite and CTA station as required; install signs where indicated to inform the public and persons seeking entrance to the project. Support on scaffold / barricades as shown, or by posts or framing of preservative treated wood or steel. Do not permit installation of unauthorized signs. Repair damaged signage and graffiti in a timely manner, not to exceed one business week, or as directed by the drawings or the Office of the Commissioner.

1. Project Identification Signs: Engage an experienced sign painter to apply graphics. Comply with details indicated. Provide two (2) project signs for each active worksite and CTA station on this project, locations as directed by the Commissioner.
2. Temporary Signs: Prepare signs to provide directional information to construction personnel and visitors.
3. Local Business and Shops signage by suspended placard and on parapet facing.
4. Locate signs as directed by the Commissioner. Maintain in good condition until Substantial Completion of the project and then remove from the site.

K. Temporary Exterior Lighting: Install exterior yard and sign lights so that signs are visible when work is being performed.

L. Collection and Disposal of Waste: Collect waste from construction areas and elsewhere daily. Comply with requirements of NFPA 241 for removal of combustible waste materials and debris. Enforce requirements strictly. Do not hold materials more than 7 days during normal weather or 3 days when the temperature is expected to rise above 80 degree F (27 degree C). Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material in a lawful manner.

M. Street, Sidewalk and Alley Cleaning: The Contractor shall maintain adjacent streets, sidewalks and alleys continually free of dirt and debris resulting from Contractor's operations, shall provide street cleaning as necessary and directed by the Commissioner, and pay for all costs related to this operation. If the Contractor fails to perform this function, the Commissioner may do such cleaning and charge same to the Contractor.

3.04 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Temporary Fire Protection: Install and maintain temporary fire protection facilities of the types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 10 "Standard for Portable Fire Extinguishers", and NFPA 241 "Standard for Safeguarding Construction, Alterations and Demolition Operations".

1. Locate fire extinguishers where convenient and effective for their intended purpose.
2. Store combustible materials in containers in fire-safe locations.
3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways and other access routes for fighting fires. Prohibit smoking in hazardous fire exposure areas.

4. Provide supervision of welding operations, combustion type temporary heating units, and similar sources of fire ignition.

B. Barricades, Scaffolds, Warning Signs and Lights: Comply with standards and code requirements for erection of structurally adequate barricades. Paint with appropriate colors, graphics and warning signs to inform personnel and the public of the hazard being protected against. Where appropriate and needed provide lighting, including flashing red or amber lights.

1. Concrete barriers or approved fencing shall be provided to separate restricted work-hour area from the unrestricted work-hour area. The exact location and number of the barriers shall be approved by the Commissioner. The materials and installation of the temporary concrete barriers shall be in accordance with Standard 704001 of the IDOT Highway Standards.

2. Provide barriers, signage, or other approved means to warn pedestrians and vehicles of the work of this project and protect personnel and the public from dust, falling debris, and other damage or injury.

3. Plastic Flexible Barriers:

a. Use of Plastic Flexible Warning Fencing is prohibited for use as temporary storage enclosures in all public access areas. The Plastic Flexible Warning Fencing/Netting should only be used as a visual warning barrier for day work, and such applications shall be requested of, and approved in writing by, the Commissioner.

4. Solid Safety Barriers:

a. The Contractor shall build and maintain a solid barrier on a daily basis if the work creates a safety hazard for the public. The Safety Engineer/Supervisor shall include inspection of the barrier in his/her daily walk-through of the construction site. This barrier should be 8 feet high minimum.

b. The Barrier shall be removed upon completion of the Work or as directed by the Commissioner.

5. Constructing Temporary Enclosures and Structures on Station Platforms:

a. Solid enclosures for temporary storage or work area separation shall be constructed of fire retardant material (such as wood treated with fire retardant chemicals etc.). Enclosures constructed of metal shall be properly grounded. Dust shields shall be provided if the enclosure is being used for demolition work. Applications for Enclosures/Structures must be requested of, and approved in writing by the Commissioner.

b. The height of the plywood/material of any enclosure/structure shall be not less than eight feet from the platform/mezzanine’s finished floor.

c. Doors shall not swing to the outside of enclosure(s) that are located in areas used by passengers.

d. Enclosures shall not create any cul-de-sac(s) (i.e., blind alley(s) or dead end(s)).

D. Enclosure Fences: When excavation begins, install an enclosure fence with lockable entrance gates. Locate where indicated, or enclose the entire site or the portion determined sufficient to accommodate construction operations. Install in a manner that will prevent people, dogs and other animals from easily entering the site, except by the entrance gates.

1. Provide 1 1/4" open-mesh, chain-link fencing with posts set in a compacted mixture of gravel and earth.

E. Covered Walkway / Construction Barricade / Scaffolding: Where shown on drawings or as required by the Commissioner, erect a structurally adequate protective covered walkway for passage of persons along the adjacent public route. Coordinate with entrance gates, other facilities and obstructions. Comply with regulations of authorities having jurisdiction, and meeting the Chicago Building Code, Div. 32, Chapter 10-28, Article V-8.

1. Provide a heavy duty, structurally rigid, decorative covered walkway that does not require bracing at the pedestrian level; is adaptable to variable sidewalk widths with spans up to 30 feet; with piston type feet for leveling height adjustment at irregular or sloping pavement levels; able to withstand a minimum of 100 mph winds and up to 300 psf live loads; high-strength translucent roof cladding capable of protecting from falling debris; and hard-wired integrated LED lighting in a decorative pattern. Scaffold structure shall be factory finished and repainted as necessary throughout the construction period; and the scaffold canopy shall provide for integrated painted or attached signage.
Basis of Design: Urban Umbrella, New Development; 20 Harrison St. NY, NY 10013; 646-798-7276; urbanumbrella.com/newdev

2. Provide protective plywood enclosure walls as located and described on the drawings, and include handrails, barricades, warning signs, lights, safe and well-drained walkways and similar provisions for protection and safe passage. Extend the backwall beyond the structure to complete the enclosure fence. Paint and maintain in a manner acceptable to the Commissioner.

3. Install warning lights and alarms to alert pedestrians of vehicles crossing temporary passage ways.

F. Security Enclosure and Lockup: If shown or required by the Commissioner, install security temporary enclosure with locking entrances to prevent unauthorized entrance, vandalism, theft and similar violations of security.

1. Storage: It is advisable that the Contractor provide a secure lockup for items and equipment stored at the site to minimize the possibility of their theft or vandalized. Any items or equipment stored at the site is the Contractor’s responsibility.

G. Environmental Protection: Provide protection, operate temporary facilities and conduct construction in ways and by methods that comply with environmental regulations, and minimize the possibility that air, waterways, and subsoil might be contaminated or polluted, or that other undesirable effects might result. Avoid use of tools and equipment

which produce harmful noise. Restrict use of noise making tools and equipment to hours that will minimize complaints from persons or firms near the site. Comply with all local ordinances.

3.05 OPERATION, TERMINATION AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.

B. Termination and Removal: Provide temporary utilities and facilities until final completion or approval of the Commissioner and at no extra cost to the Commissioner. Remove each temporary facility when the need has ended, or when replaced by authorized use of a permanent facility. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged work, clean exposed surfaces and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of the Contractor. The Commissioner reserves the right to take possession of project identification sign.

2. Clean or remove surfaces and materials contaminated with dust, debris, and other compounds or substances and restore to original condition.

C. At Substantial Completion, clean and renovate permanent facilities that have been used during the construction period, including but not limited to the following:

1. Replace air filters and clean inside of ductwork and housings.
2. Replace significantly worn parts and parts that have been subject to unusual operating conditions.
3. Replace lamps that are burned out or noticeably dimmed by substantial hours of use.

D. Touch up or repaint with matching finishes and colors painted areas that have been scarred by construction activity or noticeably worn or soiled by use.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of TEMPORARY FACILITIES will not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work specified in the TEMPORARY FACILITIES AND CONTROLS article will be considered included in the contract lump sum price as shown in the Schedule of Prices for MOBILIZATION.

4.03 PAY ITEM ACCOUNT NUMBER

A. Mobilization: 017113

END OF SECTION

SECTION 01 55 26

TRAFFIC CONTROL

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Furnish and install all Traffic Control as shown on the Drawings and as specified herein, including but not limited to the following:

1. The governing factor in the execution and staging of construction for this Project is to provide the public with the safest possible travel conditions.
2. The Work under this Section includes the furnishing, installation, maintenance and removal of all traffic control and protection, including but not limited to signs, message boards, arrow boards, temporary concrete barriers, removal of existing pavement markings, energy attenuating systems, barricades, flagmen, warning lights, sandbags and all appurtenances used for the purpose of safely regulating, warning or guiding traffic and pedestrians through the construction zone as required by these Detailed Specifications and as directed by the Commissioner.
3. Traffic Control is required for all work along Lake St. between Dearborn St. and Wabash Ave. as well as State St. between Randolph St. and Wacker Dr. and the local roadways as identified in the Maintenance of Traffic Plan

1.03 REFERENCES

A. Illinois Department of Transportation - Standard Specifications for Road and Bridge Construction, latest edition.

B. Illinois Department of Transportation – Manual on Uniform Traffic Control Devices for Streets and Highways, latest edition.

C. CDOT Rules and Regulations for Construction in the Public Way, latest edition.

1.04 SUBMITTALS

A. Submit the following

1. Traffic Control Plan
   a. The Contractor must submit a traffic control plan for the Project showing lane closures and durations and all signing and traffic control devices required with closures for the duration of the Project.

b. The Contractor must submit all requests and obtain all approvals for temporary lane closures from the Commissioner. All requests shall be submitted a minimum of 72 hours in advance of the proposed road closures.

2. Construction schedule for Traffic Control Plan

a. See Construction plans for road closure, detour, and construction schedules.

1.05 QUALITY CONTROL

A. Installation must be performed only by a qualified installer. The term qualified means experienced in performing the Work required by this Section on Projects of comparable scope, size, and complexity. The Contractor must be able to demonstrate to the satisfaction of the Commissioner and Chief Procurement Officer that it and/or any subcontractors performing such Work have the qualifications, experience and, if applicable, licenses and permits to perform the Work in accordance with the terms and conditions of this Contract. The Contractor must submit evidence of such qualifications, licenses, and permits upon request by the Commissioner.

1. The Contractor must provide a manned telephone on a continuous 24-hour-a day basis to receive notification of any deficiencies regarding traffic control and protection to correct any such deficiencies.

B. Perform Work in accordance with the latest edition, of the appropriate divisions, of the following:

1. IDOT Standard Specifications for Road and Bridge Construction.
2. IDOT Manual on Uniform Traffic Control Devices for Streets and Highways.
3. IDOT Standard Specifications for Traffic Control Items.

1.06 SPECIAL REQUIREMENTS

A. Job Conditions - General

1. The Contractor's vehicles must always move with and not across or against the flow of traffic, separated from traffic by temporary precast concrete barriers if required.
2. Vehicles must enter or leave work areas in a manner, which will not be hazardous to or interfere with normal traffic. Vehicles must not park or stop except within the designated work areas.
3. Personal vehicles will not be permitted to park within the right of way. The Contractor's personnel will be prohibited from crossing the roadway, and all pedestrian movements will be limited to within barricaded areas.

PART 2 - MATERIALS AND EQUIPMENT

2.01 MATERIALS

A. Traffic Control Devices

1. All signs, signals, markings, reflectorized safety posts, portable barricades, portable flashers, arrow boards, portable message sign boards, flagmen, or other devices that are used for the purpose of regulating, warning and guiding local and crossroad traffic must conform to the applicable portions of the State of Illinois "Manual on Uniform Traffic Control Devices for Streets and Highways," and "Standard Specifications for Traffic Control Items."
2. Striping obliterating tape to void pavement marking will be black, non-reflective and self- adhering.
3. No waiving of these requirements will be allowed without the prior written approval of the Commissioner.
4. Before beginning construction if the Contractor intends to use any signs not shown in the manual or any modification of standards shown in the manual, the Contractor must submit the details of the change and the use of the modified signs.

PART 3 - CONSTRUCTION METHODS AND INSTALLATION

3.01 GENERAL

A. All traffic control and protection must conform to the requirements of Section 701 Work Zone Traffic Control and Protection, IDOT Standard Specifications for Road and Bridge Construction, latest edition.

B. The cones or barricades, lights, and all warning signs, as required by IDOT, which will be required whenever a lane of the traveled way is closed to traffic, will be furnished and maintained by the Contractor. The Contractor will furnish and maintain all additional barricades, signs, warning lights, cones and flagmen, which is the opinion of the Commissioner, are necessary to safeguard the traffic and protect the work site. The Contractor will be responsible for the traffic protection for the duration of this Contract.

C. Placement of all signs and barricades must proceed in the direction of flow of traffic. Removal of all signs and barricades must start at the end of the construction areas and proceed toward oncoming traffic unless otherwise directed by the Commissioner. The Contractor will be required to cover all traffic control devices which may be inconsistent with traffic patterns during all changes.

3.02 FURNISH

A. The Contractor's manner of prosecuting the work or minor revisions or modifications in the construction operations may require traffic control to not be installed in accordance with a standard detail and device. In such cases, the standard details and devices proposed to be used must be submitted to and approved by the Commissioner in advance of the change in traffic control.

B. The Contractor will be required to furnish all traffic control devices unless specifically stated otherwise. Whenever the operation of the Contractor endangers or interferes with vehicular or pedestrian traffic, as determined by the Commissioner, the Contractor will furnish all additional traffic control devices necessary to direct traffic and protect his workmen, at no extra cost to the Commissioner. Sand bags that are used to secure

barricades and sign stands are included in this item. The Commissioner reserves the right to inspect all traffic control equipment furnished by the Contractor one week before it is used on this Contract. In addition, the Contractor must furnish additional flagmen at no cost to the Commissioner, on a continuous basis whenever construction operations encroach on traveled lanes, such as pavement marking, patching operations, etc.

C. Portable precast units which have the New Jersey configuration and which have previously been cast meeting earlier Illinois Department of Transportation standards may be used on this Project. The units must be in good condition, without cracks or spalls, and the connecting loops must not be broken. The Contractor will be allowed to mix barrier units of previous designs in the same run with new units, provided the connecting loops are compatible and the units are of the same width so that a smooth, continuous face can be obtained. Units having designs other than the New Jersey configuration may be used with the written approval of the Commissioner.

3.03 INSTALLATION

A. Lane closure signs, flagmen signs, and detour signs must be erected prior to placement of drums, barricades, and/or cones and remain erected until such time as the traffic control devices have been removed from the pavement.

B. Construction signs referring to temporary lane closures during working hours must be removed or covered during nonworking hours.

C. The Contractor must so arrange his operations as to keep the closing of any lane of the traveled way to a minimum.

D. The Contractor will be responsible for the proper location, installation and arrangement of all traffic control devices used for the Project. The Commissioner will inspect the traffic control device placement before work on each stage begins, and any deficiencies will be corrected by the Contractor before starting work on that stage.

E. Whenever operations require or indicate that a relocation of a proposed or existing traffic control device is advisable including the existing signs and barricades as determined by the Commissioner, the Contractor must remove, relocate, and erect all traffic control devices in question. After the work has been completed, the Contractor, at the Commissioner's direction, must return and erect the device in its original location.

F. All advance warning signs for lane closures, guide signs, intermediate information signs and standard signs must be installed at a minimum mounting height of seven feet to the bottom of the sign. Signs must be installed in a manner to resist damage or knockdown in severe wind conditions and also allow ease of relocation during stage changes.

G. The Contractor will not be permitted to erect, change or remove his barricade system without prior approval of the Commissioner. The Contractor will be required to leave and maintain all traffic control devices in place until all construction operations have been completed in each stage. The Contractor must arrange and manipulate barricade placement and schedule construction operations to permit continuous operation of all lanes designated as open to traffic

unless otherwise directed by the Commissioner.

H. The height of the barricades must be no less than three feet above the pavement or shoulder elevation. This additional protection will be considered included in the Contract, and no additional compensation will be allowed.

1. At some locations it may be necessary to supplement Type II barricades with 55-gallon steel drums. The Contractor will do this upon request from the Commissioner, at no additional cost to the City.

I. Removal of existing pavement marking and striping where required, will be by use of water blasting only.

3.04 MAINTENANCE

A. The Contractor will be required to respond to any call from the Commissioner concerning all requests for improving or correcting traffic control devices including pavement marking tape, within one-half hour from the time of notification.

B. In the event of severe weather conditions, the Contractor must provide additional personnel and equipment to maintain, relocate or remove all traffic control devices. In additional to general maintenance requirements throughout the day, the Contractor must realign all traffic control devices as necessary on a daily basis. The Contractor must relocate to the proper location all traffic control devices misplaced by Subcontractor operations. After notification, relocation of devices must take place in an expeditious manner.

3.05 REMOVE

A. The Contractor must remove all traffic control devices that were furnished, installed, and maintained by him or her under this Contract, and such devices, will remain the property of the Contractor. All traffic control devices must remain in place until specific authorization to relocate the devices is received from the Commissioner for stage changes.

3.06 TEMPORARY GUIDE SIGNS

A. The Contractor will furnish and erect temporary guide signs at the Project for maximum public guidance through the construction area and must maintain same in good condition until completion of the Project. Upon completion, the signs shall be removed. The location of the signs will be determined by the Commissioner. These temporary signs must be displayed in place prior to the commencement of construction.

3.07 GENERAL CLEAN-UP

A. All rubbish and debris resulting from the Work of this Section must be collected and disposed of as directed by the Commissioner. The Contractor must keep all public roadways, and other public right-of-ways affected by the work, clean and free from debris and dust at all times.

B. All work areas must be left in a broom clean condition.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of TRAFFIC CONTROL shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of TRAFFIC CONTROL shall be included in the contract lump sum price as shown in the Schedule of Prices for CIVIL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Civil Work: 020000.

END OF SECTION 01 55 26

SECTION 01 60 00

PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions, and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Sections include the following:
1. Substitution Procedures: Section 01 25 00.
2. References: Section 01 42 00.
3. Contract Closeout: Section 01 70 00.
4. Divisions 01 through 41 Sections for specific warranty requirements for products and installations specified to be warranted.

1.03 DEFINITIONS

A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer’s published product literature that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: Where a specific manufacturer’s product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

1.04 INFORMATIONAL SUBMITTALS

A. Product List: Submit a list, in tabular from, showing specified products. Include generic names of products required. Include manufacturer’s name and proprietary product names for each product.
1. Coordinate product list with Contractor’s Construction Schedule and the Submittals Schedule.
2. Form: Tabulate information for each product under the following column headings:

a. Specification Section number and title.
b. Generic name used in the Contract Documents.
c. Proprietary name, model number, and similar designations.
d. Manufacturer's name and address.
e. Supplier's name and address.
f. Installer's name and address.
g. Projected delivery date or time span of delivery period.
h. Identification of items that require early submittal approval for scheduled delivery date.

3. Initial Submittal: Within fifteen days after date of commencement of the Work, submit three copies of initial product list. Include a written explanation for omissions of data and for variations from Contract requirements.
   a. At Contractor's option, initial submittal may be limited to product selections and designations that must be established early in Contract period.
4. Completed List: Within thirty days after date of commencement of the Work, submit three copies of completed product list. Include a written explanation for omissions of data and for variations from Contract requirements.
5. Commissioner's Action: Commissioner will respond in writing to Contractor within five days of receipt of completed product list. Commissioner's response will include a list of unacceptable product selections and a brief explanation of reasons for this action. Commissioner's response, or lack of response, does not constitute a waiver of requirement to comply with the Contract Documents.

B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 01 33 00 Submittal Procedures. Show compliance with requirements.

1.05 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.
1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
2. If a dispute arises between contractors over concurrently selectable but incompatible products, Commissioner will determine which products shall be used.

1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.

B. Delivery and Handling:
1. Schedule delivery to minimize long term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.

C. Storage:
1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.

3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Store cementitious products and materials on elevated platforms.
5. Store foam plastic from exposure to sun fight, except to extent necessary for period of installation and concealment.
6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather protection requirements for storage.
7. Protect stored products from damage and liquids from freezing.
8. Provide a secure location and enclosure at Project site for storage of materials and equipment by Commissioner's construction forces. Coordinate location with Commissioner.

1.07 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
   1. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Commissioner.
   2. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Commissioner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.
   1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
   2. Specified Form: When specified forms are included with the Specifications, prepare a written document using appropriate form properly executed.
   3. Refer to Divisions 03 through 32 Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 01 70 00 Contract Closeout.

PART 2 - PRODUCTS

2.01 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at time of installation.
   1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
   2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
   3. Commissioner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
   4. Where products are accompanied by the term "as selected," Commissioner will make selection.
   5. Where products are accompanied by the term "match sample," sample to be matched is Commissioner's.
   6. Descriptive, performance, and reference standard requirements in the Specifications

establish "salient characteristics" of products.

B. Product Selection Procedures:
   1. Product: Where Specifications name a single product and manufacturer, provide the named product that complies with requirements.
   2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements.
   3. Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
   4. Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
   5. Product Options: Where Specifications indicate that sizes, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide the specified product or system.
   6. Basis-of-Design Product: Where Specifications name a product and include a list of manufacturers, provide the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product by the other named manufacturers.
   7. Where products are specified by name and accompanied by the term "or equal", "or approved equal", or "or other as approved by Commissioner, comply with provisions of Section 01 25 00 Substitution Procedures. The Commissioner is the sole determiner of what is equal, equivalent or acceptable for such products and substitutions.
   8. Visual Matching Specification: Where Specifications require matching an established Sample, select a product that complies with requirements and matches Commissioner's sample. Commissioner's decision will be final on whether a proposed product matches.
      a. If no product available within specified category matches and complies with other specified requirements, comply with provisions in Section 01 25 00 Substitution Procedures for proposal of product.
   9. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product that complies with other specified requirements.
      a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Commissioner will select color, pattern, density, or texture from manufacturer's product line that does not include premium items.
      b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Commissioner will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.02 COMPARABLE PRODUCTS

A. Conditions for Consideration of Comparable Products: Commissioner will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Commissioner may return requests without action, except to record noncompliance with these requirements:
   1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant product qualities include attributes such as type, function, in-service performance and physical properties,

weight, dimension, durability, visual characteristics, and other specific features and requirements.

2. Evidence that proposed product provides specified warranty.
3. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
4. Samples, if requested.

B. Submittal Requirements: Approval by the Commissioner of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.

PART 3 - EXECUTION (Not Used)

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of PRODUCT REQUIREf1ENTS will not be measured for payment.

4.02 PAYMENT

A. No separate payment will be made for the Work covered in this section. Payment for the Work of PRODUCT REQUIREf1ENTS will be included in the applicable Line Item contract lump sum price as shown in the Schedule of Prices.

END OF SECTION

SECTION 01 70 00

CONTRACT CLOSEOUT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions, and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section specifies the requirements for closing out the Contract in addition to those requirements specified in the Special Conditions and the Additional Special Conditions.

1.03 INFORMATIONAL SUBMITTALS

A. Submit a deliverables log for items to be delivered during Closeout.

PART 2 - PRODUCTS

2.01 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
   1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
   2. Advise Commissioner of pending insurance changeover requirements.
   3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
   4. Obtain and submit releases permitting Commissioner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
   5. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs, damage or settlement surveys, property surveys, and similar final record information.
   6. Deliver tools, spare parts, extra materials, and similar items to location designated by Commissioner. Label with manufacturer’s name and model number where applicable.
   7. Make final changeover of permanent locks and deliver keys to Commissioner. Advise Commissioner's personnel of changeover in security provisions.
   8. Complete startup testing of systems.
   9. Submit test/adjust/balance records.
   10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
   11. Advise Commissioner of changeover in heat and other utilities.
   12. Submit changeover information related to Commissioner’s occupancy, use, operation, and maintenance.
   13. Complete final cleaning requirements, including touchup painting.
   14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of

request, Commissioner will either proceed with inspection or notify Contractor of unfulfilled requirements. Commissioner will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Commissioner, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for Final Completion.

2.02 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:
   1. Submit a final Application for Payment.
   2. Submit certified copy of Commissioner's Substantial Completion inspection list of items to be corrected (punch list), endorsed and dated by Commissioner. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
   3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
   4. Submit pest control final inspection report and warranty.
   5. Instruct Commissioner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Commissioner will either proceed with inspection or notify Contractor of unfulfilled requirements. Commissioner will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
   1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

2.03 PUNCH LIST ITEMS

A. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
   1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
   2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
   3. Include the following information at the top of each page:
      a. Project name.
      b. Date.
      c. Name of Commissioner.
      d. Name of Contractor.
      e. Page number.
   4. Submit list of incomplete items in the following format:
      a. PDF electronic file. Commissioner will return annotated file.

2.04 WARRANTIES

A. Submittal Time: Submit written warranties on request of Commissioner for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

B. Partial Occupancy: Submit properly executed warranties within ten days of completion of

designated portions of the Work that are completed and occupied or used by Commissioner during construction period by separate agreement with Contractor.

C. Organize warranty documents into an orderly sequence based on the Table of Contents of the Project Manual.
   1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by- I 1-inch paper.
   2. Provide heavy paper dividers with plastic covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
   3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 3 - EXECUTION

3.01 DEMONSTRATION AND TRAINING

A. Operating and Maintenance Instruction: Instruct the Commissioner’s personnel to operate, adjust, and maintain systems, subsystems and stand-alone equipment not part of a system. Provide instructors experienced in operation and maintenance procedures. Arrange for each installer of equipment that requires regular maintenance to meet with the Commissioner’s personnel to provide instruction in proper operation and maintenance at each location. If installers are not experienced in procedures, provide instruction by manufacturer's representatives. Provide instruction at mutually-agreed-on times. For equipment that requires seasonal operation, provide similar instruction at the start of each season. Schedule training with the Commissioner providing at least fourteen days advanced notice.

B. Instruction for operating equipment shall include, but not be limited to, the following:
   1. System design and operating philosophy review.
   2. Document review, including operation and maintenance manuals and as- built documents.
   3. Operations review, including:
      a. Safety procedures.
      b. Hazards.
      c. Control Sequences
      d. Startup
      e. Shutdown
      f. Emergency operations
   4. Adjustments, including those for noise, vibration economy, and energy efficiency.
   5. Troubleshooting
   6. Maintenance, including:
      a. Safety procedures.
      b. Hazards.
      c. Spare parts and materials.
      d. Tools.
      e. Lubricants.
      f. Fuels.
      g. Cleaning.
      h. Warranties.

i. Maintenance agreements and similar continuing commitments.

7. Repair

3.02 CLEANING

A. General: In addition to the daily clean-up required by the ADDITIONAL SPECIAL CONDITIONS, the Contractor is responsible for the final cleaning of the job site and for the coordination and direction of the cleaning by every trade. Each trade is required to perform cleaning for its portion of the Work and as directed by the Contractor. Perform final leaning of items provided as a part of the Contract, before acceptance of the Work, including removal of dust, dirt, and stains from all finished metal, stone, glass, or other finish surfaces.

B. Unfinished Areas: Clean the shafts, closets, chases, and similar spaces which are generally unfinished, and leave free from rubbish loose material, droppings, extraneous construction materials, dirt, and dust.

C. Finished Areas: Clean finished surfaces to remove any mortar, dust, and other extraneous matter, including but not limited to, the exposed surfaces of finished metal, concrete, masonry, stone, equipment, and fixtures.

D. Final Cleaning: In addition to the cleaning specified herein and in the various sections of the Specifications, prepare the work for acceptance by a thorough cleaning throughout, including washing or cleaning of surfaces on which dirt or dust has collected. Employ a firm specializing in window cleaning to wash and polish glass on both sides. Re-cleaning will not be required after the Work has been inspected and accepted unless later operations of the Contractor make re-cleaning of certain portions necessary.

E. Removal: Remove public and private trash and rubbish from every area on a daily basis. As soon as practicable after completion of the Work, dismantle the temporary construction facilities and remove from the site the construction equipment, fences, scaffolding, rubbish of every kind, surplus materials, and supplies belonging to Contractor or its subcontractors.

3.03 SUBMITTALS FOR CONTRACT CLOSEOUT

A. Warranties and Guarantees: In addition to the general guarantee of the Work, as required by the GENERAL CONDITIONS and ADDITIONAL SPECIAL CONDITIONS, furnish any other extended warranties or guarantees as required by the Specifications.

B. Waivers of Lien: Furnish the releases and waivers of liens arising out of the provisions of the Contract.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of PROJECT CLOSEOUT will not be measured for payment.

4.02 PAYMENT

A. No separate payment will be made for the Work covered in this section. Payment for the Work of CONTRACT CLOSEOUT will be included in the applicable Line Item contract lump sum price as shown in the Schedule of Prices.

END OF SECTION

SECTION 01 73 29
CUTTING AND PATCHING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book I Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This section specifies administrative and procedural requirements for cutting and patching.

B. Execute cutting, filling or patching of work to:

1. Install specified work.
2. Remove samples of installed work specified for testing.
3. Remove and replace defective work.

C. In addition, upon written instructions of the Commissioner:

1. Uncover work to provide for observation of covered work.
2. Remove samples of installed materials for testing.
3. Remove work to provide for alteration of existing work.

D. Do not cut or alter work of another contractor without written consent of the Commissioner.

E. Refer to other sections for specific requirements and limitations applicable to cutting and patching individual parts of work, including those applicable to mechanical, electrical and communication installations.

F. Demolition of selected portions of the structure for alterations is included in Section 02 41 19, Selective Structure Demolition.

1.03 SUBMITTALS

A. Cutting and Patching Proposal: Where approval of procedures for cutting and patching is required before proceeding, submit a proposal describing procedures at least 21 calendar days in advance of the time cutting and patching will be performed and request approval to proceed. Include the following information, as applicable, in the proposal:

1. Describe the extent of cutting and patching required and how it will be performed; indicate why it cannot be avoided.
2. Describe anticipated results in terms of changes to existing construction; include changes to structural elements and operating components as well as changes in the building's appearance and other significant visual elements.
3. List products to be used and firms or entities that will perform work.
4. Indicate dates when cutting and patching will be performed.

5. List utilities that will be disturbed or affected, including those that will be relocated and those that will be temporarily out of service. Indicate how long service will be disrupted.
6. Where cutting and patching involves addition of reinforcement to structural elements, submit details and engineering calculations to show how reinforcement is integrated with the original structure.
7. Approval by the Commissioner to proceed with cutting and patching does not waive the Commissioner's right to later require complete removal and replacement of a part of the work found to be unsatisfactory.

B. Prior to cutting which affects structural members or work of another Contractor, submit written notice to the Commissioner requesting consent to proceed with cutting, including:

1. Project identification.
2. Description of affected work.
3. Necessity for cutting.
4. Effect on other work and their structural integrity.
5. Description of proposed work. Designate:
    a. Scope of cutting and patching
    b. Crafts to execute the work.
    c. Products proposed to be used.
    d. Extent of refinishing.
6. Alternatives to cutting and patching.
7. Designation of party responsible for cost of cutting and patching. Submit cost estimate for cutting and patching done on instruction of the Commissioner.

C. When conditions of work or schedule indicate change of materials or methods, submit recommendation to Commissioner, including:

1. Condition indicating change.
2. Recommendation for alternative materials or methods.
3. Submittals specified for substitutions.

D. Submit written notice to Commissioner, designating time work will be uncovered, to provide for observation.

1.04 QUALITY ASSURANCE

A. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would reduce their load-carrying capacity or load deflection ratio.

1. Obtain approval of the cutting and patching proposal before cutting and patching the following structural elements:

    a. Foundation construction.
    b. Bearing and retaining walls.
    c. Structural concrete.
    d. Structural steel or metals.
    e. Lintels.
    f. Structural decking.
    g. Equipment supports.
    h. Piping, ductwork, vessels and equipment.

B. Operational and Safety Limitations: Do not cut and patch operating elements or safety related components in a manner that would result in reducing their capacity to perform as intended, or result in increased maintenance, or decreased operational life or safety.

1. Obtain approval of the cutting and patching proposal before cutting and patching the following operating elements or safety-related systems:

a. Shoring, bracing, and sheeting.
b. Primary operational systems and equipment.
c. Air or smoke barriers.
d. Water, moisture, or vapor barriers.
e. Membranes and flashings.
f. Fire protection systems.
g. Noise and vibration control elements.
h. Control systems.
i. Communication systems.
j. Conveying systems.
k. Electrical wiring systems.

C. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in the Commissioner's opinion, reduce the building's aesthetic qualities or result in visual evidence of cutting and patching. Remove and replace work cut and patched in a visually unsatisfactory manner.

1. If possible, retain the original installer or fabricator to cut and patch the following categories of exposed work, or if it is not possible to engage the original installer or fabricator, engage another recognized experienced and specialized firm.

a. Processed concrete finishes.
b. Stonework and stone masonry.
c. Ornamental metal.
d. Preformed metal panels.
e. Window wall system.
f. Aggregate wall coating.

1.05 PAYMENT FOR COSTS

A. Cost of cutting and patch which is directed in the Contract Documents or which is required to perform the normal execution of other Work described in the Contract Documents, is a part of the Base Contract and must be performed at no additional cost to the Commissioner.

B. Costs caused by ill-timed or defective work, or work not conforming to contract documents, including costs for additional services of Commissioner must be paid for by the Party responsible for ill-timed, rejected or non-conforming work.

C. Work done on instructions of Commissioner (by change order), other than defective or nonconforming work will be paid by the Commissioner.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Use materials that are identical to existing materials. If identical materials are not available or cannot be used where exposed surfaces are involved, use materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect. Use materials whose installed performance will equal or surpass that of existing materials.

B. For replacement of work removed: Comply with specifications for type of work to be performed.

C. Where no material of the type is included in detail specifications, follow all generally accepted practices for the trade in question and provide commercial or professional grade materials designed for heavy duty service.

PART 3 - EXECUTION

3.01 INSPECTION

A. Before cutting existing surfaces examine surfaces to be cut and patched and conditions under which cutting and patching will be performed. If unsafe or unsatisfactory conditions are encountered, take corrective action before proceeding.

1. Before proceeding, meet at the site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.
2. Verify all dimensions and conditions in the field.
3. Inspect existing conditions of work, including elements subject to movement or damage during.
4. After uncovering work, inspect conditions affecting installation of new products.

3.02 PREPARATION

A. Temporary Support: Provide temporary support, shoring, and bracing to maintain structural integrity of project.

B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the project that might be exposed during cutting and patching operations.

C. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Take all precautions necessary to avoid cutting existing facilities until provisions have been made to bypass them.

3.03 PERFORMANCE

A. General: Employ skilled trade personnel to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.

1. Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.
2. Execute fitting and adjustment of products to provide finished installation to comply with specified tolerances, finishes.

B. Cutting: Cut existing construction using methods least likely to damage elements to be retained or adjoining construction. Where possible, review proposed procedures with the original installer; comply with the original installer's recommendations.

1. In general, where cutting, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.
3. Cut through concrete and masonry using a cutting machine, such as a carborundum saw or a diamond core drill.
4. Comply with requirements of applicable Sections where cutting and patching requires excavating and backfilling.
5. Where services are required to be removed, relocated, or abandoned, by-pass utility services, such as pipe or conduit, before cutting. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting.

C. Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances.

1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation.
2. Restore work which has been cut or removed; install new products to provide completed work in accord with contract documents.

3.04 CLEANING

A. Thoroughly clean areas and spaces where cutting and patching is performed. Remove completely paint, mortar, oils, putty and items of similar nature.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of CUTTING AND PATCHING shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of CUTTING AND PATCHING shall be included in the contract lump sum price as shown in the Schedule of Prices for CIVL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Civil Work: 020000

END OF SECTION

SECTION 01 78 39

RECORD DOCUMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions, and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This section specifies administrative and procedural requirements for project record documents:
   1. Record Drawings.
   2. Record Specifications.
   3. Record Product Data.

B. Related Sections:
   1. Contract Closeout: Section 01 70 00.
   2. Divisions 03 through 32 Sections for specific requirements for Project Record Documents of the Work in those Sections.

1.03 FORMAT

A. General: Do not use Record Documents for construction purposes; protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for the Commissioner's reference during normal working hours. Upon Substantial Completion of construction and prior to the Final Acceptance inspection by the Commissioner, the Contractor shall submit an electronic copy of the Record Documents for the Commissioner's review and approval.
   1. Mark record sets with red erasable pencil; use other colors to distinguish between variations in separate categories of the work.
   2. Mark new information that is important to the Commissioner but was not shown on the original Contract Documents.
   3. Note related Change Order, Requests for Information, Substitution Requests and Submittal numbers where applicable.

B. Record Drawings: Maintain a clean, undamaged set of Contract Drawings at the site. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing conditions fully and accurately; where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.
   1. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on the cover of each set.
   2. Each drawing sheet shall be a standalone digital CAD file, with no reference drawings (x-ref) included in the final deliverable to the Commissioner. Comply with U.S. National CAD Standards (NCS). Documents shall incorporate revisions in a legible fashion and shall not contain any clouds or strike-outs.

C. Record Specifications: Maintain one complete copy of the Project Specification, including

addenda, and one copy of other written construction documents such as Change Orders and modifications issued in printed form during construction. Mark these documents to show substantial variations in actual work performed in comparison with the text of the specifications and modifications. Give particular attention to substitutions and similar information on elements that are concealed or cannot otherwise be readily discerned later by direct observation. Note related record drawing information and Product Data.

D. Record Product Data: Maintain one copy of each Product Data submittal. Nark these documents to show significant variations in actual work performed in comparison with information submitted. Include variations in products delivered to the site, and from the manufacturer's installation instructions and specifications. Give particular attention to concealed products and portions of the work which cannot otherwise be readily discerned later by direct observation.

E. Record Sample Submittal: Immediately prior to the date or dates of Substantial Completion, the Contractor will meet with the Commissioner and the Commissioners' personnel to determine which of the submitted samples that have been maintained during progress of the work will be transmitted to the Commissioner for record purposes. Comply with delivery to the Commissioner's sample storage area.

1.04 RECORD DOCUMENT SUBMITTALS

A. The Contractor will be required to submit an updated set of Record Documents to the Commissioner (current to the date of the Pay Application) incorporating as- built information to the Commissioner concurrent with every Pay Application. Submit the Record Drawings in AutoCAD format. Pay Applications will not be processed if the Contractor is not in compliance. Replicate the breakout of discipline specific information on the Record Documents in a manner consistent with the original Construction Documents and be of a similar scale and size.

B. Record Documents: Upon Substantial Completion of construction and prior to the Final Acceptance inspection by the Commissioner, the Contractor shall provide revised Record Documents for the Commissioner's review and approval.
   1. Upon approval, the Contractor shall furnish the Commissioner the following Record Documents:
      a. Submit 1 set of marked-up Record Prints, 2 sets of Record Electronic Drawing files, and 3 copies printed from record plots. Plot and print each Drawing, whether or not changes and additional information were recorded.
      b. Record Specifications: Submit 2 copies of Project's Specifications, including addenda and contract modifications.
      C. Record Product Data: Submit 2 copies of each Product Data submittal. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in manual instead of submittal as Record Product Data.

C. Record Product Data: Upon Substantial Completion of construction and prior to the Final Acceptance inspection by the Commissioner, submit a complete set of Record Product Data to the Commissioner for review and approval. Make any required corrections to the Record Product Data and then submit the final set of Record Product Data to the Commissioner.

D. The Final Acceptance will not be performed until these items are submitted and approved by the Commissioner.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 OPERATION AND NIAINTENANCE INSTRUCTIONS

A. Manuals: Comply with the SPECIAL CONDITIONS requirements for operation and maintenance manuals. Under the direction of the Contractor, each subcontractor shall furnish 12 complete sets of operation and maintenance instruction manuals. The manuals shall contain the manufacturers' instructions for each item of equipment and apparatus furnished under the Contract, together with any additional data as may be required by the various sections of the Specifications. The manuals shall be indexed and suitably bound in hard cover binders.

1. Maintenance Schedule: For components of the Work which shall require routine maintenance, based on the manufacturers' published literature for the materials and equipment provided in the Work, furnish a "Schedule of Maintenance" and clearly indicate in the schedule the type and frequency of such maintenance to be performed.

B. Endorsement: At the completion of the Work, the Contractor and each subcontractor shall certify, by endorsement thereon, that each of the manuals is complete and accurate.

C. Submittal of Manuals: Prior to the Contractor's application for final payment, and as a condition to approval of the applications, each subcontractor shall deliver to the Contractor the manuals arranged in proper order, indexed and endorsed. Assemble the manuals for all divisions of the Work, review them for completeness, and submit the manuals in suitable transfer cases indexed and marked for each division of the Work.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of RECORD DOCUMENTS will not be measured for payment.

4.02 PAYMENT

A. No separate payment will be made for the Work covered in this section. Payment for the Work of RECORD DOCUMENTS will be included in the applicable Line Item contract lump sum price as shown in the Schedule of Prices.

END OF SECTION

SECTION 02 05 00
DEMOLITION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and Division 01 Specification sections, apply to this section.

1.02 SUMMARY

A. This Section includes the demolition, removal and proper disposal of the items indicated on the drawings to be removed and any other items to be removed as required to facilitate the installation of the new work; including not limited to the following:

1. Remove existing plumbing supply, drain and vent piping, etc. integral with the work, to the extent shown on the drawings, and as otherwise required. Cap piping as required.
2. Remove existing light fixtures, electrical outlets, wiring, conduit, etc. integral with the work, to the extent shown on the drawings, and as otherwise required. Cap wiring and conduit as required.
3. Remove all other items as shown, indicated, or as otherwise required to facilitate the new construction.

B. Any salvagable items to be reused are to be removed carefully to avoid damage to the items, including the following:

1. Light fixtures, speakers, and security devices
2. CTA signage and advertising (static and electronic)
3. Rotogates & Turnstiles
4. CTA Vending Machines & ATM Machines
5. Radiant heaters
6. Trash cans and other platform furniture
7. Any other salvagable items located by the Contractor shall be salvaged unless otherwise indicated by the Commissioner.

C. Work includes providing, installing, maintaining and removing temporary construction barriers as required during the course of the work. Construction barriers to be of plywood and wood framing unless approved otherwise.

D. Work includes providing, installing and removing foot traffic barricades and control devices and signage as required during the course of the work and as approved by the Authority.

E. Contractor is to schedule all work with the Authority. Contractor to submit a process plan and phasing plan for all the work, including demolition.

F. Contractor to protect the remainder of the existing building during demolition and construction. The building must be protected from moisture, the elements and extreme temperatures. The equipment within or inside the building must be protected from dust, debris, the elements and other damage during the demolition and construction. Coordinate all work with the Authority.

G. Work may require re-routing underground utility lines as required to avoid the new construction.

H. Work may require re-routing underground utility lines as required to clear the new construction.

I. Work includes patching and repairs to existing adjacent surfaces after removal or demolition. Patching and repairs to match existing materials and finishes.

J. Work includes coring and cutting existing surfaces for installation of new plumbing piping and electrical conduit. Patch upon completion.

K. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 01 Section "Summary of Work".
2. Division 01 Section "Cutting and Patching" for cutting and patching procedures for selective demolition operations.
3. Division 02 Section "Structure Demolition"
4. Division 02 Section "Selective Structure Demolition"
5. Division 02 Section "Historic Removal and Dismantling"
6. Division 06 Section "Carpentry" for material and construction requirements for temporary enclosures.

1.03 DEFINITIONS

A. Remove: Remove and legally dispose of items except those indicated to be reinstalled, salvaged, or to remain the Authority's property.

B. Remove and Salvage for Recycling: Items indicated to be removed and recycled are to be separated and arranged for recycling. Construction debris from demolition and construction waste materials are to be picked up by recycling waste haulers for recycling to the greatest extent possible. As a minimum requirement, the Contractor to follow the City of Chicago Ordinance for recycling construction debris.

B. Remove and Salvage for Re-use: Items indicated to be removed and salvaged remain the Authority's property. Remove, clean, and pack or crate items to protect against damage. Identify contents of containers and deliver to Authority's designated storage area.

C. Remove and Reinstall: Remove items indicated; clean, service, and otherwise prepare them for reuse; store and protect against damage. Reinstall items in the same locations or in locations indicated.

D. Existing to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by the Authority, items may be removed to a suitable, protected storage location during selective demolition and then cleaned and reinstalled in their original locations.

1.04 MATERIALS OWNERSHIP

A. Except for items or materials indicated to be reused, salvaged for re-use, reinstalled, or otherwise indicated to remain the Authority's property, demolished materials shall

become the Contractor's property and shall be removed from the site and legally disposed of by the Contractor.

1.05 SUBMITTALS

A. General: Submit each item in this Article according to the conditions of the contract and Division 01 Specification Sections, for approval, unless otherwise indicated:

1. Proposed dust-control measures.
2. Proposed noise-control measures.
3. Schedule of demolition activities indicating the following:

   a. For each location: Detailed sequence of demolition and removal work, with starting and ending dates for each activity.
   b. Interruption of utility services.
   c. Coordination for shutoff, capping, and continuation of utility services.
   d. Detailed sequence of selective demolition and removal work to ensure uninterrupted progress of Authority's on-site operations.
   e. Locations of temporary partitions, barriers and means of egress.
   f. Foot traffic control or interruption. Closing of areas.
   g. Shoring required.
   h. Indicate how demolition work will avoid interruption of Authority's on-site operations.
   i. Demolition plan.

4. Proposed recycling procedures.
5. Inventory of items to be removed and salvaged for re-use.

B. Contractor to submit a process plan and phasing plan for the demolition work.

C. Contractor to submit proposed barricades, control devices and signage as required during the demolition and other work; including the proposed location of the barricades, control devices and signage; and the materials proposed to be used for the barricades, control devices and signage; for the Authority's review and approval.

D. Provide the following, for information purposes:

1. Photographs or videotape for information purposes, sufficiently detailed, of existing conditions of adjoining construction and site improvements that might be misconstrued as damage caused by selective demolition operations.

E. Provide the following at Project Closeout according to Division 01 Section "Project Closeout":

1. Record drawings; including identification and accurate locations of capped utilities and other subsurface structural, electrical, or mechanical conditions.

F. Provide written and dated documentation of the total amount of each different waste material, the amount of each sent to a recycling facility and the amount of each sent to a landfill. Documentation shall be done on a daily basis. Indicate when and who the materials were picked up by and the name of the recycling facility the materials were sent to.

G. A demolition plan is to be submitted to the Authority for approval. Demolition shall not commence until the contractor has received written approval from the Authority.

1.06 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with governing EPA notification regulations before starting selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction. Comply with City of Chicago Recycling Ordinance.

1.07 PROJECT CONDITIONS

A. Contractor required to survey existing conditions to verify all existing dimensions and conditions, locations of items and construction sizes of items and including conditions and limitations under which he is to do his work.

B. Contractor required to locate all existing utilities and other improvements, including utilities not exposed to view.

C. There will be no extras allowed to compensate Contractor for his failure to review and verify existing conditions and dimensions.

D. Demolition work to adhere to phasing plans for the project.

1.08 HAZARDOUS MATERIALS

A. The Authority has determined that various components to be removed or to be painted may contain lead paint. These components shall be removed according to all applicable federal, state and local regulations including. This shall include 29 CFR1926.62 and 29 CFR1910.1025 under the Occupational Safety and Health Act, Toxic Substance and Control Act, Resource Conservation and Recovery Act, Illinois Lead Poisoning Prevention Act (77 Illinois Adm. Code 845) and City of Chicago Code 11-4-2190 (Sandblasting, grinding and chemical washing of building, facilities or other structures; permit and notification requirements; performance standards for lead paint abatement; and disposal of debris.) Contractor shall submit removal or mitigation plan to the Authority for approval.

B. For structures noted to be re-painted; existing paint that is loose, flaking, or otherwise not recommended to remain under the new paint system; is to be removed and, unless determined otherwise, should be assumed to contain lead. The following lead paint removal procedures shall be followed:

1. Work is governed by OSHA Regulations (worker protection) and NESHAP Regulations (visible emissions).
2. City of Chicago Sandblasting, Grinding and Chemical Washing Ordinance is not applicable as long as hand scrapping removal method is used. Any mechanical methods or chemical removal would require City permits. CTA Facilities Maintenance shall coordinate with Environmental Affairs if Permits are required.
3. Employees conducting lead abatement shall be licensed by IDPH as a lead abatement worker and/or supervisor.
4. Lead paint work area shall be separated by caution tape or other appropriate barrier.

5. Work area shall be covered with appropriate non-skid (canvas) tarpaulin. This tarpaulin shall be cleaned with a HEPA vacuum after each shift or prior to moving tarpaulin. Paint chips and collected dust shall be bagged and disposed of as lead waste. Contact Environmental Affairs (312-681-3869) for disposal.
6. Employee shall wet impact surface to prevent dust during scraping activity.
7. Employees shall wear disposable coveralls during lead abatement activity. Coveralls shall be disposed as lead waste.
8. Employees shall wear appropriate respirators. CTA may conduit air sample (negative exposure assessment) to determine airborne lead dust exposure.
9. Employees shall maintain good personnel hygiene by washing their hands and face prior to eating, drinking, smoking, or leaving the site.

C. Other than the lead paint referred to above, the Contractor is not responsible to remove hazardous material that is encountered in the course of the work and not identified as hazardous material in the contract documents or otherwise addressed in the contract documents. If previously unidentified hazardous material is encountered, do not disturb the materials. Immediately notify the Authority for direction and arrangement for proper removal by licensed asbestos abatement workers and proper disposal.

D. Material containing lead based paint to be disposed of as hazardous waste, according to all applicable laws and regulations, unless approved otherwise, at Contractor's expense and at approved land fills. Do not allow lead dust to contaminate other surfaces. The Contractor shall be responsible for handling, transporting, and disposing of any hazardous materials generated during the course of the project in accordance with all applicable federal, state and local environmental regulations and codes.

PART 2 - PRODUCTS

2.01 REPAIR MATERIALS

A. Use repair materials identical to existing materials.

1. Where identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
2. Use materials whose installed performance equals or surpasses that of existing materials.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that those utilities indicated and approved to be disconnected and capped, have been properly done so.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required. All work indicated may vary based on actual field conditions and dimensions. Additional demolition and/or patching may be required depending on the condition of materials and construction upon opening up the existing construction and actual justification and/or attachment of the materials.

C. When unanticipated mechanical, electrical, or structural elements that conflict with the intended function or design are encountered, investigate and measure the nature and

extent of the conflict. Promptly submit a written report to the Authority.

D. Survey the condition of the building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of the structure or adjacent structures during selective demolition.

E. Perform surveys as the work progresses to detect hazards resulting from selective demolition activities.

3.02 UTILITY SERVICES

A. Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Do not interrupt existing utilities serving occupied or operating facilities, except when authorized in writing by Authority and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to Authority and to governing authorities.

a. Provide not less than 72 hours' notice to Authority if shutdown of service is required during changeover.

B. Utility Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services serving building to be selectively demolished.

1. Arrange to shut off indicated utilities with utility companies.
2. Where utility services are required to be removed, relocated, or abandoned, provide bypass connections to maintain continuity of service to other parts of the building before proceeding with selective demolition.
3. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal the remaining portion of pipe or conduit after bypassing.

C. Utility Requirements: Refer to their respective sections of these specifications for shutting off,

disconnecting, removing, and sealing or capping utility services. Do not start selective demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.03 PREPARATION

A. Conduct demolition operations and remove debris to ensure minimum interference with adjacent occupied and used facilities.

1. Do not close or obstruct adjacent occupied or used facilities without permission from Authority and authorities having jurisdiction. Provide alternate routes around closed or obstructed foot traffic ways.
2. Do not block required exits or stairways.

B. Conduct demolition operations to prevent injury to people and damage to adjacent facilities to remain. Ensure safe passage of people around selective demolition area.

1. Protect walls, ceilings, floors, and other existing finish work that are to remain and are exposed during selective demolition operations.
2. Cover and protect equipment that has not been removed.

C. Erect and maintain dust-proof partitions and temporary enclosures as required to limit dust and dirt migration and to separate areas from fumes and noise.

D. If required, provide and maintain shoring, bracing, or structural support to preserve stability and prevent movement, settlement, or collapse of building components during selective demolition and until new support is installed.

3.04 POLLUTION CONTROLS

A. Use temporary enclosures, and other suitable methods to limit the spread of dust and dirt. Comply with governing environmental protection regulations.

B. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

C. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before start of selective demolition.

3.05 SELECTIVE DEMOLITION

A. Demolish and remove existing construction only to the extent required by new construction and as indicated on the drawings. Use methods required to complete work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. To minimize disturbance of adjacent surfaces, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-

   suppression devices during flame-cutting operations.
5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
7. Locate selective demolition equipment throughout the structure and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
8. Dispose of demolished items and materials promptly. On-site storage or sale of removed items is prohibited.
9. Return elements of construction and surfaces to remain to condition existing before start of selective demolition operations.

B. Demolish masonry in small sections. Cut masonry at junctures with construction to remain, using power-driven masonry saw or hand tools; do not use power-driven impact tools. Sawcut between existing masonry to be removed and to remain.

C. Demolish and remove existing construction according to the IDOT Standard Specifications for Road and Bridge Construction, Section 501, Removal of Existing Structures.

D. The Contractor is fully responsible for the means and method of demolition and the integrity and stability of the existing structure during demolition until the work is completed.

E. Do not remove more of the existing structure than indicated on the drawings or as required. Do not damage, mar, cut or deface the remaining structure to remain or material to be reused.

F. Verify all dimensions and existing conditions.

3.06 PATCHING AND REPAIRS

A. Promptly patch and repair holes and damaged surfaces caused by demolition operations to match adjacent construction.

B. Patching is specified in Division 01 Section "Cutting and Patching."

C. Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials. Patch to match existing, using materials to match existing.

1. Completely fill holes and depressions in existing masonry or concrete to remain with an approved masonry or concrete patching material, applied according to manufacturer's printed specifications.

D. Restore exposed finishes of patched areas and extend finish restoration into adjoining construction to remain in a manner that eliminates evidence of patching and refinishing.

E. Patch and repair floor, ceiling and wall surfaces in the new space where demolished walls or partitions extend one finished area into another. Provide a flush and even surface of uniform color and appearance.

1. Closely match texture and finish of existing adjacent surface.
2. Patch with durable seams that are as invisible as possible. Comply with specified tolerances.
3. Where patching smooth painted surfaces, extend final paint coat over entire unbroken surface containing the patch after the surface has received primer and second coat.
4. Where applicable, remove existing floor and wall finishes and replace with new materials, if necessary, to achieve uniform color and appearance.

F. Repairs, patching and replacements due to damage by the Contractor are the complete responsibility of the Contractor.

3.07 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Promptly dispose of demolished materials, accumulated debris, rubbish, and other materials resulting from demolition operations. Do not allow demolished materials to accumulate on-site except as required for recycling operations.

B. Recycle construction debris from demolition operations and construction waste to the greatest extent possible. Contractor must follow City of Chicago Recycling of Construction Debris Ordinance as a minimum requirement.

C. Concrete, masonry, steel, wood, glass, cardboard and other materials shall be separated at the construction site and pick up shall be arranged with their respective recycling waste haulers for recycling of the individual waste materials.

D. Provide written and dated documentation of the total amount of each different waste material, the amount of each sent to a recycling facility and the amount of each sent to a landfill. Documentation shall be done on a daily basis. Indicate when and who the materials were picked up by and the name of the recycling facility the materials were sent to.

E. Disposal of non-recyclable debris: Transport materials that are not suitable for recycling off Authority's property and legally dispose of them.

3.08 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to condition existing prior to start of work.

B. Sweep the building broom clean on completion of selective demolition operation.

C. Change filters on air-handling equipment on completion of selective demolition operations.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 02 05 00, Demolition shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 02 05 00, Demolition shall be included in the contract lump sum price as shown in the Schedule of Prices for Disposal of Regulated Substances.

4.03 PAY ITEM ACCOUNT NUMBER

A. Disposal of Regulated Substances: 026100

END OF SECTION

SECTION 02 16 10

MONITORING ADJACENT STRUCTURES DURING
CONSTRUCTIONS ACTIVITY

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Purpose: The work associated with this specification requires the Contractor to employ independent/3rd party agents (see Section 1.02D-1) to monitor construction activities and monitor structures that are susceptible to damage resulting from construction activities. This includes, but is not limited to, the following:

1. Installation of foundations, utilities, or surrounding excavation support systems may result in ground movements around adjacent structures. Ensure that ground movements are within acceptable limits so that there is no increase in likelihood of damage to adjacent structures.
2. Adjacent structures and ground movements adjacent to open cuts or embankments are within acceptable limits so that there is no increase in likelihood of damage to adjacent structures.

B. Scope: The work includes, but is not limited to, furnishing, installing, calibrating, maintaining, protecting and replacing all necessary equipment, developing monitoring software, establishing survey points, and all necessary equipment and materials for a complete monitoring system, including qualified personnel with experience and training to implement, review, assess, and draw conclusions on data generated by the monitoring system.

A summary of the work described within this specification includes, but is not limited to the following:

1. Identify all susceptible adjacent structures.
2. Perform Preconstruction Document Review.
3. Perform Preconstruction Condition Surveys.
4. Evaluate adjacent structures.
5. Develop Response Values and contingency plans.
6. Perform interim construction surveys that include monitoring, collecting, and reporting instrument data.
7. Perform post-construction condition survey.

C. Monitoring system includes, but is not limited to, the following:

1. Install slope inclinometers to measure lateral deformations adjacent to temporary support walls.
2. Measure movements at locations on adjacent structures using surface monuments, tilt meters, string potentiometers, and other devices.
3. Measure pore water pressures within soft clays surrounding adjacent structures.
4. Topographic survey track of structure elements, foundations, and utilities.

D. Qualified personnel shall include and meet the minimum qualifications herein.

1. All monitoring and reporting personnel must be overseen by a Contractor-hired, independent/3rd party subcontractor (hereinafter referred to as “subcontractor” or “agent”) which reports directly to Commissioner.

2. Superintendent that has experience supervising a minimum of 10 site vibration monitoring programs of equivalent size and complexity to this Project.
3. A field instrumentation specialist(s) that has a minimum of 5 years' experience using every piece of monitoring equipment used on this project and is a licensed Professional Engineer or Surveyor in the State of Illinois.
4. A Licensed Structural Engineer in the State of Illinois with a minimum of 10 site vibration monitoring programs of equivalent size and complexity to this Project. The Structural Engineer must sign and seal all submittals related to this Section.
5. A Licensed Land Surveyor in the State of Illinois must supervise all field surveys and field survey data collection.

E. Division of Responsibility: The independent/3rd party subcontractor is responsible for overall coordination, delivery of field reports, acceptable working limits, and the decision to perform work based on monitoring data the Contractor's team collects. Furthermore, the Contractor/subcontractor is responsible for providing and maintaining access to instrument locations throughout construction. Reporting to the subcontractor's superintendent, the field instrumentation specialist(s) are responsible for providing, installing, and obtaining data from the ground instrumentation and from the structural instrumentation, and the Structural Engineer is responsible for identifying all of the risks to the adjacent structures, setting the acceptable working limits, and verifying that temporary conditions are engineered to sufficiently meet the acceptable limits.

F. Adjacent Structures: The Contractor is to meet the requirements for the protection of supporting adjacent structures from the construction activity according to all provisions of the CTA-ACM.

G. Related Work Required Elsewhere:

1. Section 31 20 00 – Earth Moving
2. Section 31 50 00 – Excavation Support and Protection
3. Section 31 63 33 – Drilled Micropiles
4. Section 31 64 00 – Drilled Shafts

1.03 DEFINITIONS

A. Definition of project terms and abbreviations are found within Specification Section 01 35 00.

1. The Project = Includes the new train station, pedestrian bridge, subway, subway station, Chicago Transit Authority (CTA) track structure, elevator and escalator access and portions of property within the City of Chicago Right of Way and under CDOT control near the intersection of State Street and Lake Street. Refer to drawings for more information.
2. CTA-ACM = Chicago Transit Authority Adjacent Construction Manual Rev 01, March 2022.
3. Track Structures = Includes all structures owned by the (CTA) including, but not limited to, the new and existing train track supporting superstructure and substructure both within the Project boundaries and outside the Project boundaries. In addition, this includes the new train station, pedestrian bridge, subway, subway station, and elevator, stair, and escalator access.
4. Adjacent Structures = Include (1) structures adjacent to the Project that may be affected by construction of the Project, including, but not limited to, structures that may be affected by vibrations, displacements, settlement, excavations, demolition, or other construction activities; (2) structures including, but not limited to, buildings, roads, utilities, and infrastructure deemed important enough for monitoring; (3) any building or structure not owned by the CTA, and any building Owned by another City of Chicago agency; and (4) any relevant structure that is expected to be in place prior to completion of the work on the Project.
5. Response Values = Threshold Values and Limiting Values.
6. Threshold Values = A performance-based monitoring unit, predetermined by the Contractor for a specific type and location of monitoring. The Contractor must incorporate corrective actions into its construction means and methods to avoid reaching the established threshold value. The threshold value will be determined by the Contractor using

current industry standards and recommendations, and will consider the type, age, and sensitivity of the Adjacent Structures to minimize serviceable damage. The CTA-ACM denoted Threshold values as Warning Values.

7. Limiting Value = A performance-based monitoring unit, predetermined by the Contractor for a specific type and location of monitoring. The Contractor must stop work immediately upon equaling or exceeding a limiting value. The limiting value will be determined by the Contractor using current industry standards and recommendations, and will consider the type, age, and sensitivity of Adjacent Structures to protect a structure or utility from unacceptable levels of distress.
8. Cased Deep Benchmarks = Benchmarks founded at an elevation below the bottom of the excavation and that are isolated from the surrounding soil by an outer casing. Cased deep benchmarks are used as control benchmarks for determining the elevation of all other instruments.
9. Surface Settlement Markers = Markers placed on structures and monitored using optical survey methods to determine vertical and horizontal displacements during construction.
10. Inclinometer Casing = An instrument installed within vertical holes located entirely in the in-situ soil. A probe, lowered within the inclinometer casing, is used to monitor horizontal displacements of the soil behind the Temporary Earth Retention Structures at depth during construction.
11. Tiltmeter Plates = Instruments installed on structures to monitor angular rotation of the structure during construction. The plates are monitored by placing a portable tiltmeter on the plate.
12. Vibrating Wire Strain Gages = Gages installed on horizontal struts (or directly to adjacent structure with written permission from the Owner) to monitor the load in the struts during construction. The strain gages are read with a vibrating wire indicator.
13. Crack Monitoring Pins = Two pins; one pin placed on each side of a crack that can be measured with calipers to determine accurate changes in crack dimensions.
14. String Potentiometers = Cable-actuated position sensors that locate a specific ground position in one or more directions.
15. Vibration Monitors = Seismograph equipment that accurately monitors ground movements (accelerations, velocities, and overall movement).
16. Settlement Indicators = Equipment set up to measure and record the elevation at the top of soil of a specific location. Repeated readings at the same precise location would provide indication of settlement (lowering elevation of the top of soil).

1.04 REFERENCES

A. Chicago Transit Authority Adjacent Construction Manual (CTA ACM) Rev 01, March 2022, applicable Sections as specified in this Specification.

B. Geotechnical Report by GSG Consultants, Inc.

1.05 SUBMITTALS

A. Resumes of the qualified personnel previously listed (Superintendent, all field instrumentation specialists needed, and a structural engineer), and other key personnel, detailing relevant experience and qualification as noted within Section 1.02D.

B. Product data for all monitoring equipment used including measurement range, resolution, repeatability, accuracy and precision, temperature range, etc., as applicable for individual equipment.

C. Drawings and details showing proposed physical locations of instrumentation indicating layout and instrumentation installation details. This plan must comply with any comments furnished by CDOT's deep foundation review process and must be submitted at or before the first submittal of earth retention systems documentation. These comments may include modified or additional locations of requested monitoring and the Contractor must include these additional locations in the plan and monitoring program. The plan must show the instrumentation in relation to nearby:

1. Existing adjacent structures and supporting foundations and their distance to related construction activity.
2. Shoring structures to be installed.
3. Any installations for protecting shoring structures.
4. Surface and subsurface infrastructure.

D. Preconstruction Condition Survey:

1. Perform a detailed survey of all adjacent structures including, but not limited to, the following:

    a. High-resolution photography.
    b. Visual exterior condition assessment.
    c. Visual condition assessment of any adjacent structure uncovered during the work.
    d. Detailed topographic surveys of roadways, sidewalks, CTA Track Structures, stations, subways, and foundations to establish baseline conditions.
    e. List all documents reviewed in preparation for the Preconstruction Condition Survey.
    f. List how the probable means and methods of construction planned for the Project may adversely affect the visually observable systems previously described.

E. Response Value Summary Report:

1. Using the information gathered in the preceding tasks, evaluate potential impacts on the Adjacent Structures from construction-phase activities including, but not limited to, post-construction ground or structure movements associated with the design, construction-induced vibrations, and excavation-induced ground movements using published literature and empirical correlations. Perform this evaluation using a licensed Structural Engineer in the State of Illinois. Report shall include, but not limited to, items below for each risk identified:

    a. Level of structural and nonstructural risks associated with anticipated construction activity.
    b. Instrumentation recommended to monitor each risk. Monitoring must include all elements in Section 1.03 A, Parts 3 and 4.
    c. Frequency of measurements taken during construction from the instrumentation noted above. This frequency must be no less than weekly when excavation work is ongoing or open excavations exist.
    d. The limit state values (Threshold Value and Limiting Value) associated with each measurement taken during construction.
    e. Contingency plans the Contractor will perform in the event the Limit State Values are exceeded.

2. Include the following information:

    a. Name(s), telephone number(s), and location(s) of person(s) responsible for implementation of contingency plans.
    b. Materials, equipment, and supplies required to implement contingency plans.
    c. Location at work site of all necessary materials, equipment, and supplies required to implement the contingency plans.
    d. Each type of anticipated remedial method proposed to stabilize soil and/or structure movements. Include basis for determining proposed actions.
    e. Step-by-step procedure for performing work involved with contingency plans.
    f. Clear identification of objectives of contingency plans and methods to measure success of contingency plans.

F. A field monitoring plan that contains a detailed step-by-step procedure for conducting and reporting

all monitoring measurements to include, but not limited to, the following:

1. The Contractor/subcontractor is solely responsible for obtaining permission from adjacent property owners to access their property, install instruments, keep a contact list of all adjacent property contacts, and to coordinate all construction related matters to the adjacent structure owners.
2. A schedule indicating the proposed time sequence of instrument installation.
3. Field validation plan and summary report of the results as specified in Part 3 – Instrument Installation, Protection, Maintenance, and Replacement.
4. A schedule complying with required monitoring and reporting frequencies, for all instruments and monitoring points.

    a. Surveys of CTA- and City-owned facilities (including roadways, sidewalks, utilities, foundations, track-supporting structures, stations, escalators, elevators, stairs, etc.) must be at least weekly while any underground work (excavations, earth retention, sidewalk vaults, utilities, trenches, foundations, etc.) is active and until at least 6 weeks following backfill to grade and indication of no settlement or movement.

5. Types of monitoring instruments with manufacturer's data sheets, including regularly scheduled calibration and maintenance procedure requirements.
6. Data survey methods for optical surveys necessary to demonstrate that the specified accuracies can be achieved at a minimum 95% level of confidence.
7. Data processing procedures.
8. Reporting Procedures for scheduled reports and for special reports when Threshold Values and Limiting Values are being approached and are exceeded.
9. Outlines of sample reports and processed data forms.
10. Processed data as specified in Part 3 - Data Collection and Processing.
11. Descriptions for the monitoring equipment that meet the requirements as specified in Part 2 - Products.
12. Submit all of the above at least six (6) weeks prior to start of excavation work. An agreement is to be reached between the Structural Engineer and the Contractor's Superintendent on the contingency plan to be utilized for stopping further movement, prevention of additional damage, and corrective actions.
13. Post-construction Condition Survey:

    a. Perform a detailed survey of all adjacent structures that duplicates the process performed during the preconstruction survey.
    b. Perform the survey within thirty calendar days after Substantial Completion of the Project.
    c. Identify any deviations from the Preconstruction Condition Survey. The post-construction surveys will be used to evaluate if the Project construction activities caused damage to the Adjacent Structures.

1.06 QUALITY ASSURANCE

A. The Contractor employs the services of the qualified personnel specified within Paragraph 1.04.

B. Prior to the start of construction, the Contractor meets with the Commissioner to discuss the Preconstruction Condition Survey, Response Value Summary Report, and a field monitoring plan.

    1. The Contractor provides access to instrument locations and prevents construction activities that would damage ground instruments during construction.

C. The Contractor ensures that the field monitoring schedule of reports (established within Paragraph 1.05.F) is followed.

1.07 JOB CONDITIONS

A. Existing site geotechnical conditions have been investigated and a report prepared by GSG Consultant, Inc. This report is in the appendix of these Specifications. Neither CDOT nor their representatives are in any way responsible for the safety and serviceability of the work. The Contractor/subcontractor, and their Structural Engineer, are expected to make his own interpretations of the data for their own purposes. Furthermore, the contractor's agent must install, monitor, and interpret data from any additional instrumentation that the Contractor or subcontractor deems necessary to ensure the safety and serviceability of the work.

PART 2 – PRODUCTS

2.01 EQUIPMENT

A. The Contractor shall use any and all equipment they deem necessary to carry out the work described within this Specification. The Contractor/subcontractor is solely responsible for the determination, acquisition, and operation of all equipment.

PART 3 – EXECUTION

3.01 PRODUCT ACCESS AND SCHEDULE

A. The approximate Project schedule is denoted on the drawings.

3.02 AVAILABILITY OF DATA

A. Do not disclose instrument monitoring data to third parties and do not publish instrument monitoring data without prior approval of the Commissioner

B. The Contractor/subcontractor is expected to make their own interpretations of instrument-monitoring data for their own purposes.

C. The Contractor/subcontractor may observe equipment readings at any time (but as a minimum during the preapproved scheduled times) or take supplementary readings at no additional cost to the Commissioner. All data collected by the Contractor/subcontractor must be made available to the Commissioner.

3.03 INSTRUMENT INSTALLATION, PROTECTION, MAINTENANCE, AND REPLACEMENT

A. Protect and maintain instruments. Drain water or flush debris from under protective covers. Keep protective covers locked.

B. Provide approved substantial protective barriers as required around cased deep benchmarks and around subsurface settlement indicators.

C. Repair or replace damaged or missing instrument components or entire instruments as required within five days at no additional cost to the City of Chicago.

D. The location of the instruments will be per approved submittal.

E. Installation of any instrument requires permission from the adjacent structure owner and shall not damage or interfere with adjacent structures and their daily operations. Contractor/subcontractor shall design, install, and protect displacement monitors from accidental movement or damage from snow plows.

3.04 DATA COLLECTION AND PROCESSING

A. The Contractor/subcontractor is solely responsible for creating the validation plan. This plan shall clearly show that the appropriate equipment and qualified personnel were used to successfully

complete the track monitoring plan.

B. Validation of Equipment and Crew: The installed monitoring system, each component thereof, is to be field certified for the accuracy and reliability required for the Threshold and Limiting Values.

C. The following are items mandated by CDOT and CTA for data collection and processing:

1. The processed survey data will be submitted on a similar form as shown in Appendix E in CTA ACM.
2. For excavation within the Zone of Influence as specified in Section 3 of CTA ACM, monitoring frequency specified in CTA ACM Section 10.3 will be followed.
3. For earth retention structure or drilled shafts, the survey points for adjacent structures shall comply with Figure 10-1 in CTA ACM, unless otherwise directed by the field instrumentation specialist that more survey points are required.

D. The following are items mandated by CDOT and CTA for defining and submitting Threshold and Limiting Values:

1. Threshold Values and Limiting Values as specified in Section 10.2 of CTA ACM for adjacent structures.
2. Limiting Values as specified in Section 7.9 of CTA ACM for top of shoring wall within the Zone of Influence of adjacent structures.

E. If a Threshold Value is reached:

1. Notify Commissioner and CTA within 12 hrs.
2. Within 24 hrs. of monitoring data indicating that a Threshold Value has been reached, implement contingency plans per approved submittal.

F. Take all necessary steps such that the Limiting Value is not reached. The Commissioner may require the Contractor to suspend activities in the affected area.

G. If a Limiting Value is reached:

1. Notify Commissioner and CTA immediately. CDOT or CTA reserves the right to suspend all construction activities in the affected area.
2. Within 24 hrs. of processing instrumentation data indicating that a Limiting Value has been reached, implement contingency measures as specified in approved process plans for stopping further movement and corrective actions.
3. Perform a detailed evaluation of construction procedures and submit to the Commissioner the evaluation and recommended procedures to reduce movement. Furnish and install additional instruments if they are needed to further define the magnitude of the indicated problem.

3.05 REPORTING DATA

A. Formal monitoring reports will be submitted within five working days of retrieving the raw data. Raw data is made available to the CDOT and CTA within one working day of reading when requested. The Contractor/subcontractor may observe the readings at any time but as a minimum during the preapproved scheduled times) or take supplementary readings. The Contractor/subcontractor is responsible for the safety and serviceability of the work. The Contractor/subcontractor is to make interpretations of the data for the purposes of monitoring for any movement. Do not disclose instrumentation data to third parties. Do not publish data without prior written approval of the Commissioner.

3.06 DAMAGE TO INSTRUMENTS

A. Take precautions during the course of construction to prevent damage to instruments and monuments. Pay all costs associated with restoring damaged instruments.

3.07 DAMAGE TO ADJACENT STRUCTURES

A. The Contractor must repair adjacent structure damage to match the existing condition and quality of workmanship as was present during the Preconstruction Condition Survey.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of MONITORING ADJACENT STRUCTURES DURING CONSTRUCTIONS ACTIVITY shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of MONITORING ADJACENT STRUCTURES DURING CONSTRUCTIONS ACTIVITY shall be included in the contract lump sum price as shown in the Schedule of Prices for STRUCTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Structural Work: 030000

END OF SECTION

SECTION 02 24 00

ENVIRONMENTAL ASSESSMENT

PART 1 — GENERAL

1.01 RELATED DOCUMENTS

A. Drawings

B. Book 1: Project Information, Instructions to Bidders, and Execution Documents

C. Book 2: Standard Terms and Conditions for Construction Contracts

1.02 APPLICABILITY

A. This environmental summary is for information purposes only.

1.03 INTRODUCTION

A. Related Work
1. Section 02 61 00.10 Special Waste Hauling and Disposal
2. Section 02 61 00.20 Special Waste Plans and Report
3. Section 02 61 00.30 Non-Special Waste Disposal
4. Section 02 61 00.40 Soil Disposal Analysis

B. Description of Work: This environmental summary is for information purposes only. No work is associated with this section.

1.04 AVAILABLE ENVIRONMENTAL ASSESSMENT DOCUMENTS (included in Book 3 Specifications Appendices)

A. A Phase I Environmental Site Assessment Report for the State/Lake Loop Elevated Station (Dated October 2020 by GSG Consultants, Inc.)

B. A Phase II Environmental Site Assessment Report for the State/Lake Loop Elevated Station (Dated January 2022 by GSG Consultants, Inc.)

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of ENVIRONMENTAL ASSESSMENT will not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of this section will be considered incidental to this contract.

END OF SECTION

SECTION 02 41 13

REMOVAL OF EXISTING PAVEMENT AND APPURTENANCES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This work includes removal and disposal of existing street pavement, alley pavement and driveways, streetcar rails and ties, sidewalks and curb and gutter as shown on the plans or as directed by the Commissioner.

B. Pavement removal will include full depth saw cutting and the removal and disposal of surface, base and subbase courses, block, brick, concrete, asphalt and other pavements including driveways and the sawcutting, removing, disposing of streetcar rails and ties encountered in the field.

C. The Contractor must coordinate all streetcar-rail removal work if required with CDOT.

D. Except as modified herein, the work must be in accordance with the applicable portions of the Standard Specifications (IDOT), Sections 202 and 440.

1.03 RELATED SECTIONS

1. Section 02 41 13.13: Hot Mix Asphalt Surface Removal
2. Section 31 20 00: Earthmoving
3. Section 32 16 21: Concrete Curbs, Gutters, and Walks
4. Section 32 16 23.10: Portland Cement Concrete Sidewalk, Special

1.04 REFERENCES

A. Illinois Department of Transportation (IDOT) Standard Specifications for Road and Bridge Construction, latest edition.

1.05 QUALITY ASSURANCE

A. The Contractor must comply with all applicable codes, laws, ordinances and regulations of governmental authorities having jurisdiction over the removal work, including applicable OSHA and Standard Specifications requirements.

B. The Contractor must verify all existing conditions and dimensions in the field.

1.06 SUBMITTALS

A. Furnish the Commissioner with permission in writing from the property owner for the use of the property to dispose of surplus excavated/removed materials, in accordance with Article 202.03 of the Standard Specifications (IDOT).

PART 2 - PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 Sawcut a perpendicular full-depth joint at the limit of removal as shown on the Drawings or as directed by the Commissioner. If the surface to remain is damaged, repair or replace it as directed by the Commissioner. This additional work will not be measured for payment, but will be done at the Contractor's expense. Sawcuts must be straight and even and performed with a sawing machine meeting the approval of the Commissioner.

3.02 Sidewalk removal includes saw cutting and removal to the nearest joint beyond the end of replacement shown on the Plans, or as directed by the Commissioner. It shall be the responsibility of the Contractor to determine the thickness and composition of the existing sidewalk and pavement and the extent which it is reinforced. No additional compensation will be allowed because of variation from the assumed thickness, or from the thickness shown on the plans, or for variations in the amount of reinforcement. Should the contractor deface the edge, a sawed joint must be constructed and any additional work, including removal and replacement must be done at the contractor's expense.

3.03 Dispose of excess removed materials in accordance with Article 202.03 of the Standard Specifications.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of REMOVAL OF EXISTING PAVEMENT AND APPURTENANCES shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the Work of REMOVAL OF EXISTING PAVEMENT AND APPURTENANCES shall be included in the contract lump sum price as shown in the Schedule of Prices for CIVIL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Civil Work: 020000.

END OF SECTION 02 41 13

SECTION 02 41 13.13

HOT MIX ASPHALT SURFACE REMOVAL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This work consists of removing the existing hot-mix asphalt surface to varying depths and to the limits specified on the plans, constructing butt joints as necessary and other work as directed by the Commissioner.

B. Upon completion of the grinding operation any excess material, dust or debris remaining on the pavement must be removed by means of a mechanical street sweeper following directly behind the grinding operation.

C. During the removal of the hot-mix asphalt surface the Contractor will encounter P.C.C. base course in patches, utility repairs, structure adjustment or other minor portions of the area being milled which are undetectable prior to the milling operation. It will be understood and agreed upon that no extra compensation will be allowed to the Contractor to grind (mill) P.C.C. Pavement and/or Base.

D. Unless otherwise specified, excess material resulting from operation must be removed and disposed of as specified in Article 202.03 of the IDOT Standard Specifications.

E. Also included in this item is the removal and legal disposal of any existing debris accumulated in the gutter or at the face of curb. This work will be considered included in this item and will not be measured for payment.

F. The Contractor must be responsible for avoiding or dislodging any part of the existing brick base course underneath the hot-mix asphalt surface.

G. In the event that the Contractor cannot finish the grinding operation due to delays caused by the City, Private Utility work or adjacent construction and moves to another location, the Contractor must finish the grinding operation as soon as the said location is cleared of all conflicting work. The remobilization cost will be considered included in HOT-MIX ASPHALT SURFACE REMOVAL, of the depth specified, and no additional compensation will be made.

H. The Contractor must notify the Commissioner 72 hours prior to the need for the removal of parked vehicles from the street. The Contractor will then post the “No Parking” signs at least 72 hours preceding construction.

I. The Contractor must notify the Office of Emergency Management at (312) 747-7580 72 hours prior to the need for towing of vehicles. The City of Chicago will be responsible for removing parked vehicles located in the scheduled work area. Signs preventing parking will have to be erected at

least 72 hours before the work is scheduled. The police are to be present to issue tickets and supervise towing prior to the relocation of vehicles.

J. If in the event that the next operation to be performed on the segment will not occur within 5 working days, the “No Parking” signs must be removed and reposted 48 hours prior to resumption of work. No additional compensation will be made for removal and re-posting of signs. K. The Contractor must coordinate all streetcar-rail splice work if required with CDOT.

L. Except as modified herein, the work must be in accordance with the applicable portions of the Standard Specifications (IDOT), Sections 202 and 440.

1.03 RELATED SECTIONS

A. Section 02 41 13: Removal of Existing Pavement and Appurtenances

1.04 REFERENCES

A. Standard Specifications for Road and Bridge Construction, Illinois Department of Transportation (IDOT), latest edition.

1.05 SUBMITTALS

A. Furnish the Commissioner with permission in writing from the property owner for the use of the property to dispose of surplus excavated/removed materials, in accordance with Article 202.03 of the Standard Specifications.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 The nature and condition of the equipment and the manner of performing the work must be such that the ground surface is not torn, gouged, shoved or otherwise injured by the grinding operations. Removing the pavement to the required depth adjacent to structures in the pavement surface such as drain castings and utility covers must be accomplished in a manner satisfactory to the Commissioner. This work will be considered as included in HOT-MIX ASPHALT SURFACE REMOVAL, of the depth specified. Sawcutting and removing the pavement to construct butt joints must be accomplished in a manner satisfactory to the Commissioner. No separate payment will be made for sawcutting and constructing butt joints. This work will be considered included in HOT-MIX ASPHALT SURFACE REMOVAL, of the depth specified.

3.02 The equipment used for surface removal must be a self-propelled grinding machine capable of removing in one pass, a layer of pavement at least six feet (6’) in width and zero to four (0” – 4”) inches in depth. The grinding machine must be on not less than a 6-foot wheelbase and must be capable of grinding variable depths required. It will be required that the material be windrolled and conveyed by a continuous conveyor to a truck for removal from the construction site. It must also have an effective means for removing excess material from the surface and from preventing any dust resulting from the operation escaping into the air.

A. Prior to the start of grinding operations and until all excess material, dust or debris is removed by mechanical sweeper, all catch basins and open lid manholes must be plated or have burlap placed between the lid and frame to prevent any grinding debris from entering the sewer system. Any debris entering a manhole must be immediately removed.

B. Grindings must be immediately removed from the site and legally disposed of in accordance with Article 202.03 of the IDOT Standard Specifications. Stockpiling of any debris resulting from this item will not be allowed.

3.03 The milling of side streets at intersections, alley returns, and other confined areas may be accomplished thru the use of a smaller, more maneuverable machine other than specified above.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The Work of HOT MIX ASPHALT SURFACE REMOVAL will not be measured for payment.

4.02 PAYMENT

A. No separate payment will be made for the work covered in this section. Payment for the Work of HOT MIX ASPHALT SURFACE REMOVAL will be included in the contract lump sum price as shown in the Schedule of Prices for CIVIL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Civil Work: 020000.

END OF SECTION 02 41 13.13

SECTION 02 41 19.S
SELECTIVE STRUCTURE DEMOLITION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this section.

1.02 SUMMARY

A. This Section includes the demolition, removal and proper disposal of the items indicated on the drawings to be removed and any other items to be removed as required to facilitate the installation of the new work; including the following:

1. Remove existing concrete structure as indicated on the drawings.
2. Remove existing wall and architectural finishes as indicated on the drawings.
3. Remove existing plumbing supply, drain, and vent piping, etc. integral with the work, to the extent shown on the drawings, and as otherwise required. Cap piping as required.
4. Remove existing light fixtures, electrical outlets, wiring, conduit, etc. integral with the work, to the extent shown on the drawings, and as otherwise required. Cap wiring and conduit as required.
5. Remove existing pavement surface and base course as indicated on the drawings.
6. Remove existing irrigation and domestic water piping as indicated on the drawings.
7. Remove planters as indicated on drawings.
8. Remove all other items as shown on the drawings, indicated, or as otherwise required to facilitate the new construction.

B. Any salvageable items to be reused are to be removed carefully to avoid damage to the items, stored and protected during the work until re-installed; including the following:

1. All signage and art work

C. Protect existing to remain items at the roof from damage during the demolition and new work.

D. Contractor to avoid excessive concentrated loads beyond the 30 or 40 lbs per sq. ft. design live loads when storing material on the roof or floor, respectively.

E. The areas currently occupied must remain operational at all times unless approved otherwise. Coordinate any construction and/or staging activities that may impede normal CTA operations with the Authority including, but not limited to, any activity that generates excessive noise or airborne dust; interference with the Authority's operations; access or use by the Authority's customers or public; or the safety of employees, customers of the public. The Contractor shall schedule the access to the work, use of the facility and other issues pertaining to the demolition and construction with the Authority to minimize disruption to the Authority's operations and protect other areas of the building from damage and allow for safe passage of personnel.

F. All internal areas of the building, platforms, tracks, storage and equipment must be protected from water, debris, dust and damage at all times.

G. Provide safety protection system around work area to protect pedestrians, vehicles, customers and CTA personnel. When working at roofs or other raised areas, provide and install an approved safety net system for the perimeter of the roof or floor to prevent debris and materials from falling on the tracks or other areas below. Safety net materials and installation to be submitted to the Authority for approval.

H. Work includes providing, installing, maintaining and removing temporary construction barriers as required during the course of the work. Work includes providing, installing and removing foot traffic barricades and control devices and signage as required during the course of the work and as approved by the Authority. Construction barriers to be of plywood and wood framing unless approved otherwise.

I. Contractor to provide a staging plan and safety plan for the Authority's approval prior to starting the work. Coordinate with the Authority for staging areas.

J. Contractor shall schedule and coordinate all work with the Authority. Contractor shall submit and obtain approval on a process plan and phasing plan for all the work, including demolition prior to commencing work on site.

K. Contractor to refer to and adhere to the Drawings, Specifications and other documents provided for this Project.

L. Provide for flagging of trains as required, scheduled and approved by the Authority.

M. Contractor to protect the remainder of the existing structure during demolition and construction. Buildings must be protected from moisture and the elements. Any equipment inside buildings must be protected from dust, debris, moisture, the elements and other damage during the demolition and construction.

1. Protect all roof drains during demolition and construction at the roof level.

N. Coordinate and review the removal, relocation and/or reinstallation of electrical work and equipment, communication equipment, antennas and other specialty items with the Authority prior to beginning the work to maintain their functionality and avoid damage to the items or systems. Work may require re-routing utility lines as required to avoid the demolition and/or new construction.

O. Work may include patching and repairs to existing adjacent surfaces after removal or demolition. Work includes coring and cutting existing surfaces for installation of new plumbing piping and electrical conduit. Patch upon completion. Patching and repairs to match existing materials and finishes.

P. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 01 Section "Summary of Work".
2. Division 01 Section "Cutting and Patching" for cutting and patching procedures for selective demolition operations.

3. Division 02 Sections for environmental including asbestos abatement, lead abatement and soil remediation.
4. Division 06 Section "Carpentry" for material and construction requirements for temporary enclosures.

1.03 DEFINITIONS

A. Remove: Remove and legally dispose of items except those indicated to be reinstalled, salvaged, or to remain the Authority's property.

B. Remove and Salvage for Recycling: Items indicated to be removed and recycled are to be separated and arranged for recycling. Construction debris from demolition and construction waste materials are to be picked up by recycling waste haulers for recycling to the greatest extent possible. As a minimum requirement, the Contractor must follow the City of Chicago Ordinance for recycling construction debris.

C. Remove and Salvage for Re-use: Items indicated to be removed and salvaged remain the Authority's property. Remove, clean, and pack or crate items to protect against damage. Identify contents of containers and deliver to Authority's designated storage area.

D. Remove and Reinstall: Remove items indicated; clean, service, and otherwise prepare them for reuse; store and protect against damage. Reinstall items in the same locations or in locations indicated.

E. Existing to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by the Authority, items may be removed to a suitable, protected storage location during selective demolition and then cleaned and reinstalled in their original locations.

1.04 MATERIALS OWNERSHIP

A. Except for items or materials indicated to be reused, salvaged for re-use, reinstalled, or otherwise indicated to remain the Authority's property, demolished materials shall become the Contractor's property and shall be removed from the site and legally disposed of by the Contractor.

1.05 SUBMITTALS

A. General: Submit each item in this Article according to the conditions of the contract and Division 01 Specification Sections, for approval, unless otherwise indicated:

1. Proposed dust-control measures.
2. Proposed noise-control measures.
3. Schedule of demolition activities indicating the following:

    a. For each location: Detailed sequence of temporary supports, demolition and removal work, with starting and ending dates for each activity.
    b. Interruption of utility services.
    c. Coordination for shutoff, capping, and continuation of utility services.
    d. Detailed sequence of selective demolition and removal work to ensure uninterrupted progress of Authority's on-site operations.
    e. Locations of temporary partitions, barriers and means of egress.

f. Foot traffic control or interruption. Closing of areas.
g. Shoring required.
h. Indicate how demolition work will avoid interruption of Authority's on-site operations.
i. Demolition plan.

4. Proposed recycling procedures.
5. Inventory of items to be removed and salvaged for re-use.

B. Contractor shall submit a process plan and phasing plan for the demolition work. The Contractor shall submit drawings and calculations, signed and sealed by an engineer licensed in the State of Illinois, showing all temporary shoring and supports for all temporary conditions until the structural system is complete.

C. Contractor shall submit proposed barricades, control devices and signage as required during the demolition and other work, including the proposed location of the barricades, control devices and signage, and the materials proposed to be used for the barricades, control devices and signage, for the Authority's review and approval.

D. Provide the following, for information purposes:

1. Photographs or video for information purposes, sufficiently detailed, of existing conditions of adjoining construction and site improvements that might be misconstrued as damage caused by selective demolition operations.

E. Provide the following at Project Closeout according to Division 01 Section "Project Closeout":

1. Record drawings; including identification and accurate locations of capped utilities and other subsurface structural, electrical, or mechanical conditions.

F. Provide written and dated documentation of the total amount of each different waste material, the amount of each sent to a recycling facility and the amount of each sent to a landfill. Documentation shall be done on a daily basis. Indicate when and who the materials were picked up by and the name of the recycling facility the materials were sent to.

G. A demolition plan is to be submitted to the Authority for approval. Demolition shall not commence until the contractor has received written approval from the Authority.

1.06 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with governing EPA notification regulations before starting selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction. Comply with City of Chicago Recycling Ordinance.

1.07 PROJECT CONDITIONS

A. Contractor required to survey existing conditions to verify all existing dimensions and conditions, locations of items and construction sizes of items and including conditions and limitations under which he is to do his work.

B. Contractor required to locate all existing utilities and other improvements, including utilities not exposed to view.

C. There will be no extras allowed to compensate Contractor for his failure to review and verify existing conditions and dimensions.

D. Demolition work to adhere to phasing plans for the project.

1.08 HAZARDOUS MATERIALS

A. The Authority has determined that various components to be removed or to be painted may contain lead paint. These components shall be removed according to all applicable federal, state and local regulations including. This shall include 29 CFR1926.62 and 29 CFR1910.1025 under the Occupational Safety and Health Act, Toxic Substance and Control Act, Resource Conservation and Recovery Act, Illinois Lead Poisoning Prevention Act (77 Illinois Adm. Code 845) and City of Chicago Code 11-4-2190 (Sandblasting, grinding and chemical washing of building, facilities or other structures; permit and notification requirements; performance standards for lead paint abatement; and disposal of debris.) Contractor shall submit removal or mitigation plan to the Authority for approval.

B. For structures noted to be re-painted; existing paint that is loose, flaking, or otherwise not recommended to remain under the new paint system; is to be removed and, unless determined otherwise, should be assumed to contain lead. The following lead paint removal procedures shall be followed:

1. Work is governed by OSHA Regulations (worker protection) and NESHAP Regulations (visible emissions).
2. City of Chicago Sandblasting, Grinding and Chemical Washing Ordinance is not applicable as long as hand scraping removal method is used. Any mechanical methods or chemical removal would require City permits. CTA Facilities Maintenance shall coordinate with Environmental Affairs if Permits are required.
3. Employees conducting lead abatement shall be licensed by IDPH as a lead abatement worker and/or supervisor.
4. Lead paint work area shall be separated by caution tape or other appropriate barrier.
5. Work area shall be covered with appropriate non-skid (canvas) tarpaulin. This tarpaulin shall be cleaned with a HEPA vacuum after each shift or prior to moving tarpaulin. Paint chips and collected dust shall be bagged and disposed of as lead waste. Contact Environmental Affairs (312-681-3869) for disposal.
6. Employee shall wet impact surface to prevent dust during scraping activity.
7. Employees shall wear disposable coveralls during lead abatement activity. Coveralls shall be disposed as lead waste.
8. Employees shall wear appropriate respirators. CTA may conduit air sample (negative exposure assessment) to determine airborne lead dust exposure.
9. Employees shall maintain good personnel hygiene by washing their hands and face prior to eating, drinking, smoking, or leaving the site.

C. Other than the lead paint referred to above, the Contractor is not responsible to remove hazardous material that is encountered in the course of the work and not identified as hazardous material in the contract documents or otherwise addressed in the contract documents. If previously unidentified hazardous material is encountered, do not disturb

the materials. Immediately notify the Authority for direction and arrangement for proper removal by licensed asbestos abatement workers and proper disposal.

D. Material containing lead based paint to be disposed of as hazardous waste, according to all applicable laws and regulations, unless approved otherwise, at Contractor's expense and at approved landfills. Do not allow lead dust to contaminate other surfaces. The Contractor shall be responsible for handling, transporting, and disposing of any hazardous materials generated during the course of the project in accordance with all applicable federal, state and local environmental regulations and codes.

PART 2 PRODUCTS

2.01 REPAIR MATERIALS

A. Use repair materials identical to existing materials.

1. Where identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
2. Use materials whose installed performance equals or surpasses that of existing materials.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that those utilities indicated and approved to be disconnected and capped, have been properly done so.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required. All work indicated may vary based on actual field conditions and dimensions. Additional demolition and/or patching may be required depending on the condition of materials and construction upon opening up the existing construction and actual justification and/or attachment of the materials.

C. When unanticipated mechanical, electrical, or structural elements that conflict with the intended function or design are encountered, investigate and measure the nature and extent of the conflict. Promptly submit a written report to the Authority.

D. Survey the condition of the structure to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of the structure or adjacent structures during selective demolition.

E. Perform surveys as the work progresses to detect hazards resulting from selective demolition activities.

3.02 UTILITY SERVICES

A. Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Do not interrupt existing utilities serving occupied or operating facilities, except when authorized in writing by Authority and authorities having jurisdiction.

Provide temporary services during interruptions to existing utilities, as acceptable to Authority and to governing authorities.

a. Provide not less than 72 hours' notice to Authority if shutdown of service is required during changeover.

B. Utility Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services serving building to be selectively demolished.

1. Arrange to shut off indicated utilities with utility companies.
2. Where utility services are required to be removed, relocated, or abandoned, provide bypass connections to maintain continuity of service to other parts of the building before proceeding with selective demolition.
3. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal the remaining portion of pipe or conduit after bypassing.

C. Utility Requirements: Refer to their respective sections of these specifications for shutting off, disconnecting, removing, and sealing or capping utility services. Do not start selective demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.03 PREPARATION

A. Conduct demolition operations and remove debris to ensure minimum interference with adjacent occupied and used facilities.

1. Do not close or obstruct adjacent occupied or used facilities without permission from Authority and authorities having jurisdiction. Provide alternate routes around closed or obstructed foot traffic ways.
2. Do not block required exits or stairways.

B. Conduct demolition operations to prevent injury to people and damage to adjacent facilities to remain. Ensure safe passage of people around selective demolition area.

1. Protect walls, ceilings, floors, and other existing finish work that are to remain and are exposed during selective demolition operations.
2. Cover and protect equipment that has not been removed.

C. Erect and maintain dust-proof partitions and temporary enclosures as required to limit dust and dirt migration and to separate areas from fumes and noise.

D. If required, provide and maintain shoring, bracing, or structural support to preserve stability and prevent movement, settlement, or collapse of building components during selective demolition and until new support is installed.

3.04 POLLUTION CONTROLS

A. Use temporary enclosures, and other suitable methods to limit the spread of dust and dirt. Comply with governing environmental protection regulations.

B. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

C. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before start of selective demolition.

3.05 SELECTIVE DEMOLITION

A. Demolish and remove existing construction only to the extent required by new construction and as indicated on the drawings. Use methods required to complete work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. To minimize disturbance of adjacent surfaces, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Do no overcut corners. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire suppression devices during flame-cutting operations.
5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
7. Locate selective demolition equipment throughout the structure and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
8. Dispose of demolished items and materials promptly. On-site storage or sale of removed items is prohibited.
9. Return elements of construction and surfaces to remain to condition existing before start of selective demolition operations.

B. Demolish masonry in small sections. Cut masonry at junctures with construction to remain, using power-driven masonry saw or hand tools; do not use power-driven impact tools. Saw cut between existing masonry to be removed and to remain.

C. Demolish and remove existing construction according to the IDOT Standard Specifications for Road and Bridge Construction, Section 501, Removal of Existing Structures.

D. The Contractor is fully responsible for the means and method of demolition and the integrity and stability of the existing structure during demolition until the work is completed.

E. Do not remove more of the existing structure than indicated on the drawings or as required.
Do not damage, mar, cut or deface the remaining structure to remain or material to be reused. At locations where existing reinforcement is noted to remain, care shall be taken not to damage reinforcement during concrete removal procedures.

F. Verify all dimensions and existing conditions.

3.06 PATCHING AND REPAIRS

A. Promptly patch and repair holes and damaged surfaces caused by demolition operations to match adjacent construction.

B. Patching is specified in Division 01 Section "Cutting and Patching."

C. Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials. Patch to match existing, using materials to match existing.

1. Completely fill holes and depressions in existing masonry or concrete to remain with an approved masonry or concrete patching material, applied according to manufacturer's printed specifications.

D. Restore exposed finishes of patched areas and extend finish restoration into adjoining construction to remain in a manner that eliminates evidence of patching and refinishing.

E. Patch and repair floor, ceiling and wall surfaces in the new space where demolished walls or partitions extend one finished area into another. Provide a flush and even surface of uniform color and appearance.

1. Closely match texture and finish of existing adjacent surface.
2. Patch with durable seams that are as invisible as possible. Comply with specified tolerances.
3. Where patching smooth painted surfaces, extend final paint coat over entire unbroken surface containing the patch after the surface has received primer and second coat.
4. Where applicable, remove existing floor and wall finishes and replace with new materials, if necessary, to achieve uniform color and appearance.

F. Repairs, patching and replacements due to damage by the Contractor are the complete responsibility of the Contractor.

3.07 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Promptly dispose of demolished materials, accumulated debris, rubbish, and other materials resulting from demolition operations. Do not allow demolished materials to accumulate on-site except as required for recycling operations.

B. Recycle construction debris from demolition operations and construction waste to the greatest extent possible. Contractor must follow City of Chicago Recycling of Construction Debris Ordinance as a minimum requirement.

C. Concrete, masonry, steel, wood, glass, cardboard and other materials shall be separated at the construction site and pick up shall be arranged with their respective recycling waste haulers for recycling of the individual waste materials.

D. Provide written and dated documentation of the total amount of each different waste material, the amount of each sent to a recycling facility and the amount of each sent to a landfill. Documentation shall be done on a daily basis. Indicate when and who the materials were picked up by and the name of the recycling facility the materials were sent to.

E. Disposal of non-recyclable debris: Transport materials that are not suitable for recycling off Authority's property and legally dispose of them.

3.09 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to condition existing prior to start of work.

B. Sweep the building broom clean on completion of selective demolition operation.

C. Change filters on air-handling equipment on completion of selective demolition operations.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of SELECTIVE STRUCTURE DEMOLITION shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of SELECTIVE STRUCTURE DEMOLITION shall be included in the contract lump sum price as shown in the Schedule of Prices for STRUCTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Structural Work: 030000.

END OF SECTION

SECTION 02 41 19

SELECTIVE STRUCTURE DEMOLITION

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this section.

1.02 SUMMARY

A. This Section includes the demolition, removal and proper disposal of the items indicated on the drawings to be removed and any other items to be removed as required to facilitate the installation of the new work; including the following:

1. Remove existing bent girders as shown in the plans.
2. Remove existing bent columns as shown in the plans.
3. Remove existing track truss stringers as shown in the plans.
4. Remove all other items as shown on the drawings, indicated, or as otherwise required to facilitate the new construction.

Remove all other items as shown, indicated, or as otherwise required to facilitate the new construction.

B. Any salvageable items to be reused are to be removed carefully to avoid damage to the items, stored and protected during the work until re-installed; including the following:

1. Existing exterior light fixtures
2. Existing CTA Logo (sign)
3. Rotogates & Turnstiles
4. CTA Vending Machines & ATM Machines
5. All signage and art work
6. Stainless steel railings
7. Radiant heaters
8. Windbreaks
9. Pay Phones
10. Benches, Trash cans and other platform furniture

C. Protect existing to remain items at the roof from damage during the demolition and new work.

D. Contractor to avoid excessive concentrated loads beyond the 30 or 40 lbs per sq. ft. design live loads when storing material on the roof or floor, respectively.

E. The areas currently occupied must remain operational at all times unless approved otherwise. Coordinate any construction and/or staging activities that may impede normal CTA operations with the Authority including, but not limited to, any activity that generates excessive noise or airborne dust; interference with the Authority's operations; access or use by the Authority's customers or public; or the safety of employees, customers of the public. The Contractor shall schedule the access to the work, use of the facility and other issues pertaining to the demolition and construction with the Authority to minimize disruption to the Authority's operations and protect other areas of the building from damage and allow for safe passage of personnel.

F. All internal areas of the building, platforms, tracks, storage and equipment must be protected from water, debris, dust and damage at all times.

G. Provide safety protection system around work area to protect pedestrians, vehicles, customers

and CTA personnel. When working at roofs or other raised areas, provide and install an approved safety net system for the perimeter of the roof or floor to prevent debris and materials from falling on the tracks or other areas below. Safety net materials and installation to be submitted to the Authority for approval.

H. Work includes providing, installing, maintaining and removing temporary construction barriers as required during the course of the work. Work includes providing, installing and removing foot traffic barricades and control devices and signage as required during the course of the work and as approved by the Authority. Construction barriers to be of plywood and wood framing unless approved otherwise.

I. Contractor to provide a staging plan and safety plan for the Authority's approval prior to starting the work. Coordinate with the Authority for staging areas.

J. Contractor shall schedule and coordinate all work with the Authority. Contractor shall submit and obtain approval on a process plan and phasing plan for all the work, including demolition prior to commencing work on site.

K. Contractor to refer to and adhere to the Drawings, Specifications and other documents provided for this Project.

L. Provide for flagging of trains as required, scheduled and approved by the Authority.

M. Contractor to protect the remainder of the existing structure during demolition and construction. Buildings must be protected from moisture and the elements. Any equipment inside buildings must be protected from dust, debris, moisture, the elements and other damage during the demolition and construction.

1. Protect all roof drains during demolition and construction at the roof level.

N. Coordinate and review the removal, relocation and/or reinstallation of electrical work and equipment, communication equipment, antennas and other specialty items with the Authority prior to beginning the work to maintain their functionality and avoid damage to the items or systems. Work may require re-routing utility lines as required to avoid the demolition and/or new construction.

O. Work may include patching and repairs to existing adjacent surfaces after removal or demolition. Work includes coring and cutting existing surfaces for installation of new plumbing piping and electrical conduit. Patch upon completion. Patching and repairs to match existing materials and finishes.

P. Related Sections: The following Sections contain requirements that relate to this Section:

1. Section 01 11 00 – Summary of Work
2. Section 01 73 29 – Cutting and Patching for cutting and patching procedures for selective demolition operations.
3. Division 02 Sections for environmental including asbestos abatement, lead abatement and soil remediation.
4. Section 02 42 96 – Historic Removal and Dismantling for salvaging of historic elements to be reused.
5. Sections 06 10 00 – Rough Carpentry for material and construction requirements for temporary enclosures.

1.03 DEFINITIONS

A. Remove: Remove and legally dispose of items except those indicated to be reinstalled, salvaged, or to remain the Authority's property.

B. Remove and Salvage for Recycling: Items indicated to be removed and recycled are to be separated and arranged for recycling. Construction debris from demolition and construction waste materials are to be picked up by recycling waste haulers for recycling to the greatest extent possible. As a minimum requirement, the Contractor to follow the City of Chicago Ordinance for recycling construction debris.

C. Remove and Salvage for Re-use: Items indicated to be removed and salvaged remain the Authority's property. Remove, clean, and pack or crate items to protect against damage. Identify contents of containers and deliver to Authority's designated storage area.

D. Remove and Reinstall: Remove items indicated; clean, service, and otherwise prepare them for reuse; store and protect against damage. Reinstall items in the same locations or in locations indicated.

E. Existing to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by the Authority, items may be removed to a suitable, protected storage location during selective demolition and then cleaned and reinstalled in their original locations.

1.04 MATERIALS OWNERSHIP

A. Except for items or materials indicated to be reused, salvaged for re-use, reinstalled, or otherwise indicated to remain the Authority's property, demolished materials shall become the Contractor's property and shall be removed from the site and legally disposed of by the Contractor.

1.05 SUBMITTALS

A. General: Submit each item in this Article according to the conditions of the contract and Division 01 Specification Sections, for approval, unless otherwise indicated:

1. Proposed dust-control measures.
2. Proposed noise-control measures.
3. Schedule of demolition activities indicating the following:

    a. For each location: Detailed sequence of demolition and removal work, with starting and ending dates for each activity.
    b. Interruption of utility services.
    c. Coordination for shutoff, capping, and continuation of utility services.
    d. Detailed sequence of selective demolition and removal work to ensure uninterrupted progress of Authority's on-site operations.
    e. Locations of temporary partitions, barriers and means of egress.
    f. Foot traffic control or interruption. Closing of areas.
    g. Shoring required.
    h. Indicate how demolition work will avoid interruption of Authority’s on-site operations.
    i. Demolition plan.

4. Proposed recycling procedures.
5. Inventory of items to be removed and salvaged for re-use.

B. Contractor shall submit a process plan and phasing plan for the demolition work.

C. Contractor shall submit proposed barricades, control devices and signage as required during the demolition and other work, including the proposed location of the barricades, control devices and signage, and the materials proposed to be used for the barricades, control devices and signage, for the Authority’s review and approval.

D. Provide the following, for information purposes:

1. Photographs or video for information purposes, sufficiently detailed, of existing conditions of adjoining construction and site improvements that might be misconstrued as damage caused by selective demolition operations.

E. Provide the following at Project Closeout according to Division 01 Section "Project Closeout":

1. Record drawings; including identification and
accurate locations of capped utilities and other subsurface structural, electrical, or mechanical conditions.

F. Provide written and dated documentation of the total amount of each different waste material, the amount of each sent to a recycling facility and the amount of each sent to a landfill. Documentation shall be done on a daily basis. Indicate when and who the materials were picked up by and the name of the recycling facility the materials were sent to.

G. A demolition plan is to be submitted to the Authority for approval. Demolition shall not commence until the contractor has received written approval from the Authority.

1.06 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with governing EPA notification regulations before starting selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction. Comply with City of Chicago Recycling Ordinance.

1.07 PROJECT CONDITIONS

A. Contractor required to survey existing conditions to verify all existing dimensions and conditions, locations of items and construction sizes of items and including conditions and limitations under which he is to do his work.

B. Contractor required to locate all existing utilities and other improvements, including utilities not exposed to view.

C. There will be no extras allowed to compensate Contractor for his failure to review and verify existing conditions and dimensions.

D. Demolition work to adhere to phasing plans for the project.

1.08 HAZARDOUS MATERIALS

A. The Authority has determined that various components to be removed or to be painted may contain lead paint. These components shall be removed according to all applicable federal, state and local regulations including. This shall include 29 CFR1926.62 and 29 CFR1910.1025 under the Occupational Safety and Health Act, Toxic Substance and Control Act, Resource Conservation and Recovery Act, Illinois Lead Poisoning Prevention Act (77 Illinois Adm. Code 845) and City of Chicago Code 11-4-2190 (Sandblasting, grinding and chemical washing of building, facilities or other structures; permit and notification requirements; performance standards for lead paint abatement; and disposal of debris.) Contractor shall submit removal or mitigation plan to the Authority for approval.

B. For structures noted to be re-painted; existing paint that is loose, flaking, or otherwise not recommended to remain under the new paint system; is to be removed and, unless determined otherwise, should be assumed to contain lead. The following lead paint removal procedures shall be followed:

1. Work is governed by OSHA Regulations (worker protection) and NESHAP Regulations (visible emissions).

2. City of Chicago Sandblasting, Grinding and Chemical Washing Ordinance is not applicable as long as hand scrapping removal method is used. Any mechanical methods or chemical removal would require City permits. CTA Facilities Maintenance shall coordinate with Environmental Affairs if Permits are required.
3. Employees conducting lead abatement shall be licensed by IDPH as a lead abatement worker and/or supervisor.
4. Lead paint work area shall be separated by caution tape or other appropriate barrier.
5. Work area shall be covered with appropriate non-skid (canvas) tarpaulin. This tarpaulin shall be cleaned with a HEPA vacuum after each shift or prior to moving tarpaulin. Paint chips and collected dust shall be bagged and disposed of as lead waste. Contact Environmental Affairs (312-681-3869) for disposal.
6. Employee shall wet impact surface to prevent dust during scraping activity.
7. Employees shall wear disposable coveralls during lead abatement activity. Coveralls shall be disposed as lead waste.
8. Employees shall wear appropriate respirators. CTA may conduit air sample (negative exposure assessment) to determine airborne lead dust exposure.
9. Employees shall maintain good personnel hygiene by washing their hands and face prior to eating, drinking, smoking, or leaving the site.

C. Other than the lead paint referred to above, the Contractor is not responsible to remove hazardous material that is encountered in the course of the work and not identified as hazardous material in the contract documents or otherwise addressed in the contract documents. If previously unidentified hazardous material is encountered, do not disturb the materials. Immediately notify the Authority for direction and arrangement for proper removal by licensed asbestos abatement workers and proper disposal.

D. Material containing lead based paint to be disposed of as hazardous waste, according to all applicable laws and regulations, unless approved otherwise, at Contractor's expense and at approved landfills. Do not allow lead dust to contaminate other surfaces. The Contractor shall be responsible for handling, transporting, and disposing of any hazardous materials generated during the course of the project in accordance with all applicable federal, state and local environmental regulations and codes.

PART 2 – PRODUCTS

2.01 REPAIR MATERIALS

A. Use repair materials identical to existing materials.

1. Where identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
2. Use materials whose installed performance equals or surpasses that of existing materials.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verify that those utilities indicated and approved to be disconnected and capped, have been properly done so.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required. All work indicated may vary based on actual field conditions and dimensions. Additional demolition and/or patching may be required depending on the condition of materials and construction upon opening up the existing construction and actual justification and/or attachment of the materials.

C. When unanticipated mechanical, electrical, or structural elements that conflict with the intended function or design are encountered, investigate and measure the nature and extent of the conflict.

Promptly submit a written report to the Authority.

D. Survey the condition of the building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of the structure or adjacent structures during selective demolition.

E. Perform surveys as the work progresses to detect hazards resulting from selective demolition activities.

3.02 UTILITY SERVICES

A. Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Do not interrupt existing utilities serving occupied or operating facilities, except when authorized in writing by Authority and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to Authority and to governing authorities.

a. Provide not less than 72 hours' notice to Authority if shutdown of service is required during changeover.

B. Utility Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services serving building to be selectively demolished.

1. Arrange to shut off indicated utilities with utility companies.
2. Where utility services are required to be removed, relocated, or abandoned, provide bypass connections to maintain continuity of service to other parts of the building before proceeding with selective demolition.
3. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal the remaining portion of pipe or conduit after bypassing.

C. Utility Requirements: Refer to their respective sections of these specifications for shutting off, disconnecting, removing, and sealing or capping utility services. Do not start selective demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.03 PREPARATION

A. Conduct demolition operations and remove debris to ensure minimum interference with adjacent occupied and used facilities.

1. Do not close or obstruct adjacent occupied or used facilities without permission from Authority and authorities having jurisdiction. Provide alternate routes around closed or obstructed foot traffic ways.
2. Do not block required exits or stairways.

B. Conduct demolition operations to prevent injury to people and damage to adjacent facilities to remain. Ensure safe passage of people around selective demolition area.

1. Protect walls, ceilings, floors, and other existing finish work that are to remain and are exposed during selective demolition operations.
2. Cover and protect equipment that has not been removed.

C. Erect and maintain dust-proof partitions and temporary enclosures as required to limit dust and dirt migration and to separate areas from fumes and noise.

D. If required, provide and maintain shoring, bracing, or structural support to preserve stability and prevent movement, settlement, or collapse of building components during selective demolition

and until new support is installed.

3.04 POLLUTION CONTROLS

A. Use temporary enclosures, and other suitable methods to limit the spread of dust and dirt. Comply with governing environmental protection regulations.

B. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

C. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before start of selective demolition.

3.05 SELECTIVE DEMOLITION

A. Demolish and remove existing construction only to the extent required by new construction and as indicated on the drawings. Use methods required to complete work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. To minimize disturbance of adjacent surfaces, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire- suppression devices during flame-cutting operations.
5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
7. Locate selective demolition equipment throughout the structure and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
8. Dispose of demolished items and materials promptly. On-site storage or sale of removed items is prohibited.
9. Return elements of construction and surfaces to remain to condition existing before start of selective demolition operations.

B. Demolish masonry in small sections. Cut masonry at junctures with construction to remain, using power-driven masonry saw or hand tools; do not use power-driven impact tools. Sawcut between existing masonry to be removed and to remain.

C. Demolish and remove existing construction according to the IDOT Standard Specifications for Road and Bridge Construction, Section 501, Removal of Existing Structures.

D. The Contractor is fully responsible for the means and method of demolition and the integrity and stability of the existing structure during demolition until the work is completed.

E. Do not remove more of the existing structure than indicated on the drawings or as required. Do not damage, mar, cut or deface the remaining structure to remain or material to be reused.

F. Verify all dimensions and existing conditions.

3.06 PATCHING AND REPAIRS

A. Promptly patch and repair holes and damaged surfaces caused by demolition operations to match adjacent construction.

B. Patching is specified in Division 01 Section 01 73 29, Cutting and Patching.

C. Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials. Patch to match existing, using materials to match existing.

1. Completely fill holes and depressions in existing masonry or concrete to remain with an approved masonry or concrete patching material, applied according to manufacturer's printed specifications.

D. Restore exposed finishes of patched areas and extend finish restoration into adjoining construction to remain in a manner that eliminates evidence of patching and refinishing.

E. Patch and repair floor, ceiling and wall surfaces in the new space where demolished walls or partitions extend one finished area into another. Provide a flush and even surface of uniform color and appearance.

1. Closely match texture and finish of existing adjacent surface.
2. Patch with durable seams that are as invisible as possible. Comply with specified tolerances.
3. Where patching smooth painted surfaces, extend final paint coat over entire unbroken surface containing the patch after the surface has received primer and second coat.
4. Where applicable, remove existing floor and wall finishes and replace with new materials, if necessary, to achieve uniform color and appearance.

F. Repairs, patching and replacements due to damage by the Contractor are the complete responsibility of the Contractor.

3.07 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Promptly dispose of demolished materials, accumulated debris, rubbish, and other materials resulting from demolition operations. Do not allow demolished materials to accumulate on-site except as required for recycling operations.

B. Recycle construction debris from demolition operations and construction waste to the greatest extent possible. Contractor must follow City of Chicago Recycling of Construction Debris Ordinance as a minimum requirement.

C. Concrete, masonry, steel, wood, glass, cardboard and other materials shall be separated at the construction site and pick up shall be arranged with their respective recycling waste haulers for recycling of the individual waste materials.

D. Provide written and dated documentation of the total amount of each different waste material, the amount of each sent to a recycling facility and the amount of each sent to a landfill. Documentation shall be done on a daily basis. Indicate when and who the materials were picked up by and the name of the recycling facility the materials were sent to.

E. Disposal of non-recyclable debris: Transport materials that are not suitable for recycling off Authority's property and legally dispose of them.

3.08 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to condition existing prior to start of work.

B. Sweep the building broom clean on completion of selective demolition operation.

C. Change filters on air-handling equipment on completion of selective demolition operations.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of SELECTIVE STRUCTURE DEMOLITION shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of SELECTIVE STRUCTURE DEMOLITION shall be included in the contract lump sum price as shown in the Schedule of Prices for STRUCTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Structural Work: 030000

END OF SECTION

SECTION 02 42 13

UTILITY RELOCATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Relocate existing utilities as shown on the Drawings or as directed by the Commissioner. Private Utility relocation plans in CDOT's possession will be made available to the contractor upon request.

B. Make arrangements with appropriate City agencies and utility companies before proceeding with Work. Items requiring replacement shall be replaced in-kind. The Contractor will be solely responsible for the removal and resetting work.

1.03 RELATED SECTIONS

A. Section 31 23 10: Excavation, Trenching and Backfilling (Utilities).

B. Section 33 05 15: City Electrical Vault or Handhole To Be Adjusted.

C. Section 33 05 22: Repair and Adjustment of Sewer Mains and Structures.

1.04 REFERENCES

A. Illinois Department of Transportation (IDOT) Standard Specifications for Road and Bridge Construction, latest edition.

B. Standard Specifications for Water and Sewer Main Construction in Illinois, current edition.

C. City of Chicago Department of Water Management, specifications for water main and appurtenance's construction.

1.05 QUALITY ASSURANCE

A. Comply with all codes, laws, ordinances and regulations of governmental authorities having jurisdiction over this work including applicable OSHA and Standard Specifications requirements.

B. Verify all existing conditions and dimensions in the field.

C. Verify locations of all existing underground utilities, to determine which utilities require relocation/replacement. Record drawings are available at the Chicago Bureau of Electricity and Department of Water Management.

PART 2 - PRODUCTS (NOT USED)

PART 3 - PART EXECUTION

3.01 Fire Hydrants and water mains will be relocated in accordance with Department of Water Management criteria, Chicago Standard Specifications for Water and Sewer Main construction in Illinois, and Sections 561 and 564 of the IDOT Standard Specifications.

3.02 Valve Vaults shall be reconstructed according to Section 602 of the IDOT Standard Specifications.

3.03 Sewer main relocation will be done in accordance with Department of Water Management criteria, Chicago Standard specifications for Water and Sewer Main construction in Illinois and Section 550 of the IDOT Standard Specifications.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The Work of UTILITY RELOCATION will not be measured for payment.

4.02 PAYMENT

A. No separate payment will be made for the work covered in this section. Payment for the Work of UTILITY RELOCATION will be included in the contract lump sum price as shown in the Schedule of Prices for CIVIL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Civil Work: 020000.

END OF SECTION 02 42 13

SECTION 02 42 96

HISTORIC REMOVAL AND DISMANTLING

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Contractor shall provide all labor and materials for historic treatment procedures in the form of special types of selective demolition work for designated historic spaces, areas, and surfaces and the following specific work:
   1. Dismantling and salvage of columns, bases, 'capitals', 'knuckles', and newels for reuse.
   2. Dismantling and salvage of triangular "bents" (truss frame at top of columns, spanning between columns) along with any related members required for reassembly.
   3. Dismantling and salvage of spanning guardrail panels, kick plates and rails for re use.
   4. Dismantling and salvage of indicated portions of structure.
   5. Removal and dismantling of indicated portions of structure and debris hauling.
   6. Removal and dismantling of indicated site elements and debris hauling.

B. Related Sections:
   1. Section 01 35 91 Historic Treatment Procedures
   2. Section 02 41 29 Selective Structure Demolition
   3. Section 05 03 71 Historic Decorative Metal Cleaning
   4. Section 05 03 74 Historic Cast Iron Repair
   5. Section 09 03 91 Historic Treatment of Plain Painting

1.2 DEFINITIONS

A. Dismantle: To disassemble or detach a historic item from a surface, or a non-historic item from a historic surface, using gentle methods and equipment to prevent damage to historic items and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

B. Existing to Remain: Existing items that are not to be removed or dismantled, except to the degree indicated for performing required Work.

C. Remove: To take down or detach a non-historic item located within a historic space, area, or room, using methods and equipment to prevent damage to historic items and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

D. Retain: To keep existing items that are not to be removed or dismantled.

E. Salvage: To protect removed or dismantled items and deliver them to Commissioner **ready for reuse**.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For historic removal and dismantling specialist and historic removal and dismantling specialist's field supervisors.

B. Removal and Dismantling Historic Treatment Program: Submit 30 days before preconstruction meeting. Treatment program must be approved prior to historic treatment start-up meeting.

C. Preconstruction Documentation: Show preexisting conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by Contractor's removal and dismantling operations.

D. List of Items Indicated to Be Salvaged: Prepare a list of items indicated on Drawings to be salvaged for Commissioner's use or for reinstallation. Submit minimum 15 days before Historic Removals and Dismantling preconstruction conference.

E. Inventory of Salvaged Items: After removal or dismantling work is complete, submit a list of items that have been salvaged.

1. Include item description, item condition, number of items if more than one of a type, and tag number. Include photo(s) of item in original location.
2. As work proceeds, include on the inventory items that were indicated to be salvaged and items of historic importance discovered during the work. Document reasons, if any, why an item indicated to be salvaged was not salvaged.

1.4 PRECONSTRUCTION MEETINGS

A. Preconstruction Conference: Conduct conference at Project site.

1. Review Historic Treatment plan submitted and approved that outlines removal and dismantling procedures and protection of historic areas and surfaces.
2. Review list of items indicated to be salvaged.
3. Verify qualifications of personnel assigned to perform removal and dismantling.
4. Inspect and discuss condition of each construction type and element to be removed or dismantled.
5. Review requirements of other work that depends on condition of substrates exposed by removal and dismantling work.
6. Review methods and procedures related to removal and dismantling work, including, but not limited to, the following:

    a. Historic removal and dismantling specialist's personnel, equipment, and facilities needed to make progress and avoid delays.
    b. Materials, material application, sequencing, tolerances, and required clearances.
    c. Fire prevention.
    d. Coordination with CTA and passengers.

1.5 QUALITY ASSURANCE

A. Historic Removal and Dismantling Specialist Qualifications: A qualified historic treatment specialist. General selective demolition experience is insufficient experience for historic removal and dismantling work.

B. Removal and Dismantling Historic Treatment Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for each phase of removal and dismantling work, including protection of surrounding and substrate materials and Project site.

1. Dust and Noise Control: Include locations of proposed temporary dust- and noise-control partitions and means of egress from occupied areas coordinated with continuing on-site operations and other known work in progress.
2. Debris Hauling: Include plans clearly marked to show debris hauling routes, turning radii, and locations and details of temporary protective barriers.

C. Mockups: Prepare mockups of specific historic removal and dismantling procedures specified in this Section to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Typical Removal and Salvage Work: Remove one bay of typical columns, column accessories, trusses, and guardrail panels as shown on Drawings.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Commissioner specifically approves such deviations in writing.

D. Regulatory Requirements: Comply with notification regulations of authorities having jurisdiction before beginning removal and dismantling work. Comply with hauling and disposal regulations of authorities having jurisdiction.

1.6 FIELD CONDITIONS

A. Conditions existing at time of inspection for bidding purpose will be maintained by Commissioner as far as practical.

B. Notify Commissioner of discrepancies between existing conditions and Drawings before proceeding with removal and dismantling work.

C. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Commissioner. Commissioner will remove hazardous materials under a separate contract.

a. In the case of asbestos, stop work in the area of potential hazard, shut off fans and other air handlers ventilating the area, and rope off area until the questionable material is identified. Reassign workers to continue work in unaffected areas. Resume work in the area of concern after safe working conditions are verified.

D. Storage or sale of removed or dismantled items on-site is not permitted unless otherwise indicated.

PART 2 - PRODUCTS - (Not Used)

PART 3 - EXECUTION

3.1 HISTORIC TREATMENT SPECIALISTS

A. Historic Removal and Dismantling Specialist Firms must be approved, based on approved submittal during pre-construction.

3.2 HISTORIC REMOVAL AND DISMANTLING EQUIPMENT

A. Removal Equipment: Use only hand-held tools, except as follows or unless otherwise approved by Commissioner on a case-by-case basis:

1. Light jackhammers are allowed subject to Commissioner's approval.
2. Large air hammers are not permitted.

B. Dismantling Equipment: Use manual, hand-held tools, except as follows or otherwise approved by Commissioner on a case-by-case basis:

1. Hand-held power tools and cutting torches are permitted only as submitted in the historic treatment program. They must be adjustable such that they penetrate or cut only the thickness of material being removed.
2. Pry bars more than 18 inches long and hammers weighing more than 2 lb are not permitted for dismantling work.

3.3 EXAMINATION

A. Preparation for Removal and Dismantling: Examine construction to be removed or dismantled to determine best methods to safely and effectively perform removal and dismantling work. Examine adjacent work to determine what protective measures are necessary. Make explorations, probes, and inquiries as necessary to determine condition of construction to be removed or dismantled and location of utilities and services to remain that may be hidden by construction that is to be removed or dismantled.

1. Verify that affected utilities are disconnected and capped.
2. Inventory and record the condition of items to be removed and dismantled for reinstallation or salvage. Enter this information on the submittal of inventory of salvaged items.
3. Before removal or dismantling of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

B. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs and optional preconstruction video recordings.

C. Perform surveys as the Work progresses to detect hazards resulting from historic removal and dismantling procedures.

3.4 HISTORIC REMOVAL AND DISMANTLING

A. General: Have removal and dismantling work performed by a qualified historic removal and dismantling specialist. Ensure that historic removal and dismantling specialist's field supervisors are present when removal and dismantling work begins and during its progress.

B. Perform work according to the historic treatment program and approved mockup(s).

1. Perform removal and dismantling to the limits indicated.
2. Provide supports or reinforcement for existing construction that becomes temporarily weakened by removal and dismantling work, until the Project Work is completed unless otherwise indicated.
3. Perform cutting by hand or with small power tools wherever possible. Cut holes and slots neatly to size required, with minimum disturbance of adjacent work.
4. Do not operate air compressors inside building unless approved by Commissioner in each case.
5. Do not drill or cut columns, beams, joints, girders, structural slabs, or other structural supporting elements, without having Contractor's professional engineer's written approval for each location before such work is begun.
6. Dispose of removed and dismantled items off-site unless indicated to be salvaged or reinstalled.

C. Water-Mist Sprinkling: Use water-mist sprinkling and other wet methods to control dust only with adequate, approved procedures and equipment according to the historic treatment program, to ensure that such water does not create a hazard or adversely affect other building areas or materials.

D. Unacceptable Equipment: Keep equipment that is not permitted for historic removal or dismantling work away from the vicinity where such work is being performed.

E. Removing and Dismantling Items on or Near Historic Surfaces:

1. Use only dismantling equipment and procedures within two feet of historic surfaces. Do not use pry bars. Protect historic surface from contact with or damage by tools.
2. Unfasten items in the opposite order from which they were installed.
3. Support each item as it becomes loosened to prevent stress and damage to the historic surface.
4. Dismantle anchorages.

F. Steelwork:

1. Expose structural steel for examination by Commissioner and Contractor's professional engineer before proceeding with removal or dismantling.
2. If distress in structure is apparent during performance of the work, stop removal or dismantling and take immediate precautionary measures to ensure safety of the structure. Inform Commissioner of the problem, steps taken, and proposed corrective actions.
3. Brace and support structural steel being removed and remaining during removal and dismantling.
4. Concrete-Encased Steel: Where steel is known to be encased by concrete that is being removed, saw cut with blades that can cut no deeper than the thickness of the concrete cover, with an adequate margin for error in the location of the steel. Isolate sections of concrete by saw cutting before beginning removal.
5. Clean and dry surfaces for inspection by Commissioner before beginning installation of new work.

G. Anchorages:

1. Remove anchorages associated with removed items.
2. Dismantle anchorages associated with dismantled items.
3. In historic surfaces, patch or repair holes created by anchorage removal or dismantling according to Section that is specific to the historic surface being patched.

3.5 HISTORIC REMOVAL AND DISMANTLING SCHEDULE

A. Existing Items to be dismantled and salvaged: All columns and accessories, newel posts and accessories, guardrails, trusses and related elements as noted on drawings.

B. Existing Items to Be Dismantled and Reinstalled: columns and accessories, Newel posts and accessories, guardrails, trusses and related elements as required and in sufficient quantities for construction of new fare array canopy.

C. Existing Items to Remain: **See Schedule on drawings.**

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of HISTORIC REMOVAL AND DISMANTLING shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of HISTORIC REMOVAL AND DISMANTLING shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. ARCHITECTURAL WORK: 090000

END OF SECTION 024296

SECTION 02 61 00.10

SPECIAL WASTE HAULING AND DISPOSAL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This work consists of hauling to a properly permitted landfill all material classified as special waste material as determined by the Commissioner or his representative. This item shall include all materials, labor, permits, licenses, and incidentals required to temporarily store, haul, and dispose of legally off site of all excavated material classified as special. For the purposes of these specifications the following definitions apply:
Special waste is defined as materials which are excavated from onsite which are determined to be contaminated and which are not reused onsite.

B. This work is in addition to, and not in lieu of earth excavation or excavation work included in sewer items. Price should reflect only the additional cost in handling, hauling, and disposing of special waste as compared to that of non-contaminated waste.

1.03 RELATED SECTIONS

1. Section 02 61 00.20: Special Waste Plans and Report
2. Section 02 61 00.40: Soil Disposal Analysis
3. Section 31 20 00: Earth Moving
4. Section 31 23 10: Excavation, Trenching & Backfilling (Utilities)

1.04 REFERENCES

A. Except as modified herein, the work must conform to the applicable requirements of Section 669 of the Illinois Department of Transportation (IDOT) Standard Specifications for Road and Bridge Construction, latest edition.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 CONTAMINATED SOILS

A. Contaminated soils will be any soil determined by the Commissioner or his representatives to have a level of Volatile Organic Compounds (VOC's) in excess of 50 ppm or having suspect olfactory and/or visual indications of being contaminated.

B. The Contractor must separate contaminated material from non-contaminated material as directed by the Commissioner or his representatives. At the direction of the Commissioner, the Contractor may be required to stockpile contaminated material at locations onsite. Every effort must be made to reuse this material on site as approved by the Commissioner. The Commissioner will provide an on-site inspector to identify material which is suitable for reuse onsite.

C. Work under this item must be performed in accordance with the State RCRA land disposal requirements of 35 III. ADM. Code parts 721, 722, 724 and 728. Regulations require obtaining an IEPA generator number and transporting the contaminated soil as A Special Waste to an approved landfill for disposal following correct manifest procedures.

D. If the Commissioner or his agent suspects locations of contaminated soil, the contractor must not perform any excavation activities in the area without the presence of OSHA trained personnel equipped with Photo Ionization Detector (PID) and Flame Ionization Detector (FID) meters in order to distinguish contaminated soil from uncontaminated soil. The OSHA trained personnel must be provided by the contractor and considered included in the item SPECIAL WASTE HAULING AND DISPOSAL.

E. The contractor must provide a licensed special waste hauler to load, haul, and dispose of the special waste at a landfill properly permitted to dispose of special waste pursuant to the State RCRA land disposal requirements of 35 III. ADM. Code parts 721, 722, 724 and 728. F. The special waste must be separated from uncontaminated soil at all times.

G. Prior to transporting the special waste from the site, a special waste manifest must be completed and signed by the Commissioner (or his agent) and the hauler of the special waste as described in the State RCRA land disposal requirements of 35 III. ADM. Code parts 721, 722, 724 and 728.

H. In addition, the special waste manifest must be completed by the special waste hauler and the landfill owner upon arrival at the designated disposal site.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The Work of SPECIAL WASTE HAULING AND DISPOSAL will not be measured for payment.

4.02 PAYMENT

A. No separate payment will be made for the work covered in this section. Payment for the Work of SPECIAL WASTE HAULING AND DISPOSAL will be included in the contract lump sum price as shown in the Schedule of Prices for CIVIL WORK for all applicable work performed with the CIVIL WORK pay item account and STRUCTURAL WORK for all applicable work performed with the STRUCTURAL WORK pay item account.

4.03 PAY ITEM ACCOUNT NUMBER

A. Civil Work: 020000

B. Structural Work: 030000

END OF SECTION 02 61 00.10

SECTION 02 61 00.20

SPECIAL WASTE PLANS AND REPORT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Work under this item shall be in accordance with the Standard Specifications as indicated herein, as shown on the Plans, and as directed by the Commissioner. B. Related Sections:

1. Section 02 61 00.10: Special Waste Hauling and Disposal

2. Section 02 61 00.40: Soil Disposal Analysis

1.03 REFERENCES

A. Except as modified herein, the work must conform to the applicable requirements of Section 669 of the Illinois Department of Transportation (IDOT) Standard Specifications for Road and Bridge Construction, latest edition.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The Work of SPECIAL WASTE PLANS AND REPORT will not be measured for payment.

4.02 PAYMENT

A. No separate payment will be made for the work covered in this section. Payment for the Work of SPECIAL WASTE PLANS AND REPORT will be included in the contract lump sum price as shown in the Schedule of Prices for CIVIL WORK for all applicable work performed with the CIVIL WORK pay item account and STRUCTURAL WORK for all applicable work performed with the STRUCTURAL WORK pay item account.

4.03 PAY ITEM ACCOUNT NUMBER

A. Civil Work: 020000

B. Structural Work: 030000

END OF SECTION 02 61 00.20

SECTION 02 61 00.30

NON-SPECIAL WASTE DISPOSAL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Work under this item shall be in accordance with the Standard Specifications as indicated herein, as shown on the Plans, and as directed by the Commissioner.

1.03 RELATED SECTIONS

A. Section 02 61 00.40: Soil Disposal Analysis.

B. Section 31 20 00: Earth Moving

C. Section 31 23 10: Excavation, Trenching, and Backfilling (Utilities)

1.04 REFERENCES

A. Except as modified herein, the work must conform to the applicable requirements of Section 669 of the Illinois Department of Transportation (IDOT) Standard Specifications for Road and Bridge Construction, latest edition.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The Work of NON-SPECIAL WASTE DISPOSAL will not be measured for payment.

4.02 PAYMENT

A. No separate payment will be made for the work covered in this section. Payment for the Work of NON-SPECIAL WASTE DISPOSAL will be included in the contract lump sum price as shown in the Schedule of Prices for CIVIL WORK for all applicable work performed with the CIVIL WORK pay item account and STRUCTURAL WORK for all applicable work performed with the STRUCTURAL WORK pay item account.

4.03 PAY ITEM ACCOUNT NUMBER

A. Civil Work: 020000

B. Structural Work: 030000

END OF SECTION 02 61 00.30

SECTION 02 61 00.40

SOIL DISPOSAL ANALYSIS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Work under this item shall be in accordance with the Standard Specifications as indicated herein, as shown on the Plans, and as directed by the Commissioner.

1.03 RELATED SECTIONS

A. Section 02 61 00.10: Special Waste Hauling and Disposal.

B. Section 02 61 00.20: Special Waste Plans and Report.

C. Section 02 61 00.30: Non-Special Waste Disposal.

1.04 REFERENCES

A. Except as modified herein, the work must conform to the applicable requirements of Section 669 of the Illinois Department of Transportation (IDOT) Standard Specifications for Road and Bridge Construction, latest edition.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The Work of SOIL DISPOSAL ANALYSIS will not be measured for payment.

4.02 PAYMENT

A. No separate payment will be made for the work covered in this section. Payment for the work of SOIL DISPOSAL ANALYSIS will be included in the contract lump sum price as shown in the Schedule of Prices for CIVIL WORK for all applicable work performed with the CIVIL WORK pay item account and STRUCTURAL WORK for all applicable work performed with the STRUCTURAL WORK pay item account.

4.03 PAY ITEM ACCOUNT NUMBER

A. Civil Work: 020000.

B. Structural Work: 030000.

END OF SECTION 02 61 00.40

SECTION 02 71 00.S

INTERIOR ASBESTOS ABATEMENT

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. General provisions of Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this Section.

B. Any environmental reports, test reports, etc.

1.02 SUMMARY

A. The work in this Section includes the provision of all labor, operational equipment and incidental materials required to abate asbestos-containing materials (ACM) indicated by previous reports and discoveries, or as specified herein.

B. The work includes, but is not limited to the following:

1. The Contract work includes the abatement of friable and non-friable ACM.

2. Locations and extent of abatement work is not delineated by the construction documents. Contractor shall be responsible for identification and classification of ACM.

3. Materials may include, but are not limited to, interior plaster, interior transite ceiling panels, interior window caulk, resilient floor tile and mastic, fireproof composite material, fiber cement boards; etc.

C. Complete preparation of the space to create a contained area.

D. Restoration of the work site to its preconstruction condition. Included is the repair or replacement of allaffected materials, finishes, equipment, etc., which were damaged, affected, or otherwise changed in a manner not in accordance with the project specifications during the course of the work. The Contractor is responsible for determining if any material, finishes, equipment, etc., are not in good condition prior to his commencing work at the Site. These items shall be noted and put into record by the Contractor with a copy submitted to the APM and one copy to the Authority.

E. Related Sections:

1. Section 02 72 00, Lead Abatement

1.03 REFERENCES

A. Applicable Standards and Guidelines:

1. All work under this Contract shall be done in strict accordance with all

applicable Federal, State, County and City regulations, standards and codes governing asbestos abatement andany other trade work done in conjunction with same.

2. The most recent edition of any relevant regulation, standard, document or code shall be ineffect. Where conflict among the requirements or with these specifications exists, the moststringent requirements shall be utilized.

3. The following regulations shall be adhered to in addition to any other applicable standards:

   a. State of Illinois, Department of Public Health (IDPH) "Asbestos Abatement Act andRules & Regulations".
   b. Occupational Safety and Health Administration (OSHA)

      1) Title 29 Code of Federal Regulations Section 1910.1001 - General IndustryStandard for Asbestos.
      2) Title 29 Code of Federal Regulations Section 1910.134 General IndustryStandard for Respiratory Protection.
      3) Title 29 Code of Federal Regulations 1926.1101 Construction IndustryStandard for Asbestos.
      4) Title 29 Code of Federal Regulations Section 1910.20 Access to EmployeeExposure and Medical Records.
      5) Title 29 Code of Federal Regulations Section 1910.1200 HazardCommunication.

   c. Environmental Protection Agency (EPA)

      1) Asbestos Hazard Emergency Response Act (AHERA).
      2) Title 40 Code of Federal Regulations Part 61 Subparts A and M (RevisedSubpart B) National Emission Standard for Hazardous Air Pollutants (NESHAP).
      3) 40 CFR Part 763.1 Asbestos-Containing Materials in Schools: Final Rule andNotice.

   d. National Institute of Occupational Safety and Health (NIOSH)
   e. American National Standards Institute (ANSI).
   f. Include citations for any Federal, State, County, City or Local regulations that apply toany phase of the asbestos abatement (e.g. licensing regulations, disposal requirements, etc.).

1.04 QUALITY ASSURANCE

A. Testing Requirements:

1. Laboratory Services:

   a. All laboratory services shall be in compliance with the AHERA and the IDPHAsbestos Abatement Act and Rules & Regulations.
   b. An American Industrial Hygiene Association accredited laboratory which hassuccessfully participated in the N.I.O.S.H., P.A.T. Program, shall analyze air-monitoring samples.
   c. Results of sample analyses shall be reported verbally, followed by a written copy.

1) Within 24 hours for samples collected during removal for phase contrastmicroscopy (PCM) analysis.
2) Within 24 hours for post-removal final air clearance samples for transmissionelectron microscopy (TEM) analysis. If the contractor desires quicker turn- around time for sample results, the additional cost shall be borne by the Contractor.

d. All background (pre-abatement) air samples will be analyzed by PCM.
e. All projects larger than 160 square feet or 260 linear feet of ACM removal, encapsulation or enclosure shall be analyzed by TEM for final air clearance samples.
f. All projects smaller than 160 square feet or 260 linear feet of ACM removal, encapsulation or enclosure shall be analyzed by TEM or PCM for final air clearancesamples, the method to be determined by the APM.

2. Air Monitoring by Contractor:

a. The Contractor shall be responsible for all personal monitoring as required by law.
b. Air monitoring shall be conducted according to procedures specified in the OSHAIndustrial Hygiene Technical Manual, OSHA Instruction CPL 2.20A, Chapter 4 "Evaluation of Exposure Levels for Air Contaminants."
c. Air monitoring for non-asbestos materials shall be conducted by procedures as specified by applicable NIOSH or OSHA standards. This includes, but is not limited to, the use of chemical solvents for mastic removal.
d. Asbestos exposure monitoring shall be conducted by a trained and IDPH licensed AirSampling Professional (ASP).
e. The sampling strategy shall be approved by the APM prior to commencement of thework.
f. Air monitoring results shall be presented to the APM in a report with the followingformat:

1) Introduction - indicate project location, dates, area/size of project, contractorname, identification of monitoring firm.
2) Summary - briefly state conclusions and findings of study.
3) Recommendations for improvements to Contractor work.
4) Methodology - describe sampling equipment, procedures, and analytical methods used.
5) Discussion
6) Tables of sample data and calculations
7) Laboratory Data
8) Daily Logs.

g. Copies of all reports of Contractor's air monitoring shall be submitted to the APM in areport signed by the person who conducted the monitoring.
h. Excursion limit: Contractor shall ensure no employee is exposed to an airborne concentration of asbestos in excess of 1.0 fiber per cubic

centimeter of air (1 f/cc) asaveraged over a sampling period of 30 minutes as per 29 CFR 1926.1101(c)(2).

3. Air Monitoring by the APM:

   a. The APM will provide area air monitoring during removal and collect pre- and post-removal samples.
   b. The APM/ASP shall be on site during the duration of the abatement work.
   c. The number of daily air monitoring samples during removal or cleaning shall be decided bythe APM/ASP based on the size of the abatement activity. The following are the minimum required.

      1) 2 area samples inside the contained area.
      2) 2 personnel samples inside the contained area. (This sampling shall not be usedas the Contractor's OSHA required personnel monitoring.)
      3) 2 area samples outside the Work Area in uncontaminated areas of the building,including one at the entrance to the worker decontamination enclosure.
      4) 1 area sample at the exhaust of the negative pressure ventilation equipment.

   d. Removal and/or cleaning activities will be halted when area sample results exceed thefollowing levels:

      1) <u>Sample Type Concentration (total f/cc)</u>

         Outside Work Area 0.01 (f/cc)

         Worker time weighted average exposure
         0.10 (f/cc)

         Samples shall be analyzed by Phase Contrast Microscopy (PCM) and/orTransmission Electron Microscopy (TEM).

   e. When fiber levels in excess of 0.01 f/cc are found outside the Work Area, the Contractor may request, and shall pay for analysis of the samples by TEM to determine whether actual asbestos fiber concentration is in excess of acceptable levels. If asbestos fiber concentration is found to be less than .01 f/cc or less than 70 s/mm^2 (structures per millimeter squared), work may continue.
   f. All daily air samples will be analyzed using PCM or TEM microscopy. Verbal results of dailyPCM samples will be available within 24 hours. Verbal results of daily TEM samples will be available within 24 hours. All results will be followed by a written copy.

4. Post-removal Sampling:

   a. Post-removal clearance air sampling will not begin until the visual inspection is complete andhas been certified by the APM.
   b. The ASP will conduct aggressive air sampling using a one horsepower leaf blower against allwalls, ceiling, floors, ledges and other surfaces in the Work Area. The ASP will then place a 20-inch fan in the Work Area and point it toward the ceiling on slow speed.

c. A minimum of 5 inside Work Area samples per each gross removal/full containment area, or 1sample for each 1000 sq. ft. of floor area, whichever is greater, shall be collected. Minimum volume of air sampled shall be 1500 liters.

d. The samples will be analyzed by PCM or TEM based on the criteria cited in Subparagraph1.02.C.1.

e. The area shall be considered clean if with aggressive sampling, through PCM analysis, usingNIOSH 7400 procedures, of every sample value is at or below 0.01 f/cc.

f. The area shall be considered clean if with aggressive sampling, through TEM analysis, theaverage of the inside Work Area samples are no more than 70 asbestos structures per millimeter squared or if the average fiber concentration of the Work Area samples are not statistically larger than the average of the "outside" samples.

g. The same clearance sampling procedures and criteria apply to glove bag/mini-containment(tent) removal.

1.05 ASBESTOS ABATEMENT SUBMITTALS AND NOTICES

A. Failure to comply with the submittal requirements shall delay the issuance of the "Notice to Proceed"by the Owner. No extensions shall be allowed due to a delay in the issuance of a Notice to Proceed caused by failure of the Contractor to submit proper paperwork as specified herein.

1. Within 1 calendar day after "Notice of Award", the Contractor shall submit to the APM.

a. A complete list of all Sub-Contractors and foremen who are to work under thisContract;

b. Copies of the appropriate insurance policies certifying that the Contractor is insuredto perform asbestos abatement and has the provisions to indemnify the Owner and the APM for asbestos abatement.

c. Plans of Work Areas and decontamination chambers including clean-room, airlocks,shower, equipment room, Work Area and bag out.

d. Supervisor's licenses and other data sufficient to demonstrate compliance withspecified requirements.

B. At least one day before the start of the project, Contractor shall submit the following items to the APM.

1. A copy of the demolition/renovation notice as required by EPA, NESHAPS, 40 CFR 61, Subparts A and M, to the appropriate Federal, State, County, City or Local air pollution controlagency responsible for the enforcement of the National Emission Standard for Asbestos. Notify OSHA per 1926.1101, designate a competent person, notify employees and select respirator per 1910.

2. A copy of all notifications required by IDPH, Title 77, Chapter J 855.60 Subchapter P, IllinoisAdministrative Code.

3. Submit to the APM, for approval, shop drawings for layout and construction of decontamination enclosure systems and barriers for isolation of the Work Areas showing location and venting of HEPA units, proposed routing of waste through building and dumpsterlocation as detailed in this Specification and required by applicable regulations.

4. When rental equipment is to be used in abatement areas or to transport

asbestos- contaminated waste, a written notification concerning intended use of the rental equipmentmust be provided to the rental agency with a copy submitted to the APM.

5. Submit to the APM copies of notices to police, fire, and emergency medical personnel.
6. Submit to the APM a copy of Respirator Maintenance Program as described in Section 02 7200, Lead Abatement, Article 3.04, and a copy of Respirator Protection Training and Fit Testing Program as described in Paragraph 1.10.C below.
7. Submit copies of the appropriate insurance policies certifying the Contractor is insured to perform asbestos abatement and has the duty to indemnify CTA, its design consultants, agents, officials, and employees.

C. Prior to commencement of work, the Contractor shall submit the following items to the APM:

1. Documentation that arrangements for the transport and disposal of asbestos-containing or contaminated materials and supplies have been made. The name and location of the disposalsite, a copy of handling procedures and a list of protective equipment utilized for asbestos disposal at the landfill, prepared and signed by the Landfill Owner/Operator.
2. Documentation that each asbestos worker and supervisor has a valid IDPH license andcurrent refresher course certificate.
3. Documentation from a physician, all employees or agents who may be exposed to airborne asbestos in excess of background levels have been provided with an opportunity to be medically monitored to determine if they are physically capable of working while wearing the required respiratory equipment without suffering adverse health effects. Also, documentation personnel have received medical monitoring as required in OSHA 29 CFR 1910.1001(j) shallbe submitted. The Contractor shall provide information to the examining physician about conditions in the workplace environment (e.g., high temperature, humidity, and chemical contaminants).
4. A list of NIOSH approvals for all respiratory protective devices utilized on site. In addition, manufacturer certification of HEPA filtration capabilities for all cartridges and filters shall besubmitted.
5. Documentation that all of the Contractor's employees and agents who must enter the Work Area have passed respirator fit tests and have been assigned proper fitting respirators. Thisfit testing shall be in accordance with qualitative procedures as detailed in the OSHA Lead Standard 29 CFR 1910.1025 Appendix D Qualitative Fit Test Protocol (1985) and/or 29CFR 1910.134 Appendix A Quantitative fit Test Protocol.
6. Manufacturer's certification HEPA vacuums, negative air pressure equipment and other localexhaust ventilation equipment conform to ANSI Z 9.2-79.
7. Results of materials testing as conducted before the abatement for purposes of utilization during abatement activities (e.g., testing of encapsulant for depth of penetration, testing ofsubstitute materials of adherence to encapsulated surfaces).
8. Material Safety Data Sheet (MSDS) from supplier/manufacturer for all chemicals proposed foruse on project.
9. Drawings for layout and construction of decontamination enclosure systems and barriers forisolation of the Work Area.
10. When rental equipment is to be used in removal areas or to transport waste materials, a copyof the written notification to inform the rental company of the nature of use of the rented equipment.

D. Prior to commencement of work the CTA or its representative shall:

1. Provide to the Contractor results of background level air sampling, including samplinglocation, name of the ASP, equipment utilized and method of analysis.
2. Provide to the Contractor information concerning access, shutdown, and protectionrequirements of equipment and systems in the Work Area.

E. During abatement activities, Contractor shall submit to the APM:

1. Weekly (or as otherwise required by the Owner) job progress reports detailing abatement activities. Include review of progress with respect to previously established milestones andschedules, problems and action taken, injury reports, equipment breakdown, bulk materialand air sampling results conducted by Contractor's air sampling personnel.
2. Weekly copies of all transport manifests, trip tickets and disposal receipts for all asbestoswaste materials removed from the Work Area during the abatement process.
3. Daily copies of work site entry logbooks with information on worker and visitor access.
4. Daily logs documenting filter changes on respirators, HEPA vacuums, negative pressureventilation units and other engineering controls.
5. Daily reports on the results of bulk material analysis and air sampling data collected during the course of the abatement including OSHA, AHERA, and State of Illinois compliance of airmonitoring results.
6. Daily reports on results of materials testing conducted during the abatement for purposes ofutilization during abatement activities (e.g., testing of encapsulant for depth of penetration, testing of substitute materials for adherence to encapsulated surfaces).
7. Weekly copies of logs documenting that each asbestos worker present and in the abatementarea was licensed as such by the IDPH.

1.06 PROJECT SITE CONDITIONS

A. The Owner and public are currently not expected to be on the premises during abatement work.

B. No construction traffic shall occur through occupied portions of the Building and isolation barriers shallbe provided to secure the Abatement Areas (See Paragraph 3.01 E for Isolation Barriers).

C. No staff or public shall enter abatement areas. Contractor is responsible to keep abatement areassecure and posted with proper warning signs.

1.07 SEQUENCING/SCHEDULING

A. Contractor shall provide a written work schedule for review by the APM and Owner. Schedule shallbe itemized by containment to provide enough information for the APM and Owner to review the Schedule.

B. Contractor shall have access to all abatement Work Areas at time of Owner's approved workschedule.

1.08 WARRANTY

A. At the end of the work, Contractor shall certify:

1. All work was done in complete conformance with all OSHA, EPA (NESHAPS and AHERA),and State of Illinois applicable regulations, as well as any other applicable Federal, State, County, City or Local regulation.
2. All designated asbestos-containing and contaminated material has been removed from thesite and cleaned and legally transported and disposed of in an approved (special) waste disposal site.

B. At the end of the work, Contractor shall supply:

1. Written certification all required work has been completed and the work site and surroundingareas are clean of asbestos in accordance with this specification.
2. Written 1 year or 5 year warranty as specified in the contract documents. The abatement contractor shall warranty all replacement materials, any additional asbestos abatement andenvironmental monitoring encountered due to the performance failure of the replacement materials during the warranty period.

1.09 EMERGENCY PROCEDURES

A. Emergency planning shall be developed prior to abatement initiation and agreed to byContractor, the Owner and the APM.

B. Emergency procedures shall be in written form and prominently posted in the clean change areas and equipment rooms of the worker decontamination areas. Prior to entering the Work Area, everyone shall read and sign these procedures to acknowledge receipt and understanding of work site layout, location of emergency exits and emergency procedures. Contractor shall be responsible forestablishing and maintaining emergency fire exits from Work Areas.

C. Emergency planning shall include written notification of police, fire and emergency medicalpersonnel of planned abatement activities, work schedules and layout of Work Areas, particularly barriers that may affect response capabilities and approved means of egress.

D. Emergency planning shall include considerations of fire, explosion, toxic atmospheres, electricalhazards, slips, trips and falls, confined spaces and heat related injuries.
Written procedures shall be developed and employee training in procedures shall be provided.

E. Employees shall be trained in evacuation procedures in the event of workplace emergencies.

1. For non-life-threatening situations - employees injured or otherwise incapacitated shall decontaminate following normal procedures with assistance from fellow workers if necessary,before exiting the workplace to obtain proper medical treatment.
2. For life-threatening injury or illness - worker decontamination shall take least priority after measures to stabilize the injured worker, remove him from the workplace and secure propermedical treatment.

F. Emergency planning shall include provisions for respirator power failure, air line cuts, diaphragmcollapse, etc.

G. For all glovebag removals, a written contingency plan shall be provided to the APM which details howaccidental breaking of a glovebag will be cleaned up, decontamination procedures of Work Area and workers, and any other pertinent information for the project.

H. The Contractor must prepare and file a written report immediately following any accident or emergency. A copy of each report shall be issued to the APM. All information following any incidentshall be recorded by the APM.

1.10 PROJECT COORDINATION

A. Asbestos Project Manager (APM)

1. The APM is selected by the Contractor, approved by the CTA and shall:

a. Assist in the decision making regarding selection of procedures. Assist in preparingContract Documents Specifications and Drawings for the abatement work.
b. Assist in evaluating bids and selecting a Contractor.
c. Enforce Contract Documents (Drawings and Specifications).
d. Tour Work Area with the Contractor, agree on pre-abatement conditions of the WorkArea and make a written record of those conditions. Written record shall be agreed upon by both the APM and Contractor.
e. Observe activities at all times during the course of abatement.
f. Meet daily with the Contractor to review work progress and solve problems or adjustprocedures as appropriate for each project.
g. Ensure performance for collection of bulk material samples or air sampling and allworkplace inspections and clearance inspections for the Owner.
h. Report on abatement activities to the Contractor and CTA.
i. Request, review and maintain Contractor submittals.

2. The APM or the Project Designer shall have the authority to stop any job activities if theyare not performed in accordance with applicable regulations or guidelines, or the requirements of these Contract Documents. These will be reported to the Owner with description of activity, reason for stopping it and alternatives for correcting the problems.

B. Air Sampling Professional (ASP)

1. The ASP is selected by the Contractor and approved by the CTA and shall conduct ambientair sampling in accordance with the NIOSH Standard Analytical Method for Asbestos in Air Method 7400 or other acceptable methods as otherwise agreed upon shall follow all applicable codes and regulations.
2. The number, location, and duration of air samples shall be determined by the APM/ASP, andshall be conducted for information only, serving to monitor Contractor performance during theproject and shall not release the Contractor from any responsibility to conduct personnel air sampling for OSHA

compliance.

3. Minimum requirements for air sampling shall be in accordance with AHERA 40 CFR Part 763,Subpart E, Appendix A, and the Illinois Asbestos Abatement Act Rules and Regulations.
4. The Contractor shall be responsible for daily personnel monitoring as required by OSHAregulations.

C. Project Sequence:

1. Pre-removal inspection: Removal work shall not commence until the containments are completely constructed, all decontamination areas and equipment are fully in place andoperable, and the areas have been inspected and approved by the APM.
2. Post-removal inspection: Upon completion of asbestos removal, for each Work Area, containments shall remain in place, with air filtration systems running, until areas have beeninspected, and approved by the APM and post-removal air monitoring limits are met as described in this Section.

1.11 TRAINING AND PERSONNEL PROTECTION

A. Training:

1 Prior to commencement of abatement activities, all personnel who will be required to enterthe Work Areas or handle asbestos-containing materials, must have received adequate training in accordance with this document and all Federal, State, County, City and Local regulations.
2 Special on-site training on equipment and procedures unique to this Job Site shall beperformed as required.
3 Training in emergency response and evacuation procedures shall be provided to all workers.

B. Respiratory Protection:

1 All respiratory protection shall be provided to workers in accordance with a submitted writtenRespiratory Protection Program, which includes all items in OSHA 29 CFR 1910.134. This program shall be posted on site. Workers shall be provided with personally issued, individually identified (marked with waterproof designations) respirators approved by NIOSH.
2. The minimum respiratory protection requirements during abatement and cleaning shall be PAPR respirators with HEPA filtration and full-face pieces unless a variance for a reduction inrespiratory protection has been approved by Asbestos Project Designer. The Contractor mayuse half-face air purifying respirator equipped with dual HEPA type filters labeled with NIOSHand MSHA certification for Work Area preparation and waste bag loading. Respiratory protection selected shall be in accordance with Title 77, Chapter I. Subchapter P, Part 855.80 of the Illinois Administrative Code. If the use of chemical solvents for vinyl floor tilemastic removal is approved by the APM, proper additional filters, as recommended by themanufacturer's MSDS, must be provided to all workers.
3. Fit Testing: Workers must perform positive and negative air pressure fit tests each time arespirator is put on.
4. Workers shall be given a qualitative fit test in accordance with procedures detailed in theOSHA Respiratory Protection Standard, 29 CFR 1910.134 for all respirators used on thisabatement project.
5. Documentation of adequate respirator fit must be provided to the Owner and

APM.

6. No one with facial hair that limits the effectiveness of the respirator shall be permitted to don arespirator and enter the Work Area.
7. Additional respirators (minimum of 2 of each type) and training on their donning and use mustbe available at the work site for authorized visitors who may be required to enter the Work Area.

C. Protective Clothing:

1 Shall be in accordance with Title 77, Chapter I, Subchapter P, Part 855.80 of the IllinoisAdministrative Code.
2 Disposable clothing including head, foot and full body protection shall be provided in sufficientquantities and adequate sizes for all workers, APM, ASP and all authorized visitors by the abatement contractor.
3 Hard hats, protective eyewear, gloves, rubber boots and/or other footwear shall be provided as required for workers and authorized visitors. Safety shoes may be required for some activities.
4 Non-disposable footwear or clothing shall remain in the Work Area and shall be disposed ascontaminated material at the end of the Job. Footwear such as PVC rubber boots, if properlydecontaminated, may be used on projects and do not need to be disposed of as contaminated material.
5 Non-porous gloves and chemical splash goggles or face shield shall be required when handling solvents. Portable eyewash bottle and water shall be available for rinsing skin.

PART 2 PRODUCTS

2.01 PRODUCTS

A. General:

1 Deliver all materials in the original packages, containers or bundles bearing the name of themanufacturer and brand name (where applicable).
2 Store all materials subject to damage off the ground, away from wet or damp surfaces and under cover sufficient to prevent damage or contamination. Replacement materials shall bestored outside of the Work Area until abatement is completed.
3 All equipment and materials shall be completely clean before brought on site.
4 Polyethylene sheeting for walls and ceilings shall be a minimum of 6-mil or proved equivalent.For floors, stationary objects, and all other uses polyethylene shall be a minimum of 6-mil or proved equivalent.
5 The method of attaching polyethylene sheeting shall be agreed upon in advance by the Contractor and the Owner's Representative and selected to minimize damage to equipment and surfaces. The method of attachment may include any combination of duct tape or other waterproof tape, furring strips, spray glue, staples, nails, screws or other effective procedurescapable of sealing adjacent sheets of polyethylene and capable of sealing polyethylene to dissimilar finished or unfinished surfaces under both wet and dry conditions (including the useof amended water).
6 Polyethylene sheeting utilized for worker decontamination enclosure shall be opaque white orblack in color.
7. Disposal bags shall be of 6-mil polyethylene, pre-printed with labels as required by EPA regulation 40 CFR 61.152, OSHA requirement 29 CFR 1910.1001, 29 CFR 1926.1101 or 29CFR 1910.1200 with the following information:

DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE HAZARD

8. Disposal drums (when required) shall be metal or fiberboard with locking ring tops.
9. Stick-on labels per EPA or OSHA requirements for disposal drums.
10. Warning signs as required by OSHA Final Rules and Standards for 29 CFR Parts 1910.1001and 1926.1101 Occupational Exposure to Asbestos, Tremolite, Anthophyllite and Actinolite.
11. Material Safety Data Sheet (MSDS) from supplier or manufacturer is required for allchemicals proposed for use on projects.

B. Removal:

1 Surfactant (wetting agent) shall be a 50/50 mixture of polyethylene ether and polyoxyethyleneester, or equivalent, mixed in a proportion of 1 fluid ounce to 5 gallons of water or as specifiedby manufacturer. (An equivalent surfactant shall be understood to mean a material with a surface tension of 29 dynes/cm as tested in its properly mixed concentration, following ASTM protocol "Surface and Interfacial Tension of Solutions of Surface Active Agents.") Where Work Area temperature may cause freezing of the amended water solution, the addition ofethylene glycol in amounts sufficient to prevent freezing is permitted.
2. Encapsulating agent shall be:
3. U.S. Mineral: Cafco Bond Seal.
4. Cable Coatings, No. 28 or 22P.
5. Arpin Mfg.: Asbestite 2000.
6. Or approved equal.

2.02 EQUIPMENT

A. General:

1. A sufficient quantity of negative pressure ventilation units equipped with HEPA filtration andoperated in accordance with ANSI Z 9.2-79 (Local Exhaust Ventilation requirements) and EPA guidance document EPA 560/5-85-024 Guidance for Controlling Friable Asbestos- Containing Materials in Buildings Appendix J:

2. Recommended Specifications and Operating Procedures For the Use of Negative Pressure Systems for Asbestos Abatement shall be utilized so as to provide one workplace air change every 15 minutes. The Contractor shall increase the air change rate to six times an hour (1 airchange every 10 minutes) if chemical solvents or removers are to be used in the Work Area.

To calculate total air flow requirement:

Total ft^3/min = Vol. of Work Area (in ft^3). 15 min.

To calculate the number of units needed for the abatement:

Number of units needed = [Total ft^3/min] [Capacity of unit in ft^3/min]

a. For air-supplied respirators, estimate the volume of supplied air and add toworkplace air volume when calculating ventilation requirements.

1 Contractor must be currently licensed to use the GPAC reduced pressure (negative air) andfiltration system or the Red Baron HEPA-vent negative pressure enclosure system or approved equals and both must be approved for use by the IDPH.

2. Respirators and Protective Gears: See Paragraphs 1.10.B and 1.10.C.

3. A sufficient supply of disposable mops, rags and sponges for Work Area decontaminationshall be available.

B. Removal:

1 A sufficient supply of scaffolds, ladders, lifts, and hand tools (e.g. scrapers, wire cutters,brushes, utility knives, wire saws, etc.) shall be provided as needed.

2. Airless sprayers with pumps capable of providing 125 pounds per square inch (psi) at the nozzle tip at a flow rate of 2 gallons per minute for spraying amended water shall be provided.

3. Rubber dustpans and rubber squeegees shall be provided for cleanup.

4. Brushes utilized for removing loose asbestos containing material shall have nylon or fiberbristles, not metal.

5. A sufficient supply of HEPA filtered vacuum systems shall be available during cleanup.

PART 3 EXECUTION

3.01 WORK AREA PREPARATION

A. Modified Containment for resilient floor tile and mastic removal:

1 Have available on site a list containing the names, addresses, and telephone numbers of the Contractor, the Building Owner, the APM, the General Superintendent, the ASP, the testing laboratory and any other personnel who may be required to assist during abatement activities(e.g., Safety Officer, Building Maintenance Supervisor).

2 Have available on site a copy of the plans and specifications, the EPA, AHERA, OSHA and IDPH regulations and any other applicable Federal, State, County, City and Local governmentregulations, including the State of Illinois requirements.

3 Have a copy of Contractor's Respiratory Protection Program on site.

4 Emergency procedures as described in Article 1.08.

5 Post caution signs meeting the specifications of OSHA's latest Final Rules and Standards for29 CFR Parts 1910.1001 and 1926.1101 Occupational Exposure to Asbestos, Tremolite, Anthophyllite and Actinolite at any location and approaches to a location where airborne concentrations of asbestos may exceed ambient background levels. Signs shall be posted topermit a person to read the sign and take the necessary protective measures to avoid exposure before entering the Work Area. Additional signs may need to be posted following construction of workplace enclosure barriers.

6. Shut down and lock out electric power to all Work Areas. Provide temporary power and lighting. Ensure safe installation (including ground faulting at the power source) of temporary power sources and equipment by compliance with all applicable electrical code requirementsand OSHA requirements for temporary electrical systems. Electric power source shall also beprovided, by the Contractor, for the ASP.
7. Seal all intake and exhaust vents in the Work Area with duct tape and 6-mil polyethylene. Seal any seams in system components that pass through the Work Area. Remove all HVACsystem filters and place in labeled 6-mil polyethylene bags for staging and eventual disposalas asbestos-contaminated waste. Clean the filter assembly and ductwork using HEPA vacuums or wet cleaning techniques.
8. The CTA will provide cold water for construction purposes. Contractor shall connect to existing water system. Contractor shall provide portable water heater for personnel decontamination facility if hot water cannot be provided by the Owner during abatement.
9. Abatement Contractor shall preclean all moveable objects within the Work Area using a HEPA filtered vacuum and/or wet cleaning methods as appropriate. After cleaning, these objects shall be removed from the Work Area and carefully stored in an uncontaminated location. Upholstered furniture and drapes shall be HEPA vacuumed twice before removalfrom the Work Area.
10. Carpeting, if identified in the scope of work as contaminated ACM, within Work Areas shall beremoved and placed in labeled 6-mil polyethylene bags for staging and eventual disposal as asbestos-contaminated waste. If the carpeting is not specified for removal, the abatement contractor shall preclean the carpeting with a HEPA vacuum and protect it suitably from the abatement work in that area.
11. Abatement Contractor shall preclean all fixed objects in the Work Area using HEPA filtered vacuums and/or wet cleaning techniques as appropriate. Clean machinery behind grills or gratings if contaminated. Clean wall, floor and ceiling penetrations behind fixed items. After precleaning, enclose fixed objects in 6-mil polyethylene sheeting and seal securely with tape.
12. Preclean all surfaces in the Work Area using HEPA filtered vacuums and/or wet cleaning methods as appropriate. Do not use any methods that would raise dust such as dry sweepingor vacuuming with equipment not equipped with HEPA filters, this is prohibited. Do not disturbasbestos-containing materials during the precleaning phase.
13. Preclean all non-asbestos containing insulation on all pipes, joints, tanks, etc. in Work Area using HEPA-filtered vacuums and wet cleaning methods as deemed appropriate by the APM.After pre-cleaning, enclose in 6-mil polyethylene sheeting and seal airtight with duct tape.
14. Seal all windows, doorways, elevator openings, corridor entrances, drains, ducts, grills, grates, diffusers, skylights and any other penetrations of the Work Area (including the outside of the building, tunnels and crawl spaces, if any) with 6-mil polyethylene sheeting and tape. Also, seal all seams in system components that pass through the Work Area. Doorways and corridors, which will not be used for passage during work, must be sealed with barriers.
15. Cover walls in the Work Areas with polyethylene sheeting.

    a. Walls shall be covered with one layer of minimum of 6-mil polyethylene sheeting to aheight of 6 feet.
    b. Plastic shall be sized to minimize seams. Seams shall be staggered and separatedby a distance of at least 6 feet.
    c. Wall sheeting shall overlap floor sheeting by at least 12 inches beyond the wall/floorjoint to provide a better seal against water

damage and for negative pressure.

d. Wall sheeting shall be secured adequately to prevent it from falling away from the walls. This will require additional support and/or attachment when negative pressureventilation systems are utilized.

16. Cover obstructions, as specified for walls, including, but not limited to, pay phones, counters,podiums, and railings.
17. Maintain emergency and fire exits from the Work Areas or establish alternative exitsacceptable to the Fire Department.

B. Worker Decontamination Enclosure Systems:

1 Worker Decontamination Enclosure Systems shall be provided at all locations where workers will enter or exit the Work Area. These systems may consist of existing rooms outside of the Work Area, if the layout is appropriate, that can be enclosed in plastic sheeting and are accessible from the Work Area. When this situation does not exist, enclosure systems may beconstructed of metal, wood or plastic support as appropriate.

2. Plans for construction, including materials and layout, shall be submitted as shop drawings and approved in writing by the APM prior to work initiation. Worker Decontamination Enclosure Systems constructed at the work site shall utilize 6-mil opaque black or white polyethylene sheeting or other acceptable materials for privacy. Detailed descriptions of portable, prefabricated units, if used, shall be submitted for approval. Submittal must includefloor plan with dimensions, materials, size, thickness, plumbing and electrical utilities.
3. The Worker Decontamination Enclosure Systems shall consist of at least a Clean Room, a Shower Room, and an Equipment Room, each separated from each other and from the WorkArea by airlocks.
4. Entry to and exit from all airlocks and Decontamination Enclosure System chambers shall bethrough curtained doorways consisting of three sheets of overlapping polyethylene sheeting. One sheet shall be secured at the top and left side, the second sheet at the top and right sideand the third sheet shall be attached the same as the first. All sheets shall have weights attached to the bottom to insure that they hang straight and maintain a seal over the doorway when not in use. Doorway designs, providing equivalent protection and acceptable to the APM may be utilized.
5. Access between any two rooms in the Decontamination Enclosure System shall be throughan airlock with at least 3 feet separating each curtained doorway. Pathways into (from cleanto contaminated) and out from (contaminated to clean) the Work Area shall be clearly designated.
6. Clean Rooms shall be sized to adequately accommodate the clothes and equipment of thework crew. Benches and hooks shall be provided for hanging street clothes.
7. Shelves for storing respirators shall also be provided in this area. Clean work clothes (if required underneath disposable clothing), clean disposable clothing, replacement filters for respirators, towels and other necessary items shall be provided in adequate supply in the Clean Room. A location for postings shall also be provided in this area. A lockable door shall be used to permit access into the Clean Room from outside the Work Area. Lighting, heat andelectricity shall be provided as necessary for comfort. This space shall not be used for storage of tools equipment or materials, or as office space.
8. Shower Rooms shall be provided at all locations where workers will enter or exit the Work Area and shall contain one or more showers as necessary to adequately accommodate workers. Each showerhead shall be supplied with hot and cold water adjustable from inside the shower. The shower enclosure

shall be constructed to ensure against leakage of any kind. An adequate supply of soap, shampoo, and towels shall be supplied by the Contractor and shall be made available at all times.

9. Shower water shall be drained, collected and filtered through a system with at least 5.0- micron particle size collection capability. A system containing a series of several filters with progressively smaller pore sizes shall be used to avoid rapid clogging of filtration system bylarge particles. Filtered wastewater shall be discharged to a sanitary sewer.
10. The Equipment Rooms shall be used for storage of equipment and tools at the end of a shiftafter they have been decontaminated using a HEPA filtered vacuum and/or wet cleaning techniques as appropriate. Replacement filters (in sealed containers until used) for HEPA vacuums and negative pressure ventilation equipment, extra tools, containers of surfactant and other materials and equipment that may be required during the abatement may also be stored here as needed. A walk-off pan (a small children's swimming pool or equivalent) filledwith water shall be located in the Work Area just outside the Equipment Room for workers toclean off foot coverings while leaving the Work Area and to prevent excessive contaminationof the Worker Decontamination Enclosure System. A drum lined with a labeled 6-mil polyethylene bag for collection of disposable clothing shall be located in this room. Contaminated footwear (e.g., rubber boots, other reusable footwear) shall be stored in this area for reuse.

C. Waste Transfer Airlock:

1 The Waste Transfer Airlock shall be constructed at a location away from the Worker Decontamination Enclosure System. Whenever possible, this shall be located where there isdirect access from the Work Area to the outside of the building. This airlock system shall consist of an airlock, a container Staging Area and another airlock with access to outside theWork Area.
2 The Waste Transfer Airlock shall be constructed in similar fashion to the Worker Decontamination Enclosure System using similar materials and airlock and curtain doorwaydesigns. This airlock system shall not be used to enter or exit the Work Area.
3 The waste transfer airlock shall be secured to prevent unauthorized entry.

D. Emergency Exits:

1. Emergency exits shall be established and clearly marked with duct tape arrows or other effective designations to permit easy location from anywhere within the Work Area. They shall be secured to prevent access from uncontaminated areas and still permit emergency exiting. These exits shall be properly sealed with polyethylene sheeting which can be cut to permit egress if needed. These exits may be the Worker Decontamination Enclosure system, the waste transfer airlock and/or other alternative exits satisfactory to fire officials.

E. Isolation of the Work Areas from Occupied Areas of the Building:

1 The Work Areas shall be separated from (uncontaminated) occupied areas of the building bythe construction of Type A barriers in accordance with the requirements of the IDPH regulations. Locked doors will not be allowed to replace Type A barriers.
2 Walls shall be constructed of 2 inch by 4 inch wood or metal framing to support barriers in allopenings larger than 4 foot by 8 foot.
3 Plywood sheeting material of at least 5/8 inch thickness shall be applied to

the work side ofthe barrier.

4 Both sides of the partition shall be covered with a double layer of 4-mil polyethylene sheetingwith staggered joints and sealed in place.

5 Caulk edges of partition at floor, ceiling, walls and fixtures to form an airtight seal.

F. Maintenance of workplace barriers and Workers Decontamination EnclosureSystems:

1 After completion of construction of all Decontamination System Enclosures and polyethylenebarriers allow at least four hours to ensure the barriers will remain intact and secured to walls and fixtures before beginning actual abatement activities.

2 All polyethylene barriers inside the Work Area, in the Worker Decontamination Enclosure System, in the waste transfer airlock and at partitions constructed to isolate the Work Area from occupied areas, shall be inspected at least twice daily, prior to the start of each day's abatement activities and following the completion of the day's abatement activities. Documentinspections and observations in the daily project log.

3 Damage and defects in the enclosure system shall be repaired immediately upon discovery.

4 Smoke tubes shall be used to test the effectiveness of the barrier system before abatementwork begins and at least once a day thereafter until the work is completed. Results and observations shall be documented in the project logbook.

5 At any time during the abatement activities after barriers have been erected, if visible materialor emissions are observed outside of the Work Area or if damage occurs to barriers, work shall immediately stop. Repairs shall be made to barriers and/or debris/residue cleaned up using appropriate HEPA vacuuming and wet mopping procedures.

6 If air samples collected outside of the Work Area during abatement activities indicate airbornefiber concentrations greater than 0.01 f/cc or the pre-measured background levels (whicheveris lower) determined by phase contrast microscopy or TEM, work shall immediately stop for inspection and repair of barriers. Cleanup of surfaces outside of the Work Area using HEPA vacuums or wet-cleaning techniques shall be done prior to resuming abatement activities.

7 Install and initiate operation of negative pressure ventilation equipment as needed to provide one air change in the Work Area every 15 minutes. If chemical solvents or removers are used, the Contractor shall provide six air changes per hour in the Work Area. Openings madein the enclosure system to accommodate these units shall be made airtight with tape and/or caulking as needed. If more than one unit is installed, they shall be turned on individually andthe integrity of wall barriers shall be checked for secure attachments and to determine if additional reinforcement is necessary. Ensure adequate power supply is available to satisfy the requirements of the ventilating units. Negative pressure ventilation units shall be exhausted to the outside of the building away from occupied areas. Twelve-inch diameter extension ducting shall be used to reach from the Work Area to the outside when required. Careful installation, air monitoring and daily inspections shall be done to ensure that the ducting does not release fibers into uncontaminated building areas.

8 Negative air pressure systems shall be operated in accordance with "Specifications and Operating Procedures for the Use of Negative Pressure Systems for Asbestos Abatement,"Guidance for Controlling Friable Asbestos-Containing Materials in Buildings, EPA Report Number 560/5-85-024 (1985).

9 The Contractor shall install and initiate operation of a pressure differential

recorder (Manometer) to verify maintenance of a pressure differential of .02 inch of water, continuouslyin containment. The APM or ASP will check the recorder of the manometer on a regular basisduring the abatement. The Contractor shall keep the recorder tape for project record.

10 Once constructed and reinforced as necessary, and with negative pressure ventilation units inoperation as required, test enclosure for leakage utilizing smoke tubes. Repair or reconstruct as needed.

11 Clearly identify and maintain emergency and fire exits from the Work Area.

12 HEPA vacuum or wet clean the Worker Decontamination Enclosure System and wastetransfer airlock system at the end of each day of abatement activities.

G. Commencement of work shall not occur until:

1 Enclosure systems have been constructed, and tested.

2 Negative pressure ventilation systems are functioning adequately.

3 All pre-abatement submissions, notifications, postings, permits, bonds, insurance, etc. havebeen provided and are satisfactory to the Owner and the APM.

4 All equipment for abatement, cleanup and disposal are on hand.

5 All worker training, licensing and certification is completed.

6 Contractor receives written permission from Owner to start abatement.

7 Approval has been received from the APM.

8 Arrangements have been made for building security.

9 One full-time IDPH-certified Asbestos Supervisor per contained area is assigned to theproject as required by IDPH.

H. Removal of Building Components:

1 Remove, clean, replace and enclose in polyethylene the ceiling mounted objects such as lights and other items that may interfere with the abatement process and were not previously cleaned and sealed off. Utilize localized spraying of amended water and/or HEPA vacuums toreduce fiber dispersal during the removal of these fixtures.

2 As work progresses, spray ceiling materials and debris with amended water to keep wet untilcontainerized for disposal.

I. Alternative Procedures:

1 Procedures described in this Specification are to be utilized at all times.

2 If specified procedures cannot be utilized, a request must be made in writing to the AsbestosProject Designer providing details of the problem encountered and recommended alternatives.

3 Alternative procedures shall provide equivalent or greater protection than procedures thatthey replace.

4 Any alternative procedure must be approved in writing by the APM and where applicable, bythe IDPH, prior to implementation.

3.02 WORKPLACE ENTRY AND EXIT PROCEDURES

A. Personnel Entries and Exits:

1 All the following procedures shall be posted in the Clean Room and Equipment Room by the Contractor. These procedures shall be followed throughout the abatement project until clearance air monitoring has been

performed and documented to the satisfaction of the APM.

2 All workers and authorized personnel shall enter the Work Areas through the WorkerDecontamination Enclosure Systems.

3 All personnel who enter the Work Areas shall sign the entry log, located in the Clean Room,upon entry and exit.

4 All personnel, before entering the Work Areas, shall read and be familiar with all posted regulations, OSHA, EPA (NESHAPS and AHERA), IDPH, NIOSH, personal protection requirements (including workplace entry and exit procedures) and emergency procedures. Asign-off sheet shall be used to acknowledge these have been reviewed and understood by allpersonnel prior to entry.

5 All personnel shall proceed first to the Clean Room, remove all street clothes, and appropriately don respiratory protection (as deemed adequate for the job conditions) and launderable and/or disposable coveralls, head and foot coverings. Hard hats, eye protection and glovesshall be utilized if required. Clean respirators and protective clothing shall be provided and utilized by each person for each separate entry into the Work Areas.

6 Personnel wearing designated personal protective equipment shall proceed from the CleanRoom through the Shower Room and Equipment Room to the main Work Areas.

7 Before leaving the Work Area, all personnel shall remove gross contamination from the outside of respirators and protective clothing by brushing and/or wet wiping procedures. (Small HEPA vacuums with brush attachments may be utilized for this purpose, however, larger machines may tear the suits). Each person shall clean bottoms of protective footwear in the walk-off pan just prior to entering the Equipment Room.

8 Personnel shall proceed to the equipment room where they shall remove all protectiveequipment except respirators. Deposit disposable (and launderable) clothing into appropriately labeled containers for disposal (and laundering).

9 Reusable, contaminated footwear shall be stored in the Equipment Room when not in use in the Work Areas. Upon completion of each abatement, they shall be disposed of as asbestos-contaminated waste. (Rubber boots may be decontaminated at the completion of the abatement for reuse).

10 Still wearing respirators, personnel shall proceed to the shower areas, clean the outside of the respirators and the exposed face area under running water prior to removal of respirator and shower and shampoo to remove residual asbestos contamination. Various types of respirators will require slight modification of these procedures. A powered air-purifying respirator facepiece will have to be disconnected from the filter/power pack assembly which isnot waterproof, upon entering the shower. A dual cartridge respirator may be worn into the shower. Cartridges must be replaced for each new entry into the Work Area.

11 After showering and drying off, proceed to the clean room and don clean disposable and/or launderable clothing if there will be later re-entry into the Work Area or street clothes if it is theend of the work shift.

12 These procedures shall be posted in the Clean Room & Equipment Room.

B. Waste Container Pass-out Procedures:

1 Asbestos-contaminated waste that has been containerized shall be transported out of WorkArea through the waste transfer airlock or through the Worker Decontamination Enclosure system if separate airlocks have not been constructed.

2 Waste out procedures shall utilize two teams of workers, an "inside" team and an "outside"team.

3 The inside team wearing appropriate protective clothing and respirators for inside the Work Area shall clean the outside, including bottoms, of properly labeled containers (bags, drums,or wrapped components) using HEPA vacuums and wet wiping techniques and transport them into the waste container pass-out airlock. No worker from the inside team shall furtherexit the Work Area through this airlock.

4. The outside team, wearing a different color protective clothing and appropriately assigned respirators, shall enter the airlock from outside the Work Area, enclose the drums in clean, labeled, 6-mil polyethylene bags and remove them from the airlock to the outside. No workerfrom the outside team shall further enter the Work Area through this airlock.

5 The exit from this airlock shall be secured to prevent unauthorized entry.

3.03 RESPIRATOR MAINTENANCE

A. Develop plan for respirator maintenance covering cleaning procedures, frequency of cleaning, personresponsible for cleaning, method and means of storage, location of battery charging station, number of respirators available for use, frequency of cartridge change, compressor placement and length of hose used. Submit copy of maintenance plan to the APM. Submit verification of testing conducted in compliance with ANSI Commodity Specification for Air and OSHA Final Rules and Standards for 29 CFR Parts 1910.1001 and 1926.1101 Occupational Exposure to Asbestos, Tremolite, Anthophyllite and Actinolite.

B. Have available at each workplace one spare battery pack and cartridge per person per shift.

C. Develop emergency procedures as required in Article 1.08.

D. Maintain a log documenting all respirator maintenance procedures.

3.04 ABATEMENT PROCEDURES

A. Resilient Floor Tile and Mastic Removal within Modified Containment:

1 Clean and isolate the Work Area in accordance with Article 3.01.

2 Follow entry and exit procedures of Article 3.02.

3 Prior to commencement, during and after abatement work, air monitoring is essential as a means of documenting the air quality throughout the removal project. Upgrade workers respiratory protection or modify removal procedures to reduce airborne fiber concentrationsas directed by the APM.

4. Wet all asbestos-containing material with an amended water solution using equipment capable of providing a fine spray mist, in order to reduce airborne fiber concentrations whenthe material is disturbed. Saturate the material to the substrate, however, do not allow excessive water to accumulate in the Work Area. Keep all removed material wet enough to prevent fiber release until it can be containerized for disposal.

5. Maintain a high humidity in the Work Area by misting or spraying to assist in fiber settling andreduce airborne concentrations. Wetting procedures are not equally effective on all types of asbestos-containing materials but, shall nonetheless be used in all cases.

6. Saturated asbestos containing material shall be removed in manageable sections by a 2- person team. Removed material shall be containerized before

moving to a new location for continuance of work. Surrounding areas shall be periodically sprayed and maintained in a wetcondition until visible material is cleaned up.

7. Containers (6-mil polyethylene bags or drums where required) shall be sealed when full. When utilizing drums asbestos-containing material shall be placed first into 6-mil polyethylenebags. Asbestos-containing material shall be double bagged when 6-mil polyethylene bags are used for disposal. Bags shall not be overfilled. They shall be securely sealed to prevent accidental opening and leakage by tying tops of bags in an overhand knot or by taping in gooseneck fashion. Do not seal bags with wire or cord.
8. Bags may be placed in drums for staging and transportation to the landfill. Bags shall be decontaminated on exterior surfaces by wet cleaning and HEPA vacuuming before beingplaced in clean drums and sealed with locking ring tops.
9. Large components removed intact shall be wrapped in 2 layers of 6-mil polyethylene sheetingsecured with tape for transport to the landfill.
10. Asbestos-containing waste with sharp-edged components (e.g. floor sheeting/tile, nails, screws, metal lath, tin sheeting) will tear the polyethylene bags and sheeting, these materialsshall be placed into burlap bags prior to placement in 6-mil polyethylene bags and (drums where required) for disposal.
11. After completion of all stripping work, surfaces from which asbestos-containing materials havebeen removed shall be wet brushed with a nylon brush and sponged or cleaned by an approved equivalent method to remove all visible residue and mastic.
12. Clean up shall proceed in accordance with Article 3.05.
13. Under no conditions do these Specifications allow the flooring to be sanded, ground, cut, or abraded in any manner likely to cause the release of asbestos fibers into the air. Floor sheeting/tile shall be removed using a chipping tool or an equivalent method approved by theAPM.
14. After completing the resilient floor tile removal any mastic remaining on the floor surface mustalso be removed. The mastic shall be removed by using "Blastrac" machines or equal mechanical removers.
15. Chemical removers may be used only if written approval is received from the APM prior to theabatement. (Care shall be taken in the use and handling of chemicals/solvents. Avoid contactwith flames, sparks or other ignition sources such as HEPA units, negative air machines and portable lights.)
16. All waste generated from the mastic removal shall also be containerized appropriately fordisposal as asbestos waste. If chemical solvents are used to remove mastic, the waste generated shall be separated from other waste material and treated as hazardous waste.
17. After the Work Area has been rendered free of visible residues, it will be inspected by the APM. No encapsulating spray will be used.

3.05 CLEANUP PROCEDURES

A. Remove and containerize all visible accumulation of asbestos- containing materials and asbestos- contaminated debris utilizing rubber dust pans and rubber squeegees to move materials around. Do not use metal brushes or shovels to pick up or move accumulated waste. Special care shall be takento minimize damage to floor finishing.

B. Wet clean all surfaces in the Work Area using rags, mops or sponges as appropriate. Excess waterand wet debris may be picked up with a wet-dry shop vac.

C. Residual water shall be vacuumed with a high efficiency particulate air (HEPA)

vacuum. This watershall be filtered to 5 micrometers prior to disposal in municipal sewer.

D. Remove at the minimum on a daily basis all containerized waste from the Work Area and wastecontainer pass-out airlock.

E. The area must be inspected and approved by the APM at this point.

F. Remove the cleaned plastic sheeting from walls and floors. Windows, doors, HVAC system vents andall other openings shall remain sealed. The negative pressure ventilation units shall remain in continuous operation. Decontamination enclosure systems shall remain in place and be utilized.

G. After the first cleaning of the Work Area, wait at least 12 hours to allow fibers to settle. Then HEPA vacuum and wet clean all objects and surfaces in the Work Area again (second cleaning). The remaining plastic on the walls and floors only shall be removed. The windows, doors, HVAC systemvents and all other openings shall remain sealed. The negative pressure ventilation units shall remain in continuous operation during the 24 hour settling period, and the remaining cleaning process.

H. Decontaminate all tools and equipment and remove at the appropriate time in the cleaningsequence.

I. Inspect the Work Area for visible residue by wiping surfaces with a dark cloth. If any accumulation ofresidue is observed by the APM, it will be assumed to be asbestos and the 12-hour cleaning/settlingperiod cycle shall be repeated.

J. Once the Work Area has passed the third visual inspection, clearance air monitoring will be conducted by the ASP, as specified in Paragraph 1.03.3. A minimum of 12 hours after third cleaning shall be allowed prior to start of air sampling. The air in the Work Area shall be agitated during the air monitoring. If the acceptable air quality concentrations are met, barriers may be removed and properlydisposed of. A final inspection shall be conducted by the APM to assure no contamination remains in the Work Area.

K. All additional cleaning required shall be provided at no cost to the Owner until the clean up criteria has been met.

L HEPA units shall remain in operation until final clean check criteria has been met.

3.06 DISPOSAL

A. Disposal Procedures:

1 Removal of all asbestos-containing and contaminated materials from the Work Area shall occur at a minimum of once daily. None of these materials shall remain on Site overnight (in the Building) but rather shall be placed in the required lockable dumpster or similar approvedcontainer.

2 As the work progresses, to prevent exceeding available storage capacity on Site, sealed andlabeled containers of asbestos-containing waste shall be removed and transported to the prearranged disposal location.

3 Disposal shall occur at an authorized site in accordance with regulatory requirements ofNESHAP and applicable Federal, State, County, City

and other Local guidelines and regulations.

4 All dump receipts, trip tickets, transportation manifests and other documentation of disposal shall be delivered to the Owner for his records. A record keeping format utilizing a chain-of- custody form shall include the names and addresses of the Owner, Abatement Contractor, pickup site, disposal site, the estimated quantity of the asbestos waste and the type and number of containers used. The form shall be signed by the Abatement Contractor, and the Disposal Site Operator, as the responsibility of the material changes hands. If a separate hauler is employed, his name, address, telephone number and signature should also appearon the form.

5. Transportation to the landfill:

a. Once drums, bags and wrapped components have been removed from the Work Area, they shall be loaded into an enclosed truck for transportation. Cargo areas shallbe locked when unattended.

b. When moving containers, utilize hand trucks, carts and proper lifting techniques toavoid back injuries. Trucks with lift gates are helpful for raising drums during truckloading.

c. The enclosed cargo area of the truck shall be free of debris and lined with 6-mil polyethylene sheeting to prevent contamination from leaking or spilled containers. Floor sheeting shall be installed first and extend up the side walls. Wall sheeting shalloverlap floor sheeting by 6 inches and taped into place.

d. Drums shall be placed on level surfaces in the cargo area and packed tightly togetherto prevent shifting and tipping. Large structural components shall be placed on top of bags and secured to prevent shifting. Do not throw containers into truck cargo area.

e. Personnel loading asbestos-containing waste shall be protected by disposable clothing including; head, body, foot protection and at a minimum, half-face piece, air-purifying, dual cartridge respirators equipped with HEPA filters.

f. Any debris or residue observed on containers or surfaces outside of the Work Arearesulting from cleanup or disposal activities shall be immediately cleaned up using HEPA filters vacuum equipment and/or wet methods as appropriate.

g. If dumpsters are used for asbestos waste disposal or enclosed cargo area of truck, they shall have metal doors or metal tops that can be closed and locked to prevent vandalism, wind dispersion of asbestos fibers, or other disturbances of bagged asbestos debris. Unbagged material shall not be placed in these containers, nor shallthey be used for non-asbestos waste. Bags shall be placed, not thrown, into these containers.

h. Asbestos-containing materials shall be transported directly to the landfill. Temporarystorage shall not be permitted.

6. The APM reserves the right to accompany the transporter to the landfill.

B. Disposal at the Landfill:

1 Upon reaching the landfill, trucks shall approach the dump location as closely as possible forunloading the asbestos-containing waste.

2 Bags, drums and components shall be inspected as they are unloaded at the disposal site.Material in damaged containers shall be repacked in two 6-mil polyethylene bags and a burlap bag or one 6-mil polyethylene bag and drum as necessary.

3 Waste containers shall be placed on the ground at the disposal site, not pushed or thrown outof trucks.

4 Personnel off-loading containers at the disposal site shall wear protective equipment consisting of disposable head, body and foot protection and, at a minimum, half-face piece,air-purifying, dual cartridge respirators equipped with HEPA filters.

5 Following the removal of all containerized waste, the truck cargo area shall be decontaminated using HEPA vacuums and/or wet methods to meet the no visible residue criteria. Polyethylene sheeting shall be removed and discarded in bags or drums along withcontaminated cleaning materials and protective clothing, bags or drums at the disposal site.

6 If landfill personnel have not been provided with personal protective equipment for the compaction operation by the Landfill Operator, Contractor shall supply protective clothing andrespiratory protection for the duration of this operation.

7 All signed waste shipment records (WSR) shall be submitted to the APM within 35 days after waste shipment from the job site. APM will notify local, State and Federal EPA if WSR are notreceived within 45 days after waste shipment.

3.07 REESTABLISHMENT OF THE WORK AREA AND SYSTEMS

A. Reestablishment of the Work Area shall only occur after the completion of cleanup procedures and after clearance air monitoring has been performed and documented by TEM or PCM (as specified inParagraph 1.03.B) to the satisfaction of the CTA, its Representative and the APM.

B. Following satisfactory clearance air monitoring of the Work Areas, remaining polyethylene barriers,worker, and equipment decontamination enclosure systems shall be removed and disposed of as asbestos-contaminated waste. Following removal, the entire area, including HVAC filter assemblyand ductwork shall be wet-cleaned or HEPA vacuumed to remove residual asbestos fibers.

C. Remount objects removed during area preparation activities.

D. Relocate objects moved to temporary locations during area preparation activities.

E. Reestablish HVAC, mechanical and electrical systems in proper working order after receivingwritten approval from the APM.

F. Repair all areas of damage that occurred as a result of abatement activities.

3.08 GLOVEBAG REMOVAL/MINI-CONTAINMENT (TENT)

A. Area Preparation:

1 Air monitoring shall be performed as specified in Article 1.03.

2 Shut down the electric power to the abatement areas. Provide temporary power and lighting.Ensure safe installation (including ground faulting) of temporary power sources and equipment by compliance with all applicable electrical code and OSHA requirements for temporary electrical systems.

3 Contractor shall connect to Owners water supply system.

4 All necessary tools and materials shall be placed in the Mini-Containment (Tent) Work Areabefore the glovebag removal procedure begins.

5 All visible debris on the floor or other surfaces in the Work Areas shall be cleaned up byHEPA vacuuming and wet cleaning methods.

6. Contain the Work Area in which removal shall be performed:

   a. See paragraph E of this section**.**
   b. Shut down the Work Area HVAC system and seal all openings.
   c. Erect mini-containment (tent) consisting of one layer of 6-mil polyethylene. The mini-containment (tent) shall include a ceiling, walls and a floor.
   d. Provide an airlock with a polyethylene sheeting curtained doorway at access doors.
   e. Provide a negative pressure atmosphere within the Work Area in compliance with therequirements of Subparagraph 2.02.A.1 and Subparagraphs 3.01.F.7, F.8, F.9 and F.10.
   f. Rope outside area with asbestos warning tape.

7. Post warning signs.
8. Provide decontamination facilities consisting of at least a clean room, shower room and equipment room, as specified in Paragraph 3.01.B, within reasonable proximity to all Work Areas but within the Work Area enclosed by each "Type A" barrier. The APM must approve the location. The equipment room shall be under negative air pressure for the entire duration of the work.
9. Provide a waste transfer airlock as specified in Paragraph 3.01.C.
10. Maintain emergency and fire exits from the Work Area.
11. During abatement personnel shall be provided with two disposable suits.

B. Set Up:

1 Each glovebag removal shall require mini-containment (tent), individually or collectively. Mini-containment (tent) removal procedures shall be performed by a minimum of two licensed asbestos workers trained in mini-containment (tent) procedures and equipped with full personnel protective equipment

2 If any insulation on the pipe/fitting/duct is severely damaged, either at or remote from the section of insulation being removed, wrap the entire portion of insulation in polyethylene andsecure with duct tape, spiraling the length and provide a shroud around the damaged area.

3 Insulation adjacent to that being removed shall be wrapped in 6-mil polyethylene sheetingand sealed airtight with duct tape.

4 Wrap one layer of duct tape around the pipe/fitting/duct at each location where the glovebagwill be attached.

5 The pipe/fitting/duct insulation diameter shall not exceed one half the glovebag above theattached gloves.

6 Open the bag. Place tools inside. Wrap glovebag around pipe/fitting/duct and seal the topwith staples and duct tape. The glovebag is to be attached securely around the insulation,forming a smooth airtight seal.

7. Tape the ends of the glovebag to the pipe. When removing from vertical piping/fitting/duct, special care shall be taken to ensure the lower end of the glovebag is securely sealed againstthe pipe and the glovebag remains airtight.
8. Reinforce the bottom of bag. Make 2 folds (approximately 1 inch each) and secure with ducttape.
9. Tape the wand from the water sprayer to the water sleeve.
10. Tape hose of HEPA vacuum to mini-containment (tent) space.
11. The Contractor shall set up a chain of glovebags within the Work Area prior to requesting theAPM's inspection.
12. The APM will not inspect the glovebags individually. The APM will issue a warning notice orstop work notice if abatement starts without the APM's

inspection, testing and approval of glovebag set up.

13. Each glovebag shall be visually and smoke tube tested for air-tightness by the APM prior toasbestos removal.
14. Any leak points shall be taped airtight and a retest performed.

C. Removal:

1 Where damaged ACM is laying on ceiling or floor, all surfaces shall be HEPA vacuumed priorto starting removal procedures.

2. Remove small amount of pipe/fitting/duct insulation in mini-containment (tent).

    a. Spray all tools with water and place in pouch.
    b. The asbestos-containing pipe/fitting/duct insulation within the secured glovebag shallbe wetted with amended water prior to stripping.
    c. Cut the ends of the insulation and slit lengthwise. Constantly mist the asbestosmaterial with amended water during cutting and removal.
    d. Remove insulation from pipe/fitting/duct.
    e. Deposit the waste in the bottom of the glovebag.
    f. Spray unprotected pipe with amended water, scrub and wipe down exposedpipe/fitting/duct to remove all visible ACM.
    g. Seal the exposed ends of insulation with encapsulant prior to detaching the glovebag.
    h. The pipe/fitting/duct, the interior of the bag, the insulation and the tools shall be sprayed with amended water. The enclosed atmosphere shall be misted and timeallowed for the mist to settle.
    i. The glovebag shall not be shifted down a pipe or duct, nor shall it be moved from theinitial pipe or duct to another.
    j. Isolate tools in the glovebag gloves, thus turning the gloves inside out, forming a newpouch, twist and seal with duct tape, sever at mid-seal forming two separate bags.
    k. Collapse the glovebag using HEPA filtered vacuum.
    l. Twist glovebag several times and seal with duct tape.
    m. Slip a 6-mil polyethylene disposal bag over the glovebag while it is still attached to pipe/fitting/duct. Remove the tape, open the top of the glovebag and fold it down intothe disposable bag.
    n. Twist, seal and label the disposal bags.
    o. Clean the bag with a damp cloth.
    p. Dispose all materials, rags, brushes, etc. as asbestos-contaminated waste.

3. Follow waste container pass-out procedures specified in Paragraph 3.02.B.
4. After removal is finished, wet-wipe and HEPA vacuum the Work Area.

D. Work Decontamination:

1. Once removal work begins, all workers leaving the Work Area shall be decontaminated by having their outer suit thoroughly HEPA vacuumed. Proceed into airlock, remove and place outer suit in a drum lined with a 6-mil polyethylene bag for disposal. Proceed immediately tothe shower area, with respirator still on, perform complete decontamination as specified in Subparagraphs 3.02.A.6, A.7, A.8, A.9 and A.10. The Workplace Entry and Exit Procedures(Paragraph 3.02.A) shall be posted in the clean room and equipment room.

E. Emergency Procedures (See Article 1.08):

1 In the event of a glovebag rupturing or melting the device and shroud shall be immediatelycleaned with wet cloths and HEPA vacuuming.
2 The broken glovebag shall be encased in a new glovebag and attached as specified in theabove paragraphs.
3 Workers contaminated by asbestos material shall follow Worker Decontamination Proceduresas previously specified.

F. Clean-up Procedure:

1. Remove and containerize all visible accumulation of asbestos-containing materials and debris utilizing rubber dustpans and rubber squeegees to move materials. Do not use metal shovels to pick up or move accumulated waste.
2. Wet clean all surfaces in the Work Area using rags, mops and sponges as appropriate.
3. Encapsulate the areas from which asbestos has been removed in accordance with Article3.04.
4. Remove all containerized waste from the Work Area.
5. The area must be inspected and approved by the APM at this point.
6. Decontaminate all tools and equipment and remove at the appropriate time in the cleaningsequence.
7. Inspect the Work Area for visible residue. If any accumulation of residue is observed by theAPM, it will be presumed asbestos and the cleaning cycle shall be repeated.
8. Following completion of removal and clean up, all shrouds (including tent) shall remain sealeduntil clearance air monitoring is complete and the results acceptable.
9. Aggressive air sampling methods shall be utilized for all clearance air monitoring unlessdirected otherwise by the APM.
10. The Contractor shall remove all debris and materials left over and leave the Owners' Buildingin a "clean" state.
11. The Contractor shall return all furniture, equipment and all other items the Contractorremoved at the onset of work and restore all areas to their original condition.

G. Damage by Contractor:

1. Contractor shall be responsible for all damage caused by or during the abatement process. Contractor shall make every effort to rectify the damaged areas to their original condition subject toapproval by the Owner, its Representative and the APM.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of INTERIOR ASBESTOS ABATEMENT shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of INTERIOR ASBESTOS ABATEMENT shall be included in the contract lump sum price as shown in the Schedule of Prices for STRUCTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Structural Work: 030000.

END OF SECTION

SECTION 02 72 00

LEAD ABATEMENT

PART 1 – GENERAL

1.01 SUMMARY

A. The work of this section includes all labor, equipment, and materials necessary to perform lead abatement of surfaces noted or required in preparation for receiving new finishes. Work includes adhering to all applicable codes, regulations, health and safety requirements; obtaining all permits; performing all testing; training and licensing all personnel; protection of personnel, public, and adjacent surfaces; proper and legal disposal of all contaminated materials; maintaining all documentation; and any other work as required.

B. Locations and extent of abatement work is not delineated by the construction documents. Contractor shall be responsible for identification, classification, and abatement of lead-bearing substances.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this Section.

B. Reports and known previous discoveries provided by the Agency.

1.03 RELATED WORK

A. Division 09 Sections, Painting.

1.04 REFERENCES

A. The Illinois Department of Public Health regulations apply to all facilities occupied by children 6 years old or younger. The Chicago Department of Public Health inspects for, and regulates, lead contamination in all Chicago public facilities. Mitigation or abatement of all interior and exterior lead-bearing substances are covered by these specifications.

B. Applicable Standards and Guidelines:

1. All work under this Contract shall be done in strict accordance with all applicable Federal, State, County and City regulations, standards and codes governing lead abatement and any other trade work done in conjunction with same.
2. The most recent edition of any relevant regulation, standard, document or code shall be in effect. Where conflict among the requirements or with these specifications exists, the most stringent requirements shall be utilized.
3. The following regulations shall be adhered to in addition to any other applicable standards:

   a. 410 ILCS 45 Illinois Lead Poisoning Prevention Act
   b. 77.I.p.845 Illinois Lead Poisoning Prevention Code
   c. 29 CFR 1926 US OSHA Construction Standards
   d. 29 CFR 1926.62 US OSHA Lead Exposure In Construction; Interim Final Rule
   e. 29 CFR 1910.134 US OSHA Respiratory Protection.
   f. HUD Guidelines Lead Based Paint: Interim Guidelines for Hazard
   g. Identification and Abatement in Public and Indian Housing, Revised Chapters 5, 8,

9, 10, and 11 (June, 1996)

1.05 DEFINITIONS

A. Abatement means the work area preparation, complete removal of lead-bearing substances, and cleanup of surrounding work area to prescribed levels of decontamination.

B. Abatement Contractor (AC) means the entity responsible for performing the work in this section, with the training and accreditation to competently perform the work. This entity will obtain and maintain any licenses required for the work in this section.

C. CDPH means the Chicago Department of Public Health.

D. Environmental Project Manager (EPM) is selected by the Contractor and approved by the CTA to perform environmental monitoring and act on behalf of the CTA or its agents on the project.

E. General Contractor (GC) or Contractor means the entity responsible for performing the complete scope of work in the Documents. The GC may elect to self-perform or subcontract out any portion of the work. If the GC acts as the AC, it must have the same credentials, training, accreditations and licenses required by the AC.

F. HEPA Filter means a High Efficiency Particulate Air filter capable of trapping 99.97 percent of particles greater than 0.3 micrometers in mass median aerodynamic equivalent diameter.

G. IDPH means the Illinois Department of Public Health.

H. Lead Abatement Contractor/Supervisor, hereinafter referred to as “supervisor” means any person who supervises lead abatement workers. This person must be trained, accredited, and licensed as required, and must also meet OSHA competent person criteria for lead abatement.

I. Lead-Based Paint means paints or coatings that are lead bearing substances.

J. Lead Bearing Soil means soil containing more than 1,000 micrograms of lead per gram of soil.

K. Lead Bearing Substance means any dust on surfaces or furniture or other non-permanent items and any paint or other surface coating material containing more than five-tenths of one percent (0.5 percent) lead by weight (calculated as lead metal) in the total non-volatile content of liquid paint, or lead bearing substances containing greater than one milligram per square centimeter or any lower standard for lead content in residential paint as may be established by federal law or regulation; or more than 1 milligram per square centimeter in the dried film of paint or previously applied substance.

L. MSDS means Material Safety Data Sheet, required by OSHA for any substances that are toxic, caustic, or otherwise hazardous to workers.

M. Plasticize means to apply plastic sheeting over surfaces or objects to protect them from contamination or water damage.

N. Wet Cleaning means cleaning all surfaces with a solution containing tri-sodium phosphate mixed according to the manufacturer’s directions, or a phosphate-free lead dissolving detergent.

O. Work Area means areas where lead abatement activities are conducted.

P. Work Site means the room or rooms undergoing lead abatement activities. All closets, vestibules, and immovable equipment within a room are considered part of the work site in which abatement work has been identified on the drawings, whether or not they are numbered separately.

Q. XRF means x-ray fluorescence analyzer. This instrument is used to determine if lead is present in surfacing materials and to determine the amount of lead in materials.

1.06 WORK INCLUDED

A. The work includes all labor, equipment, materials, and supplies necessary to perform the lead abatement work by the procedures described herein. The Contractor, by submitting a bid for the work, represents itself as knowledgeable and expert in the performance of the work, and includes all things usually and customarily necessary to provide a complete and finished job, whether specifically mentioned or not.

B. Clean-up of lead-bearing dust, flakes, and residues; mitigation or abatement of paint, architectural components, substrates, floors, grounds, or other lead-bearing items including pre-cleaning, moving of furnishings, establishing regulated areas, isolating the work areas, protection of adjacent surfaces, containment when required, cleanup and decontamination to the specified clearance levels, proper packaging and disposal of wastes, and all other steps necessary to complete the lead abatement process.

C. Repair or replacement of damaged surfaces, fixtures, or furnishings to restore them to their pre-existing condition to the satisfaction of the Authority.

D. When the work requires both lead and asbestos abatement in the same spaces, they should be performed in the sequence and combinations that produce the most efficient results and the least amount of total waste. That sequence will generally be:

1. Cleanup and removal of failed or delaminated friable asbestos-containing debris, if any.
2. Cleanup of lead dust, flakes, chips, and residues. If these lead wastes are mixed with asbestos debris, they must be disposed together as regulated lead waste.
3. Removal of friable asbestos materials and cleanup of visible residues.
4. Removal of architectural components with lead-based paint still adhered, such as wood trim, doors, plaster, drywall, window frames, etc.
5. Removal of non-friable asbestos materials. If both asbestos and lead are on the same components, for example lead paint and asbestos-containing glazing compound, the components may be removed and disposed as construction debris as long as both the lead- and asbestos-bearing materials remain intact.
6. Removal of lead-based paint, coatings, or surfacing material.
7. Final cleanup and decontamination of the workspace. Final air clearance (asbestos) and wipe samples (lead) may be performed concurrently.
8. When lead and asbestos final decontamination processes are combined, the more stringent cleanup procedures will apply for both.
9. Waste disposal.

    a. Classified lead waste: loose paint flakes, chips, and dust; lead cleaning and decontamination supplies; contaminated soil; disposable suits, gloves, headcovers, and footcovers; respirator, vacuum, or negative air machine filters; or

other items likely to fail a TCLP test.

b. Special waste: friable asbestos-containing waste materials.

c. Construction and demolition (C&D) debris: non- friable asbestos-containing waste materials (such as, but not limited to transite, flooring, mastics, packing, caulking); lead-bearing architectural components; cleaned poly sheeting from lead projects; concrete and lumber with or without tile or mastic attached; demolition debris, and other general wastes.

d. All asbestos-containing or lead-bearing wastes shall be disposed in a landfill approved to accept asbestos-containing or lead-bearing waste materials.

E. Compliance with all applicable laws, regulations, standards, and these specifications. In the case of a conflict, the contractor will comply with the most stringent.

F. All licenses, accreditations, permits, notifications, reports, or other documents required by law, regulation, this specification, or the Documents.

1.07 QUALITY ASSURANCE

A. Assessment, Monitoring, Testing, and Analysis

1. The EPM will perform inspection and testing services prior to the start of work. The EPM will perform testing, inspection, and monitoring services during the work and upon its completion:

a. Testing of coatings, soils, dust, and debris to determine the presence of lead or other hazardous substances. Test results will be included in the Documents.

b. Air monitoring during the work to determine the airborne concentrations of lead inside and outside of the work area. The EC shall stop the work if airborne lead concentrations outside the work area exceed the OSHA PEL of 50 micrograms per cubic meter of air ($\mu g/m^3$) (micrograms per cubic meter) as an 8-hour time-weighted average. The work may re-start when the source of lead release has been identified and resolved, and corrective measures have been instituted to prevent recurrence.

c. Monitoring may be discontinued after the first three days when airborne concentrations lead concentrations have remained below 30 $\mu g/m^3$ (micrograms per cubic meter) for two consecutive days.

d. Wipe samples of surfaces in and around the work areas after completion of the work to determine residual lead levels on surfaces.

2. The Abatement Contractor shall perform:

a. An Exposure Assessment prior to the start of the work to determine the requirements for respiratory protection and frequency of OSHA monitoring for each type of activity.

b. Perform OSHA compliance air monitoring to determine exposures to its employees in accordance with OSHA 29 CFR 1926.62. Frequency of testing will comply with OSHA requirements for the anticipated and actual exposure levels.

3. Credentials required for testing and analysis of lead:

a. Accreditation by AIHA or AALA; or

b. Participation in the Environmental Lead Proficiency Analytical Testing (ELPAT) program; or

c. Participation in the Proficiency in Analytical Testing (PAT) for metals analysis.

1.08 SUBMITTALS AND NOTICES

A. The Abatement Contractor shall submit the following information to the Authority and EPM:

1. Exposure Assessment
2. OSHA compliance monitoring
3. Area air monitoring
4. Copies of Licenses:
5. Lead Abatement Contractor
6. All supervisors
7. All workers
8. Laboratory or analyst credentials and proficiency certificates for contractor samples.
9. Copies of Contractor and Laboratory Insurance Certificates
10. Waste Disposal receipts

a. AC shall retain records for 6 years:
b. Name and address of the contractor who performed the project.
c. Location of the project.
d. Summary of abatement techniques used.
e. Location of the disposal site for lead-based substances removed from the work site.
f. Starting and completion dates of the lead abatement project.

PART 2 – PRODUCTS

2.01 TOOLS AND EQUIPMENT

A. Equipment – All Equipment shall at least conform to minimum industry standards:

1. Negative Air Machines shall provide HEPA filtration and conform to ANSI Z9.2 fabrication criteria.
2. Respirators shall be NIOSH or MSHA approved for use with lead, asbestos, or other contaminants anticipated in the work.
3. Full-body safety harnesses shall be used with approved lanyards for fall protection. Safety belts are not permitted.
4. Other Safety equipment, such as hard hats, eye protection, gloves, and footwear shall comply with their respective ANSI standards.

B. Tools

1. Shovels and scoops shall be suitable for use in a plasticized containment. Plastic or rubber models are preferred, but metal shovels are acceptable when used with care to prevent damage to poly sheeting and permanent surfaces. Duct tape may be applied to the leading edges to aid in poly damage prevention.
2. Scrapers, wire and bristle brushes, utility knives and other hand tools shall be of good quality and suitable for the intended uses. The contractor shall keep an ample supply on hand for the completion of the work.
3. Power tools such as, but not limited to saws, pneumatic chisels, brushes, sanders, and needle guns shall be equipped with shrouds and HEPA-filtered local exhaust systems to capture released particles.

2.02 MATERIALS

A. Installed materials which become a part of the work such as, but not limited to, primers, paints,

surfacing compounds, and other surface coverings or finishes shall be new unless specified otherwise, of good quality, non-lead bearing, and shall conform with the respective reinstallation specification sections.

B. Abatement materials:

1. Poly sheeting for all applications shall 6 mil nominal thickness for all applications.
2. Tape shall be 2-inch or 3-inch duct tape or other waterproof tape suitable for joining poly seams and attaching poly sheeting to surfaces.
3. Spray adhesives shall be non-flammable and free of methylene chloride solvents.
4. Disposal bags shall be 6 mil where used for single-bagging, and minimum 4 mil where used for double-bagging.
5. Disposable suits, hoods, and foot coverings shall be TYVEK or similar.
6. Solvents shall be compatible with any primers, paints, coatings, or other surfacing materials to be installed following their use.
7. Cleaning solutions shall cause lead to chelate, precipitate, or otherwise release effectively release from surfaces. Cleaning solutions shall not leave residue on surfaces to be painted.

PART 3 – EXECUTION

3.01 EMPLOYEE TRAINING, QUALIFICATION, AND MEDICAL SCREENING

A. Supervisors and Workers shall be trained, accredited, and licensed in accordance with IDPH rules.

1. Contractor shall keep copies of licenses at the jobsite at all times.
2. A licensed supervisor (competent person) shall be present at the worksite at all times when work under this section is being conducted.

B. Medical Screening shall be instituted for contractor's employees in accordance with paragraphs (j) and (k) of the OSHA rules, including (but not limited to):

1. Biological monitoring for lead and zinc protoporphyrin (ZPP) for employees whose exposures to lead exceed the action level of 30 $\mu g/m^3$ (micrograms per cubic meter) for more than 30 days in a 12 month period; for employees exposed above the action level who request it; or as soon as possible if the employee develops signs or symptoms associated with lead intoxication or is pregnant. Monitoring shall be conducted at least every 2 months for the first 6 months, and every 6 months thereafter.
2. Any employee whose blood lead level is at or above 40 µg/dl (micrograms per deciliter) shall be monitored at least every two months until blood lead levels fall below 40 µg/dl (micrograms per deciliter).
3. Any employee whose blood lead level is at or above 50 µg/dl (micrograms per deciliter) shall be removed from the exposure.
4. The OSHA rules provide employees specific medical and compensation rights in these instances.

3.02 PERMISSIBLE LIMITS

A. Permissible Limits of lead in lead bearing substances. Substances with lead content below the following levels are not regulated and are not subject to the requirements of this section:

1. 5,000 parts per million (ppm), or 0.5 percent lead by weight in any substance. However, note that OSHA regulations apply to any operation that releases lead into the air in concentrations in excess of the action level of 30 $\mu g/m^3$ (micrograms per cubic meter) (see Paragraph B.1. below), and the CDPH will require remedial action when dust contains

greater than 200 µg/sf (micrograms per square foot) (see Paragraph A.3 below) of surface area on horizontal surfaces except interior and exterior floor which are 40 µg/sf (micrograms per square foot). Actions such as sandblasting, dry sanding, or other dry aggressive abrasive disturbances can generate lead concentrations greater than either of these limits on substances with lower lead contents and, in such instances, will be required to adhere to this specification, regardless of substance lead content.

2. 1,000 micrograms per gram (µg/g) of soil.
3. 200 micrograms per square foot (µg/sf) of surface area of dust on horizontal surfaces except floor which are 50 µg/sf (micrograms per square foot).

B. Permissible Exposure Limits for contractor employees:

1. No person shall be permitted to be exposed to a lead concentration in excess of 50 $\mu g/m^3$ (micrograms per cubic meter of air) as an 8 hour time-weighted average (TWA). When respirators are used, the exposure may be considered to be at the level provided by the protection factor of the respirator.

2. Where exposures are above the action level of 30 $\mu g/m^3$ (micrograms per cubic meter) for more than 30 days in a 12 month period, medical monitoring in accordance with OSHA rules will be instituted for exposed employees.

3.03 EXPOSURE ASSESSMENT AND MONITORING

A. The AC shall make an assessment of the exposures expected by the tasks to be used for the scope of work listed in the Documents. Assessment may be based upon:

1. Initial monitoring of representative workers who the contractor believes are exposed to the greatest airborne concentrations of lead, or
2. Past monitoring (within the past 12 months) or objective data for conditions closely resembling the processes, type of material, control methods, work practices and environmental conditions to be used for this Documents, or
3. In the absence of an exposure assessment or monitoring, the contractor shall assume the following exposure conditions:

   a. ≤500 $\mu g/m^3$ (micrograms per cubic meter) for manual demolition of lead-bearing substances (i.e., drywall, other architectural components), manual scraping, manual sanding, heat gun use, and power tool cleaning with dust collection systems, or any other task where there is reason to believe an employee may be exposed to airborne lead.
   b. ≤2500 $\mu g/m^3$ (micrograms per cubic meter) lead burning, rivet busting, power tool cleaning without dust collection systems, cleanup of dry spent abrasives, or movement or removal of abrasive blasting enclosures.
   c. >2500 $\mu g/m^3$ (micrograms per cubic meter) for abrasive blasting, welding, cutting, and torch burning.

B. The Contractor shall perform personal monitoring in accordance with the following requirements:

1. Initially, to establish an exposure assessment when past monitoring or objective data are not available for an initial determination.
2. Periodically if the exposures are, or are expected to be, above the action level of 30 $\mu g/m^3$ (micrograms per cubic meter).
3. Where a Negative Initial Determination is made, that exposures will be below the action level, no further monitoring is required.

4. Whenever there has been a change of equipment, process, control, personnel, or a new task has been initiated that may exceed the action level of 30 µg/m^3 (micrograms per cubic meter) contractor shall resume periodic monitoring.
5. Monitoring and analysis shall have an accuracy (to a confidence level of 95 percent) of not less than +/- 25 percent for airborne concentrations of lead equal to or greater than 30 µg/m^3 (micrograms per cubic meter).

C. The Contractor may be required to perform air monitoring outside the work area if there is observance of contamination escape from the work area (such as dust accumulation), or evidence of failure of control methods to contain the release of airborne lead particles.

3.04 RESPIRATORY PROTECTION REQUIREMENTS

A. Respiratory protection shall be worn by all persons in the worksite performing abatement tasks who may be exposed to lead dust or fumes during lead abatement activities. At a minimum, the following shall be provided, for:

1. <500 µg/m^3 ½ mask air purifying respirator with HEPA cartridges (APR).
2. <1,250 µg/m^3 Loose-fitting hood or helmet powered APR (PAPR) Hood or helmet supplied air respirator (SAR) in continuous flow mode.
3. <2,500 µg/m^3 Full facepiece APR, Tight fitting PAPR, Full facepiece SAR in demand mode, ½ mask or full facepiece SAR in continuous flow mode.
4. <50,000 µg/m^3 ½ mask or full facepiece SAR in pressure-demand mode.
5. >50,000 µg/m^3 Work shall stop until conditions are brought below this level

B. Contractor shall have a written respiratory protection program in accordance with OSHA 29 CFR 1910.134, including but not limited to, medical screening, semi-annual (every 6 months) fit testing for negative pressure respirators, training, cleaning and maintenance.

C. Respirators shall not be removed while in the work site or work area.

D. Only MSHA- or NIOSH-approved respirators shall be used.

E. Additional respiratory protection by supplemental filters, such as organic vapor cartridges, may be needed when handling some coating or stripping products. Consult the Material Safety Data Sheet, manufacturer, or industrial hygienist and obtain the proper filters and usages as necessary.

3.05 HYGIENE PRACTICES

A. Eating, drinking, smoking, and applying of cosmetics are not allowed in the work site or work area. Any person leaving the work site or work area shall rinse his or her mouth with potable water and wash hands and face thoroughly before eating drinking, or smoking. A lavatory facility, potable water supply, or portable decontamination unit shall be provided for the washing of face and hands.

B. A changing area and shower shall be provided for changing into and removing personal protective clothing, and for showering or washing before leaving the work area for the day. (845.30(c)(2) and (k)) (845.30 (l)(2)).

C. Equipment decontamination procedures shall be employed to prevent the spread of lead contamination. Disposable items shall not be reused and shall be disposed of properly (845.30(p)(2)(C)).

D. Personal Protection Equipment (PPE) shall include:

1. Full body suits with hoods and shoe covers. Tyvek® or similar disposable suits may be worn only once, and must be disposed in accordance with the Waste Disposal section. Non- disposable suits shall be laundered separately.
2. When respirators are not full-face models, goggles with side shields shall be worn when working with a material that may splash or fragment, or if protective eyewear is specified on the MSDS for that product.

3.06 WORK AREA ISOLATION AND PREPARATION

A. General Preparation

1. Post caution signs at all entrances and exits to the work area:

   a. At least 20 inch x 14 inch
   b. Date and location of the lead abatement project
   c. Wording at least 2 inch high stating, “Caution, Lead Hazard, Do Not Remain in Work Area Unless Authorized”

2. Secure the work area from entry by children under 16 years of age, pregnant women, or other unauthorized persons.
3. Close off the work site from other portions of the building by closing doors tightly, taping shut when necessary, or with 6 mil poly z-flap curtains over doorways or entrances to the worksite.
4. At work area exit, provide walk-off pan, wet towel, or other means to prevent tracking lead contamination to other parts of the facility.

B. Interior Preparation

1. Furniture, personal items, and other moveable objects in the worksite shall be protected with 6 mil poly sheeting and sealed with tape, or moved from the work site and stored in a location designated by the Environmental Consultant.

   a. If surface dust sample results were at or above 200 µg/sf (micrograms per square foot) prior to the start of work, items shall be cleaned before being moved to another area to prevent cross-contamination.

2. Turn off all forced air ventilation and seal exhaust and intake points in the worksite.
3. Turn off electrical circuits in the work site as much as possible or isolate them from contact. Provide temporary power equipped with Ground-Fault Circuit Interrupter (GFCI) devices to prevent electric hazards in the wet working environments. power cords must be in good condition, not spliced, not more than 100 feet long, and shall be suspended off the floor and out of workers’ way to protect the cords from damage. Cords must not be fastened with staples, hung from nails, or suspended with wire.
4. Seal the opening seams of all food storage units, such as cabinets or refrigerators, or cover with poly sheeting.
5. Cover all objects that cannot be moved, such as radiators, stoves, cabinets, built-in furniture, bookcases, or other stationary items with 6 mil plastic sheeting taped securely in place.
6. Remove all carpeting from the work site. Lightly mist with water prior to removal to prevent lead dust exposure. Carpeting shall be professionally cleaned or replaced.
7. Cover floors in the work site with 6 mil plastic sheeting, sealed with tape.
8. Establish a negative pressure system to prevent contaminated air from escaping from the work site to uncontaminated areas, and consisting of:

a. Negative air machines (NAMs) exhausted from the work site, and vented to the outside of the building whenever possible.
b. Provide sufficient number of NAMs to provide a negative pressure of 0.02 inches wc between the work area and adjacent spaces, and 4 air changes per hour.
c. Operate the system in accordance with Appendix D, section 845 of the IDPH rules.
d. The negative air system shall remain in continuous operation until cleanup and clearance is achieved.

C. Exterior Preparation

1. 6 mil plastic sheeting shall be placed over the ground, foundation, or other surfaces adjacent to or below the abatement area.
2. Close or otherwise seal windows, grilles, intakes, or other nearby openings (above, below, or beside) that could be exposed to airborne dust from the work.
3. Sheeting shall extend out from the foundation 3 feet per story to be abated, with a minimum of 5 feet and a maximum of 20 feet.
4. Sheeting shall be secured at the foundation and along all edges and seams.
5. When liquid waste is produced by any abatement method used, the edges of the plastic sheeting shall be raised a sufficient distance to contain the liquid waste.

3.07 LEAD ABATEMENT

A. General:

1. Unless otherwise specified in the Documents, all lead-bearing substances that are to be coated shall be removed by methods that minimize the generation of dust or debris. As stated in Section 09 90 10, Cleaning and Painting of Existing Surfaces, of these documents, “the Contractor shall completely remove all existing coatings. The Contractor shall assume that all coatings contain lead, and residue generated during the cleaning process shall be fully contained and properly disposed of as hazardous waste. The Contractor shall determine if coatings in certain areas do not contain lead by means of chemical and physical analyses approval by the Engineer.”
2. Lead-based paint abatement practices shall be compatible with, and shall produce surfaces that are in conformance with Section 09 90 10, Cleaning and Painting of Existing Surfaces.
3. Where existing lead-bearing substances may be disturbed by the installation of new work, they shall be removed sufficiently to prevent such disturbances.
4. Where disturbances of lead-bearing substances produce dust, the dust must be assumed to contain lead until tested and proven otherwise. Dust suppression methods, such as misting with water and HEPA vacuums shall be used.
5. Movement of lead-bearing wastes through unsecured public areas:

a. Wastes shall be contained in 6 mil impermeable (i.e. poly) bags.
b. Architectural components and other debris shall be wrapped in 6 mil plastic sheeting and sealed with tape.
c. Load-out only during CTA approved hours.
d. Dust and debris shall not be tracked or spilled outside the work site. In the event of spillage or tracking, contractor shall HEPA vacuum visible debris and wet wipe all affected areas with a TSP solution or non-TSP lead-dissolving detergent solution.

B. Interior Abatement methods will need to comply with the approved methods established in Section 09 90 10, Cleaning and Painting of Existing Surfaces, and may include:

1. Removal and replacement of the component or surface.
2. Commercial Blast Cleaning (SPCC- SP 6)

3. Off-site chemical stripping. This method is generally only advisable with unique, irreplaceable, architecturally, or historically significant components and will only be required when specifically called out in the Documents.
4. Heat gun with operating temperatures not to exceed 700 degrees Fahrenheit.
5. Nonflammable chemical strippers that do not contain methylene chloride. Chemical strippers shall be compatible with new paints, coverings, or coatings to be installed.
6. Sander, needle gun, chipper, scarifier, or other mechanical paint removal system. All such power tools shall be equipped with a HEPA vacuum collection system.

C. Exterior abatement methods may include:

1. All methods listed under Interior Abatement.
2. Vacuum-blasting.
3. Window replacement:

    a. The room interior shall be sealed off and protected from dust entry. If windows are removed from the inside, the room must be fully protected in accordance with Paragraph 3.07.B, “Interior Preparation.” and Paragraph 3.07.C, “Exterior Preparation.” When windows are removed from the outside, protection must be in accordance with Paragraph 3.07.C, Exterior Preparation, including at least a seal over the wall immediately inside the window work area. In either case, the AC is responsible for preventing lead dust contamination of interior spaces.
    b. All lead-based paint must be removed from the wood window frame parts that will remain.
    c. Metal window replacements: The contractor is cautioned that high concentrations of lead dust have been found behind the window frame caps installed over the original lead-based painted frames during previous window replacements. Although a lead license is not required for metal window removal, contractor must assume that he or she may encounter concentrated lead dust. When removing these caps, the room interior shall be protected in accordance with Paragraph 3.07.B, “Interior Preparation.” Level II work practices shall be used, including misting with water to suppress dust release and to prevent exposures above the PEL.

D. Soil Removal or Remediation

1. Identify and eliminate the source of lead contamination if possible, to prevent re-contamination of remediated soil.
2. Dust generation shall be held to a minimum and dust suppression methods shall be performed, such as misting with water during handling.
3. Monitoring of airborne dust shall be performed by the Environmental Consultant, and shall not exceed acceptable levels.
4. Soil which is stockpiled prior to disposal shall be:

    a. Placed on a layer of impermeable plastic if stockpiled on CTA property;
    b. Kept moist to avoid dust generation; and
    c. Covered with impermeable plastic which is secured to the ground.

5. Soil shall be subjected to a TCLP test to determine waste classification.
6. Contaminated soil shall be transported to disposal facility in sealed containers or covered vehicles. Care shall be taken to prevent tracking of contaminated soil off- site by vehicular or foot traffic.

E. Demolition. Prior to demolition activities, non-intact (damaged) lead-based paint shall be removed by an IDPH licensed lead abatement contractor. Structural demolition of buildings does not require

removal of lead-bearing substances or lead-licensed contractors or workers. However, the following minimum requirements must be observed to prevent spread of lead contamination:

1. Close windows and seal doors of adjacent or nearby structures. Cover air intakes or other openings on facing walls or roof areas where dust could enter.
2. Mist the demolition activities with water to suppress dust release.
3. Do not spread debris outside the immediate demolition area.
4. Do not allow foot or other traffic through the demolition area that may spread lead- bearing dust to other building areas.

3.08 CLEANING AND DECONTAMINATION

A. Interior Cleaning. Include in the cleaning process any furniture, cabinets, or other item that remained in the worksite that have become contaminated with lead-bearing dust.

1. Properly containerize and remove all lead wastes from the work site.
2. HEPA vacuum all surfaces including woodwork, walls, windows, window wells, and floors.
3. Wet clean all surfaces with a cleaning solution.
4. Allow all surfaces to dry and HEPA vacuum any remaining visible residue.

B. Exterior Cleaning:

1. Recover all visible debris from exterior areas.
2. HEPA vacuum surfaces that have been abated, paying particular attention to horizontal surfaces, such as window sills, wells, mullions, ledges, etc., both in the abated area and on nearby windows and surfaces.

3.09 FINAL CLEARANCE

A. A lead abatement work area shall be complete if lead dust levels on horizontal interior surfaces are below 200 micrograms per square foot (µg/sf), except interior and exterior floors that are to be below 40 µg/sf. At least 3 wipe samples shall be collected from floors, windowsills, countertops, tops of cabinets, or other representative surfaces.

3.10 DISPOSAL

A. All plaster, paint chips, lead dust, cleaning supplies, HEPA filters, vacuum contents and filters, disposable suits, and other concentrated lead-bearing waste shall be packed in at least two 4 mil plastic bags or one 6 mil plastic bag.

1. Dispose of concentrated lead wastes separately from architectural components.
2. Subject concentrated wastes to TCLP test to determine waste classification.
3. Prepare a lead shipment manifest, to be signed by the generator, shipper, and disposal site; to be returned to the generator within 45 days.

B. Architectural components, other items to which lead-based paint remains adhered, and cleaned plastic sheeting may be disposed as common C&D debris.

1. When carried through the interior of the building or across unprotected areas, components shall be wrapped in 6 mil plastic sheeting and sealed with tape.

C. All lead-bearing wastes shall be stored in covered, locked containers until transported off site.

D. Remove lead waste from the work site within 48 hours of TCLP test results if tested, or within 48

hours of final cleanup if not subjected to testing.

E. Transport all non-hazardous wastes in covered vehicles to a landfill approved by the IEPA.

F. Transport all hazardous wastes in covered vehicles to a hazardous waste landfill permitted to accept lead wastes.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of LEAD ABATEMENT shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of LEAD ABATEMENT shall be included in the contract lump sum price as shown in the Schedule of Prices for STRUCTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Structural Work: 030000

END OF SECTION

SECTION 02 73 00.S

MOLD ABATEMENT

PART 1 GENERAL

1.01 SUMMARY

A. The work of this section includes all labor, equipment, and materials necessary to safely abate mold and mold spores from impacted facilities as shown or required. Work includes adhering to all applicable codes, regulations, health and safety requirements; obtaining all permits; performing all testing; training and licensing all personnel; protection of personnel, public, and adjacent surfaces; proper and legal disposal of all contaminated materials; maintaining all documentation; and any other work as required.

1.02 RELATED DOCUMENTS

A. Drawings and other Specification Sections apply to this Section.

1.03 RELATED WORK

A. Section 02 72 00, Lead Abatement.

1.04 REFERENCES

A. Work shall be completed according to the following guidance documents:

1. United State Environmental Protection Agency (USEPA), “Mold Remediation in Schools and Commercial Buildings”, Office of Air and Radiation, Indoor Environments Division (6609J), EPA 402-K-01-001, March 2001.
2. New York City Department of Health and Mental Hygiene, “Guidelines on Assessment and Remediation of Fungi in Indoor Environments”, November 2008.
3. Illinois Department of Public Health, “Reducing Your Exposure to Mold”, Division of Environmental Health Fact Sheet.

1.06 WORK INCLUDED

A. The work includes all labor, equipment, materials, disposal materials, services, employee protection, tools, insurance and supplies necessary to perform the removal or abatement of mold impacted building components by the procedures described herein. The Contractor, by submitting a bid for the work, represents itself as knowledgeable and expert in the performance of the work, and includes all things usually and customarily necessary to provide a complete and finished job, whether specifically mentioned or not.

B. Locations and extent of abatement work is not delineated by the construction documents. Contractor shall be responsible for identification and classification of mold occurrence.

C. Abatement procedures used by Contractor shall utilize state of the art techniques including appropriate containment, decontamination facilities, and negative air pressure.

D. Contractor shall provide bagging, waste disposal receptacles, and equipment as

needed, movement, and transport of mold impacted waste from the site of work, and disposal at a licensed waste disposal facility, approved by the Authority.

E. Contractor shall provide all cleaning supplies required to remove mold, on building components that will remain in-place.

F. Contractor shall maintain a comprehensive logbook detailing progress of abatement and mitigation activities with recorded information available upon the Authority's request.

G. Contractor must be available for periodic meetings scheduled with the Authority's staff or designated construction managers to discuss the project and to assure that the project is on schedule.

1.07 RECORDS AND PERMITS

A. Contractor shall be responsible for preparation of notification to building occupants, impacted CTA personnel, or other parties that may be impacted by mold mitigation activities. The Authority shall be responsible for distribution of notification to tenants or other impacted people.

B. Contractor shall be responsible for any notification to appropriate regulatory agencies, if required. (Current regulations do not require notification within CTA service area).

C. Contractor shall comply with the following programs:

1. Hazard Communications Program as per 29CFR 1926.59 or 19010.1200.
2. Contractor's Respiratory Protection Program as per 29CFR 1910.134 or 1926.103.
3. Contractor's Lock Out, Tag-Out and Electrical Safety Programs as per 29CFR 1910.147 and 1910.331-335.

D. Contractor to provide all required licenses, accreditations, permits, notifications, reports, or other documents required by law, regulation, this specification, or the Documents.

E. Contractor to comply with all applicable laws, regulations, standards and these specifications. In the case of a conflict, the Contractor will comply with the most stringent.

G. All personnel assigned to perform mold abatement work must be certified by attending an approved mold abatement training class.

1.08 SUBMITTALS

A. Pre-Project Submittal: Submit the following to the Authority for approval prior to commencement of the work:

1. Detailed plan of procedure proposed for the mitigation work, including location of the decontamination unit (if used), sequencing the work, time frame for completion of work, waste disposal procedures, employee protection requirements, and a detailed description of methods employed to eliminate any mold from being distributed outside the work area.
   The Authority's Manager of Environmental Affairs or his /her designee will monitor the mitigation project and coordinate work between the Contractor and the Authority.
2. Emergency telephone numbers(s) and contingency plans.
3. Waste disposal site and disposal procedures.

4. Contractor's OSHA compliance program.
5. Certification of Contractor as to meeting the experience requirement specified herein.
6. Materials to be used for the mold abatement work including worker protection, protection of other surfaces, bags for disposal of contaminated materials, etc.
7. Certification of completion of the mold training course for each employee assigned to the project.

B. Post-Project Submittal: Submit to the Authority Waste Manifests for the removal, transport and disposal of all mold containing building materials and materials used in the mold abatement work (drop cloths, poly protection, bags, worker protection, etc.).

1.06 QUALITY ASSURANCE

A. Contractor shall have experience with the abatement and removal of mold and mold damaged items from commercial buildings. Contractor shall provide documentation to the Authority that they have completed at least ten (10) mold abatement projects of similar size and duration similar in scope to that encountered in this project for the Authority.

B. Each of the Contractor's workers assigned to the Authority's projects shall have completed a minimum of eight (8) hours of mold abatement training by an approved provider. Contractor shall provide documentation and certification of successful completion of the training.

PART 2 PRODUCTS

2.01 MOLD ABATEMENT MATERIALS

A. Poly sheeting shall be 6 mil nominal thickness for all applications.

B. Tape shall be 2-inch or 3-inch duct tape or other waterproof tape suitable for joining poly seams and attaching poly sheeting to surfaces.

C. Spray adhesives shall be non-flammable and free of methylene chloride solvents.

D. Disposal bags shall be 6 mil where used for single-bagging, and minimum 4 mil where used for double-bagging.

E. Disposable suits, hoods, and foot coverings shall be TYVEK or similar.

PART 3 EXECUTION

3.01 PROTECTION OF PUBLIC AND CTA EMPLOYEES

A. Contractor shall occupy only such area as are designated by the Authority, and shall protect the public by use of proper barricades, warning signs, and such safety measures as will be effective.

3.02 ACCESSS TO THE SITE AND REMOVAL OF EQUIPMENT

A. The Contractor shall be responsible for the movement and transportation of his own materials, tools, and equipment to and from the work site.

B. Materials, tools, and equipment may be transported across the Authority's property, to the work site, at such points and under such regulations as the Authority may impose for protection of structures, landscaping, pavement, curbs, sidewalks, utilities, fences, and all other equipment located on or near the site of the work.

C. The Contractor shall remove surplus tools and equipment on a daily basis. Upon receiving notice from the Authority's representative that the work has been completed, Contractor shall immediately begin to remove all of his surplus and waste material. The Contractor shall also remove all remaining tools and equipment from the Authority's premises and shall have all of these items off the premises within two (2) days.

D. Should the Contractor or any Subcontractor fail to abide by these requirements, the Contractor agrees that the Authority may, at its discretion, remove said equipment from such locations as it may select and that the cost of such removal shall be deducted from amounts then due to the Contractor.

3.03 EXISTING CONDITIONS

A. The Authority and the Contractor shall agree in writing on building fixture condition prior to commencement of work. It shall be the Contractor's responsibility to replace or repair to the Authority's satisfaction any items identified as save or protect, prior to close-out of the project.

3.04 WORK AREA ISOLATION AND PREPARATION

A. General: Secure the work area from unauthorized persons. Close off the work site from other portions of the building by closing doors tightly, taping shut when necessary, or with 6 mil poly z-flap curtains over doorways or entrances to the worksite.

1. Furniture, personal items, and other moveable objects in the worksite shall be protected with 6 mil poly sheeting and sealed with tape, or moved from the work site and stored in a location designated by the Authority.

2. Turn off all forced air ventilation and seal exhaust and intake points in the worksite.

3. Cover all objects that cannot be moved, such as radiators, stoves, cabinets, built-in furniture, bookcases, or other stationary items with 6 mil plastic sheeting taped securely in place.

4. Cover floors in the work site with 6 mil plastic sheeting, sealed with tape.

B. Containment-The purpose of containment during remediation activities is to limit release of mold into the air and surrounds, in order to minimize the exposure to the Contractor and building occupants to mold. In, general, the size of the area helps determine the level of containment. However, a heavy growth of mold in a relatively small area could release more spores than a lighter growth of mold in a relatively large area. Choice of containment shall be at the discretion of the authority's Manager of Environmental Affairs or his/her designee. Two types of containment:

C. Limited Containment

1. Generally limited to areas involving 10 and 100 square feet of mold contamination.

2. The enclosure around the moldy area should consist of a single layer of 6-mil, fire retardant polyethylene sheeting.
3. For small areas, the polyethylene sheeting can be affixed to floor and ceiling using duct tape.
4. In large areas, a steel or wooden stud frame can be erected and polyethylene sheeting attached to it.
5. All supply and air vents, doors, chases, and risers within the containment area shall be sealed with polyethylene sheeting.
6. Heavy mold growth on ceiling tiles may impact HVAC systems if the space above the ceiling is used as a return air plenum. In this case, containment should be installed from the floor to the ceiling deck, and the filters in the air handing units serving the affected area shall be replaced once remediation is finished.
7. The containment shall be maintained under negative pressure relative to the surrounding areas.
8. A HEPA filtered fan unit exhausted out side of the building shall be used to maintain negative pressure. Or for small, easily contained areas, an exhaust fan ducted to the outdoors may be substituted.
9. The surfaces of all objects removed from the containment area should be remediated/cleaned prior to removal.
10. The remediation guideline outlined in Section 9.1 can be implemented when the containment is completely sealed and is under negative pressure.

D. Full Containment

1. Required for the cleanup of mold-contaminated surface areas greater than 100 square feet or in any situation in which it appears likely that the occupant space would be further contaminated without full containment.
2. Double layer of 6-mil polyethylene sheeting shall be used to create a barrier between the moldy area and other parts of the building.
3. The containment shall be maintained under negative pressure relative to the surrounding areas.
4. A decontamination chamber or airlock shall be constructed for egress into the remediation area.
5. The egress shall consist of an airlock with a slit entry with covering flaps (“z” flaps).
6. The airlock chamber shall be large enough to hold a waste container and allow personnel to put on or remove PPE.
7. All contaminated PPE, except respirators should be placed in a sealed bag while in airlock or decontamination chamber.
8. Respiratory protection shall be worn until personnel are outside the decontamination chamber.
9. PPE must be worn during HEPA vacuum filter changes or cleanup of the HEPA vacuum.

3.05 WORKER PROTECTION

A. It is Contractors responsibility to provide appropriate worker protection. At a minimum, worker protection shall be provided as following based on project size:

B. Total Surface Area Affected -Less Than 10 square feet
1. N-95 respirator
2. Gloves
3. Goggles

C. Total Surface Area Affected-Between 10 and 100 square feet

1. P-100 respirator or half-face respirator with HEPA filter
2. Disposable coveralls
3. Goggles/eye protection

D. Total Surface Area Affected Greater Than 100 square feet

1. Full-face powered air purifying respirator with HEPA filter
2. Disposable coveralls
3. Head gear
4. Foot coverings

E. Gloves-Required to protect the skin from contact with mold allergens (and in some cases mold toxins) and from potentially irritating cleaning solutions.

1. Long gloves that extend to the middle of the forearm shall be used.
2. Glove material shall be compatible with the material being handled.

F. Disposable Coveralls-Required for all projects greater than 10 square feet

1. Shall be constructed of a breathable impervious material such as TYVEK
2. Shall be constructed with head and foot coverings
3. All gaps, such as those around ankles and wrists shall be sealed (duct tape recommended).

3.06 MOLD MITIGATION

A. A variety of mold cleanup methods may be used for remediating damage to building materials and furnishings caused by moisture control problems and mold growth. The specific method or group of methods used will depend on the type of material affected. Contractor shall provide a mitigation plan for review and approval by the Authority as outlined herein.

B. The following are recommended methods for mold mitigation:

C. Wet Vacuum-Wet vacuums are vacuum cleaners designed to collect water

1. Can be used to remove water from floors, carpets, and hard surfaces where water has accumulated.
2. They should not be used to vacuum porous materials, such as gypsum board or ceiling tiles.
3. They should be used when materials are still wet-wet vacuums may spread spores if sufficient liquid is not present.
3. Tanks, hoses, and attachments of these vacuums should be thoroughly cleaned and dried after use.

D. Damp Wipe

1. Can be used to remove mold from nonporous surfaces.
2. Mold impacted area should be scrubbed with water and a disinfectant labeled for the removal of fungi and fungi spores. Concentrate disinfectant shall be mixed according to labeled instructions.
3. Cleaned areas should be dried quickly and thoroughly to discourage further mold growth.

E. HEPA (High-Efficiency Particulate Air) Vacuum

1. Recommended for final cleanup of remediation area after materials have been

thoroughly dried and contaminated materials removed.

2. Recommended for cleanup of dust that may have settled on surfaces outside the remediation area.
3. Care must be taken to assure that the filter is properly seated in the vacuum so that all the air must pass through the filter.
4. When changing the filter, Contractor shall wear PPE to prevent exposure to the mold that has been captured.
5. The filter and contents of the HEPA vacuum must be disposed of in a well-sealed bag.

F. Discard-Remove Damaged Materials and Seal in Plastic Bags

1. Building materials and furnishings that are contaminated with mold growth and are not salvageable should be double bagged using 6-mil polyethylene constructed bags or sheeting.
2. Discarded materials may be disposed as ordinary construction debris
3. Discarded materials shall be bagged prior to removal from containment area.
4. Large items that have heavy mold growth should be covered with polyethylene sheeting and sealed with duct tape before they are removed from the containment area.

3.07 STOPWORK

A. If the Authority or their representatives present a written stop order, immediately stop all work. Do not recommence work until authorized in writing by the Authority.

3.08 DISPOSAL

A. All mold-containing or mold-bearing wastes including building materials, fixtures, protective coverings used during the mold abatement, protective clothing used by workers performing the mold abatement and other contaminated materials shall be bagged and sealed in the area. This waste shall be transported from the site and disposed of at a landfill approved by the Authority.

B. Remove mold-containing or mold-bearing waste from the work site within 48 hours of its abatement or removal.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of MOLD ABATEMENT shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of MOLD ABATEMENT shall be included in the contract lump sum price as shown in the Schedule of Prices for STRUCTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Structural Work: 030000.

END OF SECTION

SECTION 03 20 10

CONCRETE REINFORCEMENT EPOXY COATED

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. The work under this Section shall consist of furnishing all labor, materials, and equipment required for furnishing, fabricating and placing reinforcement steel used in concrete slabs and structures, including bars, mesh, ties, supports, chairs, spacers, clips and all other appurtenant work. All reinforcing bars, mesh and accessories to be epoxy coated.

B. Related Sections: The following sections contain requirements that relate to this Section.

1. Division 03 Sections, Concrete
2. Section 03 30 00 – Cast-In-Place Concrete
3. Section 03 41 00 – Precast Concrete Platform
4. Section 04 80 00 – Unit Masonry

1.03 REFERENCES

A. Except as modified herein, the work shall conform to the applicable portions of the Standard Specifications. Where reference is made to one of the below standards, the version in effect at the time of bid opening shall apply.

B. American Society for Testing and Materials (ASTM)

1. ASTM A 36 – Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Steel Piling.
2. ASTM A 82 – Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
3. ASTM A 184 – Standard Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.
4. ASTM A 185 – Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.
5. ASTM A 307 – Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
6. ASTM A 615 – Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
7. ASTM A 706 – Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
8. ASTM A 743 – Specification for Castings, Iron-Chromium, Iron-Chromium-Nickel, Corrosion-Resistant, for General Application.
9. ASTM A 775 – Specification for Epoxy-Coated Reinforcing Steel Bars.
10. ASTM A 884 – Specification for Epoxy-Coated Steel Wire and Welded Wire Fabric for Reinforcement.
11. ASTM A 994 – Standard Test Method for Comparing Bond Strength of Reinforcing Bar to Concrete Using Beam-End Specimens.
12. ASTM A 1064 - Standard Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement.
13. ASTM D 3963 – Standard Specification for the Fabrication and Job Site Handling of Epoxy – Coated Reinforcing Steel Bars.

14. ASTM E 376 – Practice for Measuring Coating Thickness by Magnetic-Field or Eddy-Current (Electromagnetic)Test Methods.
15. ASTM F 1554 – Standard Specification for Anchor Bolts, Steel, 36, 55 and 105 ksi Yield Strength.

C. American Concrete Institute (ACI)

1. ACI 117 – Standard Specification for Tolerances for Concrete Construction and Materials.
2. ACI 301 – Standard Specification for Structural Concrete.
3. ACI 315 – Details and Detailing of Concrete Reinforcement.
4. ACI 318 – Building Code Requirements for Structural Concrete.
5. ACI SP-66 – ACI Detailing Manual.

D. Concrete Reinforcing Steel Institute (CRSI)

1. Manual of Standard Practice.

E. American Welding Society (AWS)

1. AWS D1.1 – Structural Welding Code-Steel.
2. AWS D1.4 – Structural Welding Code - Reinforcing Steel.
3. AWS D12.1 – Recommended Practices for Welding Reinforcing Steel Metal Inserts, and Connections in Reinforced Concrete Construction.

F. American Railway Engineering and Maintenance-of-Way Association AREMA Manual.

G. IDOT Standard Specifications for Road and Bridge Construction (hereafter referred to as the Standard Specifications)

1.04 SUBMITTALS

A. Prior to performing the work, the Contractor shall submit to the Authority, in accordance with Section 01 33 00, Submittal Procedures, a list of materials and product data for concrete reinforcement. Include all bars, mesh, and accessories.

B. Provide certified copies from the supplier indicating the grade of steel being furnished, and reports on mill tests for chemical analysis, tensile strength, and bend tests for reinforcing bars and welded wire fabric. The Contractor shall certify, in writing, that material supplied meets or exceeds specified requirements. Supplier of reinforcing to certify the grade of steel being supplied meets these requirements.

C. Contractor shall submit shop drawings showing materials of construction and installation details and spacing for concrete reinforcement; for review and approval. Include all bars, mesh and accessories.

D. Provide reinforcing steel placing drawings for each portion of the work.

1. All details, dimensions and information required for fabrication and placement of concrete reinforcement in accordance with Contract Documents, prepared in accordance with ACI 315 recommendations.
2. Elevations, plans, sections, and dimensions of concrete work with required reinforcement clearances.
3. Ledges, brackets, openings, sleeves, embedment's, electrical conduit and items of other trades including interference with reinforcing materials.
4. Sizes, grade designations, spacing, locations, and quantities of wire fabric reinforcing steel, temperature, and shrinkage reinforcement dowels.

a. Do not use dimensions scaled from Contract Drawings to determine bar lengths.
b. Hooks and bends not specifically dimensioned shall be detailed per ACI 318.

5. Bending and cutting schedules, assembly diagrams, splicing and connection requirements, details, and laps.
6. Each type of supporting and spacing devices, including miscellaneous accessories.
7. Construction joint type, details and locations.
8. Placement drawings of concrete accessories and embedded items, including fabrication details of items to be placed. Drawings shall consolidate the work of all trades and shall be coordinated by the Contractor.
9. Reproduction of structural drawings as shop drawings is not permitted.

E. Provide specifications for epoxy coating of reinforcing, mesh, and accessories. Provide certified copies of test results for epoxy coated reinforcing steel and accessories. The test reports shall indicate that the epoxy coating meets or exceeds ASTM A775 and ASTM D 3963. The certificates must be signed by the reinforcing fabricator or supplier and contain a detailed description of the material processed.

F. Provide data for materials to be used for epoxy-coated reinforcing repair. Include manufacturer's recommended materials and manufacturer's recommendations for the repair of epoxy-coated reinforcing.

G. If applicable, provide manufacturer's data for synthetic reinforcing fibers. Identify all placements that are to contain synthetic reinforcing fibers. The amount of fibers per cubic yard to be used for each placement shall be noted.

H. Where welding of rebar to other metal embeds is required, Welder qualifications shall be submitted for record. Note, welded rebar splices are not permitted.

I. Submit, for every epoxy bar or fabric delivery, an up to date copy of the epoxy coating fabrication plants CRSI epoxy coating plant certificate, that shows the plant is up to date and in good standing with the CRSI epoxy certification requirements.

1.05 FABRICATION, DELIVERY, STORAGE, AND HANDLING

A. Fabrication and handling of ECR shall be per ASTM D3963 and the Appendix of ASTM A775.

B. Epoxy Coated Reinforcing: Deliver, store, and handle epoxy coated reinforcing in a manner to protect the epoxy coating from damage and in accordance with accepted industry standard.

C. Reinforcing steel shall be shipped and stored with bars of the same size and shape fastened in bundles with durable tags, marked in legible manner with waterproof markings showing the same "mark" designations as those shown on the submitted Placing Drawings.

D. Reinforcing steel with more than 2% of its coated surface area damaged in any given 1 ft. section shall be rejected per ASTM D3963 and replaced satisfactorily coated bar.

E. Reinforcing steel with less than 2% of its coated surface area damaged in any given 1 ft. section shall be repaired with a two part epoxy material per the requirements ASTM D3963. A minimum of 7 mill dry film thickness of repair coating shall be provided.

F. Store epoxy coated reinforcing off the ground on suitable pads to prevent damage and to allow air circulation for the prevention of wet storage stain.

PART 2 – PRODUCTS

2.01 REINFORCING BARS, FABRIC AND ACCESSORIES

A. Epoxy-Coated Steel Reinforcement Bars: ASTM A615, Billet Steel Bars, Grade 60 all sizes, deformed and in accordance Section 1006.10 of the Standard Specifications. Bend epoxy coated bars by cold forming only; heated bending of coated bars not permitted. Repair damaged epoxy coating in accordance with ASTM A775.

B. Epoxy-Coated Welded Wire Fabric: ASTM A884 fabric and epoxy-coated in accordance with ASTM A775/A775M and Section 1006.10 of the Standard Specifications. Furnish in sheets rather than rolls.

C. Fabrication of reinforcement shall be in compliance with the CRSI Manual of Standard Practice and ACI 315 and ASTM A 143, A 384 and A 385, except as specified herein. Bars shall be cold bent. Avoid fabrication techniques that could cause distortion or embrittlement of steel. Bend bars before epoxy coating is applied to avoid damage to the epoxy coating. Bars shall not be straightened or re-bent.

D. Bar Supports, General: Provide bar supports and other accessories in accordance with CRSI "Recommended Practice for Placing Reinforcing Bars", unless otherwise specified. Provide support to hold reinforcing in proper position while concrete is being placed. Where used over moisture barriers in slabs on grade, provide precast concrete supports or other type supports having bearing sand plates to prevent damaging the moisture barrier.

E. Bar Supports and Accessories for Use with Epoxy-Coated Reinforcing: In addition to the general requirements for bar supports, comply with the following for use with epoxy-coated reinforcing.

1. Wire Supports: Coated with dielectric material such as epoxy or plastic, compatible with concrete, for a distance at least 2" from the point of contact with the epoxy- coated reinforcing bars.
2. Precast Concrete Block Supports: May be used for footing foundations and slabs- on-grade. Precast concrete blocks, if containing reinforcement, the metal reinforcement shall be coated with dielectric material such as epoxy, compatible with concrete.
3. Plastic Supports: All plastic assembly, dielectric, compatible with concrete.
4. Provide spreader bars, bar clips and spreaders, and other accessories coated with dielectric material such as epoxy compatible with concrete.

2.02 EPOXY COATING

A. Coating material shall be any one of the epoxy resin powders which have been prequalified by the National Bureau of Standards and approved by the Authority.

B. The coating applicator shall furnish to the Authority at the time of shipment written certification that the coated reinforcement bars were cleaned, coated and tested in accordance with the requirements of AASHTO M284 or ASTM A775 per the structure type.

C. Epoxy coated reinforcement bars shall be tied with plastic or epoxy coated annealed wires, 16 gage or heavier. No. 9 tie down wires shall be epoxy coated.

D. Bar supports shall conform to the “Bar Support Specifications” contained in “Manual of Standard Practice” as published by the Concrete Reinforcing Steel Institute and shall be Class C, Plastic Protected Bar Supports. Precast concrete block bar supports shall be used underneath bottom bars in foundations.

2.03 ACCESSORIES

A. Tie Wire:

1. Type: Minimum 16 gauge annealed steel wire, ASTM A 82.
2. Wire Bar Type: Comply with CRSI.

B. Splicing System:

1. Provide standard reinforcement splices by lapping ends, placing bars in contact, and tying tightly with wire in accordance with requirements of ACI 318 for minimum lap of spliced bars.
2. For mechanical tension and compression splices of reinforcing steel where specifically detailed on drawings, use Cadweld (C-series) splice, Dayton BAR-GRIP, NMB splice sleeve or Erico Lenton splices installed in strict compliance with manufacturer's requirements.
3. Tensile splicers shall be capable of developing 125% of the reinforcing steel ASTM specified minimum yield strength.
4. Compression splicers shall be the mechanical type such that the compression stress is transmitted by end bearing held in concentric contact.

C. Supports of Reinforcement:

1. Types: Bolsters, chairs, spacers, clips, chair bars, and other devices for properly placing, spacing, supporting, and fastening the reinforcement epoxy coated to match supported reinforcement.
2. For Contact with Forms: Use types with not less than 3/32" of plastic between metal and concrete surface. Plastic tips shall extend not less than ½" on metal legs.
3. Individual and continuous slab bolsters and chairs shall be of type to suit various conditions encountered and must be capable of supporting 300 pound load without damage or permanent distortion.
4. Unless otherwise indicated on drawings, bottom reinforcing bars in footings shall be supported by precast concrete bricks or individual high chairs with welded sand plates on bottom.
5. For Slabs on Grade: Use supports with sand plates or horizontal runners where base material will not support chair legs.

D. Adhesive Anchoring System for reinforcing dowels into existing concrete:

1. Acceptable products include but are not limited to: Adhesive for dowels in existing concrete shall be either EPCON C6+ Epoxy adhesive supplied by Red Head, HIT HY-200 injectable adhesive supplied by Hilti, Inc., Tulsa, Oklahoma, or Power-Fast Epoxy Injection Gel, supplied by Powers Rawl, Inc., New Rochelle, N.Y.
2. Engineered anchor system is specified on the General Notes of the Contract Drawings. Contractor shall provide calculations by a licensed structural engineer in the State of Illinois for alternate adhesive anchor system to show it is as good or better than the product specified on the drawings.

2.03 FABRICATION

A. Reinforcing Steel Fabrication:

1. Fabricate in accordance with approved shop drawings, ACI 315 and Contract Documents.
2. Bending and Straightening: Except for #3 dowel bars will not be permitted after partial embedment in concrete.
3. Heating of Reinforcement: Will be permitted only with specific prior approval of the Authority.

4. Welding: Comply with ANSI/AWS D1.4; use E9018 electrodes or approved electrodes.
5. Tolerances: Comply with ACI 117.
6. Unacceptable Materials: Reinforcement with any of following defects will not be permitted in Work.

    a. Bar lengths, depths, and bends exceeding ACI fabrication tolerances.
    b. Bends or kinks not indicated on Drawings or final shop drawings.
    c. Bars with reduced cross-section due to excessive rusting or other cause.

B. Welded Wire Fabric:

1. Type: As fabricated in accordance with CRSI, unless otherwise noted.

C. Templates:

1. Required for all footing and column dowels, and where required for proper alignment of reinforcing.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine the areas to receive the Work and the conditions under which the work will be performed. Contractor shall remedy conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

B. Surface condition, bending, spacing and tolerances of placement of reinforcement shall comply with the CRSI Manual of Standard Practice and ACI 301 and approved shop drawings. The Contractor shall be solely responsible for providing an adequate number of bars and maintaining the spacing and clearances shown on the approved shop drawings.

C. Comply with applicable portions of Section 420.09 and 420.10 of Standard Specifications for Road and Bridge Construction, Illinois Department of Transportation.

D. Prior to placing reinforcement, all grease, dirt, mortar and other foreign substances shall be removed from all surfaces of reinforcing.

3.02 PLACING REINFORCING BARS

A. General: Install and place reinforcing in accordance with approved reinforcing placement shop drawings, in accordance with “Manual of Standard Practice” as published by the Concrete Reinforcing Steel Institute.

B. Unless indicated otherwise, all reinforcing bars shall have at least 2 inches of protective concrete cover. Maintain the following surface clearance dimensions plus 1/4":

1. Concrete cast against and permanently exposed to earth, 3 inches.
2. Slabs on grade, 2 inches.
3. Concrete surfaces in contact with water or exposed to weather, 2 inches.
4. Concrete not exposed to earth, water or weather: 1 inch for slabs, 1 ½” for beams and columns.

C. Reinforcing bars shall extend 12 bar diameters but not less than 12” beyond bend unless noted otherwise.

D. Support and secure reinforcing with accessories and epoxy coated tie wire to prevent

displacement before and during concreting. Concrete shall not be poured if bars are not properly and securely placed with adequate supports.

E. Reinforcement bars shall be supported, as specified herein, and their distances from faces of forms shall be maintained by means of approved blocks or epoxy coated ties, hangers, or other supports.

F. Ties: Bars should be securely tied to prevent displacement during concreting operation with epoxy-coated tie wire, as required.

G. All bar bends and hooks shall be in accordance with ACI 318 unless indicated otherwise on the drawings.

H. No reinforcing steel bars shall be welded after being epoxy coated. No reinforcing steel bars shall be welded unless specifically shown on the Drawings, specified herein, or unless approved in writing by the Authority. All bars that have been welded, including tack welds, without such approval shall be immediately removed from the work. When welding of reinforcement is approved or called for, it shall comply with AWS D1.4.

I. Reinforcing steel interfering with the location of other reinforcing steel, conduits, or embedded items may be moved within the specified tolerances or one bar diameter, whichever is greater. Greater displacement of bars to avoid interference shall only be made with the approval of the Authority. Do not cut reinforcement to install inserts, conduits, mechanical openings or other items without the prior approval of the Authority.

J. Reinforcing steel bars shall not be field bent except where specifically authorized in writing by the Authority. If authorized, bars shall be cold-bent around the standard diameter spool specified in the CRSI. Attempt to bend without damaging the epoxy coating. Do not heat bars. Closely inspect the epoxy coating and reinforcing steel for breaks. If the epoxy coating or reinforcing steel is damaged, replace. Upon approval of the Authority, coated reinforcing steel bars that are field bent may have the damage to the epoxy coating repaired in accordance with the applicable ASTM Standard and applied per manufacturer's recommendations – a minimum of 7 mils dry film thickness shall be provided for repair. Do not bend reinforcement after it is embedded in concrete unless specifically shown otherwise on the Drawings

K. When coated reinforcing steel bars are cut in the field, the ends of the bars shall be coated with the same material used for repair of coating damage.

3.03 REINFORCEMENT AROUND OPENINGS

A. Unless specific additional reinforcement around openings is shown on the Drawings, provide additional reinforcing steel on each side of the opening equivalent to one half of the cross-sectional area of the reinforcing steel interrupted by an opening. Provide additional (2) #5's at mid slab depth at each corner of opening and at re-entrant corners. The additional bars shall have sufficient length to develop bond at each end beyond the opening or penetration.

3.04 ACCESSORIES

A. Determine, provide and install epoxy coated accessories such as chairs, chair bars and the like in sufficient quantities and strength to adequately support the reinforcement and prevent its displacement during the erection of the reinforcement and the placement of concrete.

B. Use precast concrete blocks where the reinforcing steel is to be supported over soil.

C. Stainless steel bar supports or epoxy coated steel chairs with stainless steel tips shall be used where the chairs are set on forms for a concrete surface that will be exposed to weather or water. Use of plastic tipped metal chairs is permissible in all other locations unless otherwise noted on the Drawings or specified herein.

3.05 SPLICES

A. Bar Splices: Bar splices shall be permitted only where shown on the drawings. Should the Contractor desire to splice bars at locations other those shown on the drawings, written permission must be obtained from the Authority. Such splices shall be distributed or located at points of low tensile stress. Splices shall not be permitted unless a minimum of two inches can be provided between the spliced bar and the nearest adjacent bar. All splices for bars shall be made by use of a mechanical connector or by placing the bars in contact and wiring them together for the length of the splice.

B. Lap Splices: All spliced bars shall have a minimum lap splice lengths as indicated on the drawings or longer as otherwise required by ACI standards or codes; ACI Standard Class B for Top/Bottom Bars. Where bars of different sizes lap, provide lap splice length for larger bar.

C. Provide standard reinforcement splices by lapping ends, placing bars in contact, and wiring tightly together.

D. Where dowels are indicated but not sized, provide dowels that match size and location of main reinforcement and lap splice with the main reinforcement.

E. Welded wire fabric shall be lapped at least eight inches, or one wire space, whichever is greater, at ends and edges as well as wired together.

3.06 INSPECTION

A. In no case shall any reinforcing steel be covered with concrete until the installation of the reinforcement, including the size, spacing and position of the reinforcement has been observed by the Authority and the Authority's release to proceed with the concreting has been obtained. The Authority shall be given ample prior notice of the readiness of placed reinforcement for observation. The forms shall be kept open until the Authority has finished observations of the reinforcing steel.

1. If the reinforcement is not placed according to the tolerances noted herein, the Authority shall require the Contractor to reposition the reinforcing.
2. All concrete placed in violation of this provision shall be rejected, removed and corrective work shall be at no cost to the Authority.

B. General: The Contractor's Testing Agency shall test and inspect concrete reinforcement and embedded assemblies as Work progresses. Failure to detect any defective work or material shall not in any way prevent later rejection when such defect is discovered nor shall it obligate the Authority for final acceptance.

3.07 REPAIR OF REINFORCEMENT COATING

A. General: Repair or remove and replace damaged epoxy coated reinforcing, as approved by the Authority.

B. Repair of Epoxy Coating:

1. Reinforcing steel with more than 2% of its coated surface area damaged in any given 1 ft. section will not be accepted approved with repairs.
2. Reinforcing steel with less than 2% of its coated surface area damaged in any given 1 ft. section shall be repaired with a two-part epoxy material conforming to the requirements ASTM D3963. A minimum of 7 mill dry film thickness of repair coating shall be provided.
3. Clean the surfaces and apply epoxy repair coating in accordance with coating manufacturer's recommendations.

4. Coat the cut ends, welds and mechanical splice devices regardless of the dimensions or area of the affected surface.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of CONCRETE REINFORCEMENT EPOXY COATED shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of CONCRETE REINFORCEMENT EPOXY COATED shall be included in the contract lump sum price as shown in the Schedule of Prices for STRUCTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Structural Work: 030000

END OF SECTION

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this section.

1.02 SUMMARY

A. This Section specifies requirements for cast-in-place concrete. The work under this Section shall consist of furnishing all labor, materials, and equipment required to provide and install the cast-in- place concrete structures shown on the drawings and including formwork, joint filler, isolation joint, water stops, embedded items, vapor retarder, concrete sealer and all other appurtenant work required to complete this work. The concrete work includes slabs on grade, structural slabs, concrete topping slab, concrete steps, concrete foundations, footings, piers and other concrete structures.

B. Furnish all sampling and testing as required for qualification of proposed materials and establishment of design mixes and performing field testing of all concrete by a qualified testing laboratory acceptable to the Authority and engaged by and at the expense of the Contractor.

C. Related Sections: The following sections contain requirements that relate to this Section.

1. Section 03 20 10 – Concrete Reinforcement Epoxy Coated
2. Section 03 41 00 – Precast Concrete Platform
3. Section 03 53 00 – Concrete Topping
4. Section 03 74 00 – Concrete Repairs

1.03 STANDARDS

A. Comply with provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified:

1. American Concrete Institute (ACI).
2. American Society for Testing and Materials (ASTM).
3. Illinois Department of Transportation (IDOT) Standard Specification for Road and Bridge Construction.

B. Where reference is made to one of the standards, the revision in effect at the time of bid opening shall apply.

1. ASTM C31 – Standard Practice for Making and Curing Concrete Test Specimens in the Field.
2. ASTM C33 – Standard Specification for Concrete Aggregates.
3. ASTM C39 – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
4. ASTM C42 – Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
5. ASTM C94 – Standard Specification for Ready-Mixed Concrete.
6. ASTM C143 – Standard Test Method for Slump of Hydraulic Cement Concrete.
7. ASTM C150 – Standard Specification for Portland Cement.
8. ASTM C156 – Standard Test Method for Water Retention by Concrete Curing Materials.
9. ASTM C171 – Standard Specification for Sheet Materials for Curing Concrete.

10. ASTM C172 – Practice for Sampling Freshly Mixed Concrete.
11. ASTM C173 – Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
12. ASTM C231 – Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
13. ASTM C260 – Standard Specification for Air-Entraining Admixtures for Concrete.
14. ASTM C309 – Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
15. ASTM C494 – Standard Specification for Chemical Admixtures for Concrete.
16. ASTM C618 – Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
17. ASTM C979 – Color Pigment for Concrete.
18. ASTM C1064 – Test Method for Temperature of Freshly Mixed Portland Cement Concrete.
19. ASTM E 303 – Standard Test Method for Measuring Surface Functional Properties Using the British Pendulum Tester.
20. ACI 117, "Standard Tolerances for Concrete Construction and Materials."
21. ACI 211.1, "Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete."
22. ACI 301, "Specifications for Structural Concrete for Buildings."
23. ACI 304, "Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete."
24. ACI 305, "Hot Weather Concreting."
25. ACI 306, "Cold Weather Concreting."
26. ACI 308, "Standard Practice for Curing Concrete."
27. ACI 309, "Standard Practice for Consolidation of Concrete."
28. ACI 318, "Building Code Requirements for Reinforced Concrete."
29. ACI 347, "Guide to Formwork for Concrete".

C. American National Standards Institute. (ANSI)

1. ANSI B 101.1 – Test Method for Measuring Wet Static Coefficient of Friction of Common Hard-Surface Floor Materials.
2. ANSI B 101.3 – Test Method for Measuring Wet Dynamic Coefficient of Friction of Common Hard-Surface Floor Materials.
3. ANSI A 326.3 – American National Standard Test Method for Measuring Dynamic Coefficient of Friction of Hard Surface Flooring Materials.

1.04 PERFORMANCE REQUIREMENTS

A. Concrete paving or floor walking surface test on samples of concrete slab with specified finish for the project.

1. Slip resistance: Test each concrete surface finish to be used for walking surfaces. Slip resistance tests must be performed by a qualified independent testing agency approved by the Authority and the tests to be done according to ANSI B 101.3, Test Method for Measuring Wet DCOF (Dynamic Coefficient of Friction) of Common Hard Surface Floor Materials using the BOT-3000E digital tribometer measuring device and/or according to ASTM E303 using the British pendulum tester. The test device and method to be as selected by and approved by the Authority.

1.05 SUBMITTALS

A. Submit the following, in accordance with Section 01 33 00, Submittal Procedures:

1. Sources of cement and aggregates.
2. Material Safety Data Sheets (MSDS) for all concrete components and admixtures.
3. Air-entraining admixture. Product data including catalogue cut, technical data, storage requirements, product life, recommended dosage, temperature

considerations, field testing methods and conformity to ASTM standards.

4. Water-reducing admixture (plasticizer). Product data including catalogue cut, technical data, storage requirements, product life, recommended dosage, temperature considerations and conformity to ASTM standards.
5. Accelerating/retarding admixtures. Product data including catalogue cut, technical data, storage requirements, product life, recommended dosage, temperature considerations and conformity to ASTM standards.
6. Concrete design mix for each formulation of concrete proposed for use including constituent quantities per cubic yard, water-cementitious materials ratio, concrete slump, type and manufacturer of cement. The mix design shall be signed and sealed by either an Illinois Professional Engineer or Structural Engineer. The mix designs shall specify weight and type of Portland Cement, fine aggregate, coarse aggregate, brand names and amounts of chemical admixtures, range of water content, range of slump and expected compressive strength for seven, fourteen and twenty-eight days. Provide the following for each mix proposed. Results are to be no older than 1 year from date of concrete pour.

    a. Compression test results for proposed mixes. Include standard deviation data for each proposed concrete mix based on statistical records where applicable.
    b. Curve of water-cementitious materials ratio versus concrete cylinder strength for each formulation of concrete proposed based on laboratory tests. The cylinder strength shall be the average of the 28 day cylinder strength test results for each mix. Provide results of 7 and 14 day tests if available.
    c. Fine aggregates – Test reports indicating conformity with ASTM standards, including sieve analysis, physical properties, and deleterious substance.
    d. Coarse aggregates – Test reports indicating conformity with ASTM standards, including sieve analysis, physical properties, and deleterious substances.
    e. Cements – Test reports indicating conformity with ASTM standards, including chemical analysis and physical properties for type.
    f. Contractor shall submit documentation from the concrete suppliers indicating previous experience with the proposed mix design.

7. Test report for coefficient of friction for concrete walking surface.
8. Sheet curing material. Product data including catalogue cut, technical data and conformity to ASTM standard.
9. Liquid curing compound. Product data including catalogue cut, technical data, storage requirements, product life, application rate and conformity to ASTM standards. Identify proposed locations of use.
10. Concrete sealer; sealer compound and slip resistant additive, if applicable; product data, specifications and instructions for application.
11. Concrete stain product data, specifications and instructions for application.

    a. Provide color charts for manufacturer's standard colors for Authority's selection and approval.

B. The Contractor shall provide the following for review and obtain approval: product data for materials and items including forming materials and accessories, form release agents, admixtures, patching compounds, bonding agents, joint systems, curing compounds and others as requested. Certify that each admixture is compatible with others used.

C. The Contractor shall submit formwork shop drawings and calculations for all structural concrete to the Authority for review with the exception of footings, piers, pier caps, walls, etc. that are less than six (6) feet tall and not directly adjacent to the tracks. The shop drawings shall indicate the fabrication, erection and support procedures for the formwork. The formwork shop drawings and structural calculations for the design of the formwork and formwork support shall be signed and sealed by an Illinois licensed structural engineer. Show form construction including jointing,

special form joints, location and pattern of form tie placement and other items that affect exposed concrete visually. The Contractor shall make modifications to the procedure if required, to obtain results that are satisfactory to the Authority, only after receiving approval in writing from the Authority.

1. Formwork design calculations are to have the following minimum requirements.

    a. All loads applied on the formwork must be identified and must have a load path thru the structure to a suitable foundation. All elements in the load path must be designed and detailed.
    b. Formwork to be designed per ACI 347-Guide to Formwork for Concrete.
    c. Tie splices are to have equal or greater capacity than the tie rods, i.e. coil ties splices are not to be used.
    d. Actual mix design needs to be used to calculate pressure on formwork.
    e. Actual concrete temperature (or colder temperature to be conservative) needs to be used to calculate pressure on formwork.
    f. Actual pour rate (or faster pour rate to be conservative) needs to be used to calculate pressure on formwork.
    g. In such case that the formwork is a prefabricated unit that has limits to the pressures it can support, the SE should provide the contractor with a maximum pour rate (or lower pour rate if dictated by the contractor) based on conservatively assumed temperature and mix design. Formwork system then to be designed based on a pour rate agreed to between the IL SE and the contractor.
    h. In such cases where formwork or accessories are proprietary, the design SE (or the independent SE as part of the independent review in part 4), as part of the calculation package shall provide documentation explaining that they have reviewed the analysis and/or testing verification done by the manufacturer and understand that they, by signing and sealing the calculation package with the proprietary products, are liable for any failures.

2. Formwork shop drawings are to have the following minimum requirements.

    a. They are to match the formwork calculations.
    b. Accessories not supplied by the formwork supplier and expected to be supplied by the Contractor need to be identified as such and called out with a product manufacturer, name and part number, or other such material specifications, to ensure the contractor purchases the same product that was designed by the formwork design Structural Engineer.
    c. Overlay rebar shop drawing information and other adjacent construction information at locations of potential conflict and coordinate a solution.
    d. If directly adjacent to tracks or road, show section to verify clearance with trains and/or vehicle traffic.
    e. Comply with Section 3.02.

3. The Contractor shall submit product data sheets, material certifications, etc. for accessories noted on the formwork shop drawings as not being supplied by the formwork supplier.

4. Formwork design calculations, shop drawings and product data submittals to be

reviewed by an Independent Structural Engineer, hired by the Contractor, and the review process is to have the following minimum requirements.

a. The Independent Structural Engineer reviewer, as a minimum, is to review the formwork calculations and shop drawings to ensure the formwork design Structural Engineer has addressed the minimum requirements for shop drawings and calculations as noted herein.
b. Formwork design Structural Engineer and Independent Structural Engineer to coordinate and come to a resolution on disagreements.
c. Once formwork design Structural Engineer and Independent Structural Engineer come to resolution on all disagreements, a final set of formwork shop drawings and calculations signed and sealed by the formwork design Structural Engineer are to be issued for construction to the Authority along with a signed and sealed letter from the Independent Structural Engineer noting that all of their concerns have been addressed with an attachment of itemized comments and resolution actions.

D. Provide material certificates in lieu of material laboratory test reports, when permitted. Certificates shall be signed by the manufacturer and Contractor, certifying that each material item complies with or exceeds specified requirements.

E. Provide delivery tickets for all ready-mixed concrete. Tickets to include the following information:

1. Significant times during the process such as start load, end load, leave plant, arrive job, begin pour and end pour.
2. Date
3. Truck number
4. Driver number
5. Total yards in truck
6. Total yards for order
7. Plant location
8. Delivery location
9. Mix number
10. Other items added to the mix prior to loading, during loading or after loading not already indicated in the approved mix design, including when it was added.

F. Provide batch reports for all ready-mixed concrete. Tickets to include the following information:

1. Significant times during the process such as batch time, start load, end load.
2. Date
3. Truck number
4. Driver number
5. Total yards in load
6. Plant location
7. Delivery location
8. Mix number
9. Description of all ingredients
10. Design quantities of all ingredients
11. Actual quantities of all ingredients
12. Total weight of load
13. Design w/c ratio
14 Actual w/c ratio
15. Percent moisture of aggregates

G. Provide product data, specifications, installation instructions, samples, shop drawings showing locations and installation details and other information for the following:

1. Cementitious materials.
2. Admixtures.
3. Form materials and form-release agents.
4. Steel reinforcement and accessories.
5. Fiber reinforcement.
6. Waterstops.
7. Curing compounds.
8. Floor and slab treatments.
9. Bonding agents.
10. Adhesives.
11. Vapor retarders.
12. Semirigid joint filler.
13. Joint-filler strips.
14. Repair materials.

H. Provide bonding agent product data including catalog cut, technical data and installation directions and recommendations.

I. Provide compatibility test results between adjacent sealants and curing and sealing materials.

J. As-Built requirements: Pursuant to Division One Section, Closeout Procedures, provide as-built drawings indicating actual locations and elevations of all foundations, foundation elements, openings and other features upon completion of the project.

K. Provide two copies of test reports from the Contractor's testing agency verifying concrete strength.

L. The Contractor shall submit a process plan for forming, placing, finishing and curing of all concrete to the Authority for review and approval. At a minimum, the process plan is to include the following:

1. A copy of all submittals associated with the process.
2. A copy of all checklists as noted in Section 3.13.

M. The Contractor shall coordinate the concrete slab work with the requirements for the installation of the specified finished floor for a complete adhered and warrantied floor system. The requirements shall be provided by the manufacturer and installer of the finish floor system.

1. Submit a process plan for installing and finishing the concrete slab in preparation for the installation of the specified finished floor.
2. Verify in writing that any additives to the concrete will not adversely affect the installation of the specified finished floor.
3. Verify in writing the type of finish (trowel, broom) is required for the specified finished floor.
4. Verify in writing the flatness ratio required for the specified finish floor and submit the actual flatness ratio upon completion.
5. Verify in writing the compatibility of using a floor sealer with the specified finish floor and the type of sealer recommended for use with the finished floor.
6. Verify in writing the maximum moisture content allowed for proper installation of the specified floor finish and provide test results indicating that the requirement has been met prior to beginning the finished floor installation.
7. Verify in writing the compatibility of any other bonding agent or topping proposed to be used in the floor system.

N. Submit the finished floor installer's written acceptance of the concrete floor slab prior to continuation of the floor system installation.

O. Concrete Finish Samples: Contractor to provide a 24" X 24" X 1.5" sample panel of concrete for each type of concrete finish to be provided for all vertical and horizontal surfaces.

1. Smooth concrete finish surfaces for vertical surfaces, interior floor slabs and other indicated exposed concrete surfaces.
2. Nonslip broom finish surfaces for walks, platforms, driveways, public areas of stationhouse floors and other indicated exposed concrete surfaces. Certify that the nonslip finish will achieve the required coefficient of friction.
3. Contractor to cut a 12" X 12" portion of each approved sample for delivery to the Authority's office; remaining portion for each approved sample to remain at the project site.
   Sample shall be retained for comparison with the actual completed surfaces.

P. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

C. Reinforced concrete shall comply with the latest ACI codes: ACI 301, Specification for Structural Concrete; ACI 304, Guide for Measuring, Mixing, Transporting, and Placing Concrete; ACI 311, ACI Concrete Inspection Manual; ACI 315, ACI Detailing Manual; ACI 318, Building Code and Commentary; and ACI 347, Guide to Formwork for Concrete. The most stringent requirement of the codes, standards, building codes and this Section shall apply when conflicts exist.

D. Only one source of cement and aggregates shall be used on any one structure. Concrete shall be uniform in color and appearance.

E. Testing of the following materials shall be furnished by Contractor to verify conformity with this Specification Section and the stated ASTM Standards.

1. Fine aggregates for conformity with ASTM C33 – sieve analysis, physical properties, and deleterious substances.
2. Coarse aggregates for conformity with ASTM C33 – sieve analysis, physical properties, and deleterious substances.
3. Cements for conformity with ASTM C150 – chemical analysis and physical properties.
4. Pozzolans for conformity with ASTM C618 – chemical analysis and physical properties.

F. Proportion mixes by either laboratory trial batch or field experience methods, using materials to be employed on the job for each type of concrete required, in compliance with ACI 318 (Chapter 4). In addition, documentation shall be provided demonstrating that the proposed concrete proportions will produce an average compressive strength at least 15% higher than the herein specified compressive strengths.

G. Use ready-mix concrete, complying with ASTM C94 and supplied by a ready-mix source which is inspected yearly by the Illinois Department of Transportation. Delivery tickets shall note the mix designation, admixtures, time dispatched, date, project number and Contractor and shall be submitted for review by the Authority.

H. Testing: Contractor shall arrange for and pay for an independent testing laboratory, approved by the Authority, to perform the following tests; providing a copy of all reports to the Authority for approval:

1. Concrete sampling for design mix, air content and slump.
2. Concrete cylinders for compression strength.

3. Backfill compaction testing.
4. Conduct specified Source Quality Control and Field Quality Control and submit reports for all concrete work.

I. Provide quality assurance according to Section 1020 of the IDOT Standard Specifications.

1.07 PROJECT CONDITIONS

A. Comply with manufacturer's written instructions for substrate temperature and moisture content, ambient temperature and humidity, ventilation, and other conditions affecting concrete performance.

B. Principal opening sizes and locations are indicated on the drawings. Additional smaller openings and sleeves may be required by other disciplines and shall be constructed according to details submitted to the Authority for approval.

1.08 COORDINATION

A. Coordinate work of this section with other subcontractors to verify required dimensions and locations including for inserts, anchors, anchor bolts, plates, conduit, and other items to be embedded in the concrete or installed with the concrete.

B. Coordinate the delivery of embedded items or items to be installed with the concrete so as to avoid delays to the installation of the new concrete work.

1.09 DELIVERY, STORAGE AND HANDLING

A. Cement: Store weathertight to provide protection from dampness and contamination.

B. Aggregate: Arrange and use stockpiles to avoid excessive segregation or contamination with other materials or with other sizes of like aggregates. Do not use frozen or partially frozen aggregate.

C. Sand: Arrange and use stockpiles to avoid contamination. Allow sand to drain to a uniform moisture content before using. Do not use frozen or partially frozen sand.

D. Admixtures: Store in closed containers to avoid contamination, evaporation or damage. Provide suitable agitating equipment to assure uniform dispersion of ingredients in admixture solutions which tend to separate. Protect liquid admixtures from freezing and other temperature changes which could adversely affect their characteristics.

E. Sheet Curing Materials: Store in weathertight buildings or off the ground and under cover.

F. Liquid Curing Compounds: Store in closed containers.

G. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 – PRODUCTS

2.01 CLASS SI CONCRETE

A. All concrete defined by this specification shall be Class SI Concrete having a compressive strength as shown on the drawings, or if not shown, as indicated herein, and conform to the requirements of Sections 503 and 1020 of the IDOT Standard Specifications.

B. Cement: Domestic Portland cement, Type I or II (Type III used only when high early strength

is needed and as approved by CTA), complying with ASTM C150.

C. Fine Aggregate: Washed inert natural sand conforming to the requirements of ASTM C33.

D. Coarse Aggregate: Maximum size aggregate shall be ¾ inch. Well-graded crushed stone or washed gravel conforming to the requirements of ASTM C33. Grading requirements shall be as listed in ASTM C33 for the specified coarse aggregate size number.

E. Water: Potable water free from injurious amounts of oils, acids, alkalis, salts, organic matter, or other deleterious substances.

F. Admixtures: Admixtures shall be free of chlorides and alkalis (except for those attributable to water). Each admixture shall be compatible with all of the components in the concrete mix and shall be suitable when it is required to use more than one admixture in a concrete mix. Admixtures shall be compatible with the concrete mix including other admixtures potable water after 30 days.

1. Air-Entraining Admixture: The admixture shall comply with ASTM C260. Proportioning and mixing shall be in accordance with manufacturer's recommendations.
2. Water-Reducing Agent: The admixture shall comply with ASTM C494, Type A. Proportioning and mixing shall be in accordance with manufacturer's recommendations.
3. Admixtures causing retarded or accelerated setting of concrete shall not be used without written approval from the Authority. When allowed, the admixtures shall be retarding or accelerating water reducing or high range water reducing admixtures.

G. The use of calcium chloride and other chloride containing agents is prohibited.

2.02 MIXES

A. Select proportions of ingredients to meet the design strength and materials limits specified and to produce concrete having proper placability, durability, strength, appearance and other required properties. Proportion ingredients to produce a homogenous mixture which will readily work into corners and angles of forms and around reinforcement without permitting materials to segregate or allowing excessive free water to collect on the surface.

B. Slump of the concrete shall be as measured by ASTM C143. If a high-range water reducer (plasticizer) is used, the slump indicated shall be that measured before plasticizer is added. Plasticized concrete shall have a slump ranging from 6- to 8-in.

C. Proportion admixtures according to the manufacturer's recommendations. Two or more admixtures specified may be used in the same mix provided that the admixtures in combination retain full efficiency and have no deleterious effect on the concrete or on the properties of each other.

D. Design mixes, when tested according to ASTM C 330, to be as indicated on the drawings, or if not indicated, provide normal weight structural concrete with 4000 psi at 28-day compressive strength, 0.44 maximum water-cement ratio for non-air-entrained concrete and 0.40 maximum for air-entrained concrete.

E. Slump Limits for Normal Weight Concrete: Proportion and design mixes to result in a concrete slump at point of placement of 4” to 6”; with superplasticizer the maximum concrete slump at point of deposit to be 6” to 8”,

F. Normal weight aggregates to conform to ASTM C 33 unless specified otherwise. Maximum aggregate size to be 3/4 inch.

G. Air Entraining Admixture: ASTM C 260; provide for exterior exposed concrete and as otherwise

required: 4-7%.

H. Water Reducing Admixture (Superplasticizer): ASTM C 494; provide for exterior exposed concrete and concrete with a water-cement ratio of 0.50 or less. Type as specified or approved by Authority. Type “A” water-reducing admixture, added in compliance with the manufacturer’s recommendations - with no reduction in the specified cement content. (Type “D” water-reducing admixture may be used in lieu of Type “A” during hot weather concreting).

I. Admixtures containing chlorides shall not be used in the concrete.

J. Fly ash shall be used conforming to Sections 1010 and 1020.05 of the IDOT Standard Specifications. When used, the fly content shall be no less than 15 percent nor more than 25 percent of the total cement, by weight

K. Adjustments to Concrete Mixes: Mix design adjustments may be requested when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, as accepted by the Authority. Laboratory test data for revised mix design and strength results must be submitted to and accepted by the Authority.

L. No other admixtures shall be added without written approval from the Authority. The use of calcium chloride and other chloride containing agents is prohibited. Additives such as accelerators, retarders, anti washout agents (AWA) may be used if approved by the Authority.

M. Concrete Stain: Apply stain to concrete after installation of slab according to stain manufacturer’s written instructions and to create results in hardened concrete color consistent with approved mockup.

2.03 READY MIXED CONCRETE

A. Provide ready mixed concrete in accordance with ASTM C94 and as specified. When air temperature is between 85 deg F (30 deg C) and 90 deg F (32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

1. If an approved high-range water-reducer (plasticizer) is used to produce plasticized concrete, the maximum time interval shall not exceed 90 minutes.
2. Do not use concrete in the work if it undergoes initial set or is not deposited within 90 minutes after the water is introduced. Do not add water to unworkable concrete at delivery end unless the testing laboratory accepts the procedure.

B. Provide an official ticket for each ready mix truck delivery indicating all pertinent data for that load.

2.04 FORMWORK MATERIAL

A. General: Forms to provide continuous, straight, smooth, exposed surfaces. Furnish forms in largest practicable sizes to minimize number of joints.

1. Where shown as “Architectural Finish” or where concrete will be exposed to view, provide only new MDO plywood faces.

B. Forms:

1. Either steel or wood, of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use forms that are straight and free to distortion and defects.

C. Wall Forms: Plywood, metal, or metal-framed plywood-faced to provide continuous, straight, smooth as-cast surfaces. Furnish in largest practicable sizes to minimize number of joints. Provide form material with sufficient thickness to withstand pressure of newly placed without bow or

deflection.

D. Wood Forms:

1. Finish No. 1 (for concealed below-grade concrete) exterior plywood B-B concrete form Class II PS-1-74.
2. Finish No. 2 (for smooth exposed concrete) exterior type, resin coated plywood, high density concrete form overlay, Class I, PS-I-74.

E. Form Ties: Factory-fabricated, adjustable-length, removable or snap-off metal form ties designed to prevent form deflection and to prevent spalling of concrete upon removal. Provide units that will leave no metal closer than 1-1/2 inches to the plane of the exposed concrete surface. Provide ties that, when removed, will leave holes not larger than 1 inch in diameter in the concrete surface.

F. Form release agent: A non-staining form release agent shall be used on all form work. Form release agent used shall not damage form liner.

2.05 WATERSTOP

A. Waterstop to be one of the following as shown on the drawings or as selected by the Authority,

B. Flexible Rubber Waterstops: CE CRD-C 513, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

1. Profile: Flat dumbbell with center bulb, Flat dumbbell without center bulb, Ribbed with center bulb, Ribbed without center bulb or as indicated.
2. Dimensions: 4 inches by 3/16 inch thick, 6 inches by 3/8 inch thick or 9 inches by 3/8 inch thick; nontapered.

C. Chemically Resistant Flexible Waterstops: Thermoplastic elastomer rubber waterstops, for embedding in concrete to prevent passage of fluids through joints; resistant to oils, solvents, and chemicals. Factory fabricate corners, intersections, and directional changes.

1. Profile: Flat dumbbell with center bulb, Flat dumbbell without center bulb, Ribbed with center bulb, Ribbed without center bulb or as indicated.
2. Dimensions: 4 inches by 3/16 inch thick, 6 inches by 3/16 inch thick, 6 inches by 3/8 inch thick, 9 inches by 3/16 inch thick or 9 inches by 3/8 inch thick; nontapered.

D. Flexible PVC Waterstops: CE CRD-C 572, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

1. Profile: Flat dumbbell with center bulb, Flat dumbbell without center bulb, Ribbed with center bulb, Ribbed without center bulb or as indicated.

2. Dimensions: 4 inches by 3/16 inch thick, 6 inches by 3/8 inch thick, 9 inches by 3/8 inch thick; nontapered.

E. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch.

F. Self-Expanding Rubber Strip Waterstops: Manufactured rectangular or trapezoidal strip, bentonite-free hydrophilic polymer-modified chloroprene rubber, for adhesive bonding to concrete, 3/8 by 3/4 inch.

G. Manufacturers, provide a waterstop manufactured by one of the following, subject to the requirements specified herein:

1. Durajoint.

2. JP Specialties, Inc.
3. Sika Greenstreak, Inc.
4. Warco.
5. Williams Products, Inc.
6. Approved equal.

2.06 JOINT FILLER

A. Expansion Joint Filler: Bituminous preformed joint filler conforming to ASTM D 1751. Strips to be full depth of concrete and 3/4" thick unless noted otherwise.

2.07 ISOLATION JOINT

A. Isolation joints are to be ½ inch wide.

B. Isolation joint material to be BASF expansion joint filler and Sonolastic SL-2 (or approved equal).

2.08 REINFORCING MATERIALS

A. Refer to Section 03 20 10, Concrete Reinforcement Epoxy Coated, of these specifications for concrete reinforcing materials.

2.09 CURING AND SEALING COMPOUNDS

A. Liquid Curing Compound: Liquid membrane-forming curing compound shall comply with the requirements of ASTM C309, Type 1-D (clear or translucent with fugitive dye) and shall contain no wax, paraffin, or oil. Curing compounds shall have a minimum of 18 percent solids, be non-yellowing and have a unit moisture loss no greater than 0.55 kg/m^2 in 72 hours as measured by ASTM C156.

B. Concrete Sealer: Silane based, odorless, colorless; that penetrates, hardens and densifies concrete surfaces and leaves a non-darkening film that protects the concrete surface from moisture, water, oil, grease, dirt, deicing salts and other contaminant penetration. Sealer must be compatible with any concrete admixtures, color stains, curing compounds, hardeners, and any other concrete treatments used. Sealer must meet current local VOC restrictions and be non-flammable.

1. Manufacturers of concrete sealers, concrete sealer compound and slip resistant additive that may be used for this project include, but not limited to, the following:
   a. BASF Chemical Company.
   b. ChemMasters.
   c. Custm Building Products, Aqua Mix Sealer's Choice Gold.
   d. H & C Concrete Coatings.
   e. Sika.
   f. SpecChem.
   g. TK Products.
   h. Approved Equal.

2. Concrete sealer for concrete that has been thoroughly cured and concrete has obtained a minimum of 80% its design strength (14-28 days):
   a. Provide Sikagard 705 L as manufactured by Sika or approved equal.

3. Slip Resistant Additive:
   a. Provide Surface Grip Slip Resistant Additive as manufactured by Spec Chem or an approved equal where indicated or as required to achieve the required coefficient of friction.

2.10 RELATED MATERIALS

A. Vapor Retarder: Provide vapor retarder that is resistant to deterioration when tested according to ASTM E154 such as polyethylene sheet not less than 6 mils thick.

B. Moisture Retaining Cover: One of the following:

1. Waterproof Paper: ASTM C 171
2. Polythene Sheeting: ASTM C 171
3. Polythene-coated Burlap: ASTM C 171

C. Slip resistant Additive: Slip resistant additive for the concrete sealer to improve the slip resistance of the sealer; for interior and exterior applications where indicated on the drawings, as required to achieve the required coefficient of friction and as approved by the Authority.

D. Aggregate for Non-Slip Finish: Fused aluminum oxide grits, or crushed emery, as abrasive aggregate for non-slip finish, with emery aggregate containing not less than 40% aluminum oxide and not less than 25% ferric oxide; for interior and exterior applications where indicated on the drawings, as required to achieve the required coefficient of friction and as approved by the Authority. Use material that is factory-graded, packaged, rustproof and non-glazing, and is unaffected by freezing, moisture and cleaning materials

E. Latex Bonding Agent: Provide Bonding Agent per manufacturer's recommendations when placing new cast-in-place concrete against existing concrete. Bonding Agent shall comply with ASTM C1059, Type II – exterior use.

F. Insulation: Extruded Polystyrene Board Insulation: Rigid cellular polystyrene thermal insulation with closed cells and integral high-density skin, formed by the expansion of polystyrene base resin in an extrusion process to comply with ASTM C 578, Type IV; in manufacturer's standard lengths and widths; thicknesses as indicated on drawings, or if not indicated, 1½".

1. Adhesive: Type recommended by insulation board manufacturer for application indicated.

PART 3 – EXECUTION

3.01 PREPARATION

A. Determine that subgrades, excavations, and other surfaces where concrete is to be placed are of proper bearing capacity, of solid material, undisturbed, of proper compaction if filled.

B. Determine that excavations are of proper size, at proper depth, and properly located.

C. Excavations and subgrades where concrete is to be placed must be clean and dry.

3.02 FORM CONSTRUCTION

A. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 and per approved submittals.

B. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:

1. Class A, 1/8 inch for smooth-formed finished surfaces.
2. Class B, 1/4 inch for rough-formed finished surfaces.

C. Forms shall be constructed so that the completed concrete structures conform to the shape, lines and

dimensions of the members as shown on the Drawings, within tolerances allowed by the Standard Specifications. They shall be properly braced or tied together to maintain position and shape. Forms shall be made sufficiently tight to prevent leakage of mortar. Provide for openings, offsets, recesses, chamfers, blocking, anchorages, inserts and other features required in the work. Provide for thickened slabs where shown or required of proper width and depth and provide required recesses in the slab. Maintain tolerances complying with ACI 347.

D. Design to be readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials.

E. Install sufficient lengths of forms to allow continuous progress of the Work and so forms can remain in place at least 24 hours after concrete placement.

F. Check completed formwork for grade and alignment to the following tolerances:

1. Top of Form Units: Not more than 1/8" in 10'.
2. Vertical Face: Longitudinal axis, not more than ¼" in 10'.

G. Clean forms after each use and re-coat as often as required to ensure separation from concrete without damage.

H. Place steel forms with ribs perpendicular to supports and secure with plug welds to each support using curved welding washers. Space welds at 12" o.c. Provide at least 2" for end laps occurring over supports and lap sides at least one corrugation.

I. Forms for Exposed Concrete:

1. Drill forms to suit ties used and to prevent leakage of concrete mortar around tie holes. Do not splinter forms by driving ties through improperly prepared holes.
2. Do not use metal cover plates for patching holes or defects in forms.
3. Provide sharp, clean corners at intersecting planes, without visible edges or offsets. Back joints with extra studs or grits to maintain true, square intersections.
4. Use extra studs, walers and bracing to prevent bowing of forms between studs and to avoid bowed appearance in concrete. Do not use narrow strips of form material which will produce a bow.
5. Assemble forms so they may be readily removed without damage to exposed concrete surfaces.
6. Form molding shapes, recesses and projections with smooth-finish materials and install in forms with sealed joints to prevent displacement.

J. Provide openings in concrete formwork to accommodate work of other trades. Coordinate with all other trades.

K. Forms and adjacent surfaces to receive concrete to be clean and free of old concrete, grease and debris.

L. The formwork shall be removed when the concrete is strong enough to withstand any applied forces and permission has been obtained from the Authority.

M. Form ties shall be non-exposed cone type and shall be spaced as shown on the drawings or as approved by the Authority. All cones shall be filled with concrete after removal of the formwork.

N. The Contractor is required to use a surveyor to properly locate the formwork, including elevations.

O. The Contractor shall use smooth surfaced forms with tight joints for any concrete work that will remain exposed to view, either partially or fully; as determined prior to installation of the forms.

P. Coat contact surfaces of forms with form-release agent, according to manufacturer's written

instructions, before placing reinforcement.

3.03 PLACING REINFORCEMENT

A. See Section 03 20 10, Concrete Reinforcement Epoxy Coated. Reinforcement to be clean and free of rust, scale, dirt, and ice. Accurately position, support, and secure reinforcement. Place reinforcement to maintain minimum coverages for concrete protection. Install bars and welded fabric in longest lengths practicable, lapping at all splices. Offset laps to prevent continuous laps in either direction.

B. Reinforcement shall have the following minimum cover, unless noted otherwise:

1. Surfaces not formed: 3 inches.
2. Formed surfaces in contact with soil or water: 3 inches.
3. Formed surfaces not in contact with soil or water: 2 inches.

C. Corner bars matching interior and exterior wall face horizontal bars shall be provided at all wall intersections. See drawings.

D. Grouted reinforcing anchors shall be Hilti HY-150 Max. Adhesive or an equal system approved by the Authority.

E. The Contractor is to notify the Authority when reinforcement bars are installed. Placement of concrete shall not commence until the Authority has inspected and approved the reinforcement placement.

3.04 JOINTS

A. Construction Joints: Locate and install construction joints as shown on the drawings or so they do not impair the strength or appearance of the structure, as acceptable to the Authority.

B. Provide keyways at least 1-1/2 inches deep in construction joints between walls and footings. Bulkheads designed and accepted for this purpose may be used for slabs.

C. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints except as indicated otherwise. Do not continue reinforcement through sides of strip placements.

D. Use bonding agent on existing concrete surfaces that will be joined with fresh concrete.

E. Isolation joints between new concrete and existing concrete, shall be filled with a premolded joint filler and sealing compound.

F. Only those construction joints shown on the drawings will be allowed unless approved otherwise by the Authority.

G. Control Joints. Depth to be T/4, min 1”, spaced at 15’ o.c. max. with a max aspect ratio of 1.5:1, unless otherwise noted on the drawings.

3.05 EXPANSION JOINTS

A. Provide expansion joints at all intersections with other slabs, at existing elements, vertical surfaces, at abutments with other structures, and at other locations where indicated or required. Expansion joints to be 3/4” unless noted otherwise. Expansion joints to be continuous and for the full depth of the concrete except for space for sealant.

3.06 ISOLATION JOINTS

A. Provide isolation joints where shown or required. Isolation joints to be 1/2” unless noted

otherwise. Isolation joints to be continuous and for the full depth of the concrete except for a ¼" space for sealant.

3.07 WATERSTOPS

A. Install waterstops where shown or required to form a continuous diaphragm. Install in longest lengths practical. Support and protect exposed waterstops during progress of the work. Field fabricate joints in waterstops by sealing according to manufacturer's written instructions.

B. Waterstops shall be secured in place by splitting the concrete form. The center bulb shall be centered in the joint. While concrete is being placed the concrete shall be thoroughly vibrated to insure complete embedment of the ribbed flanges.

3.08 VAPOR RETARDER

A. Place vapor retarder under concrete slabs and other at- or below-grade applications. Use largest available sheets. Overlap edges and seal as recommended by manufacturer.

3.09 INSTALLING EMBEDDED ITEMS

A. General: Set and build into formwork anchorage devices and other embedded items required for other work that is attached to or supported by cast-in-place concrete. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached.

B. All exposed concrete corners shall be broken with a 3/4" x 3/4" chamfer or should match existing or adjacent work.

C. Place steel plates, angles, anchor bolts, plate and nelson stud assemblies, etc. as shown into concrete before it sets. Position embedded anchor bolts using templates.

D. Unless otherwise shown or approved, conduits and pipes embedded within a slab, wall or beam shall have a maximum outside dimension no greater than one third the overall thickness of the slab, wall or beam; and spacing shall be greater than or equal to three diameters or widths on center.

E. Provide continuous water stops at each construction joint of any concrete element exposed to soil or water below grade. Provide a 1 ½ inch by 3 ½ inch continuous key at each joint requiring water stops.

F. Electrical and communication conduits shall not be placed in concrete without prior approval by the Authority.

3.10 PREPARING FORM SURFACES

A. General: Coat contact surfaces of forms with an approved, nonresidual, low-VOC, form-coating compound before placing reinforcement.

B. Do not allow excess form-coating material to accumulate in forms or come into contact with in-place concrete surfaces against which fresh concrete will be placed. Apply according to manufacturer's instructions.

C. All exposed concrete edges shall have a ¾ inch chamfer.

3.11 MEASURING MATERIALS

A. Concrete shall be composed of portland cement, fine aggregate, coarse aggregate, water and admixtures as specified and shall be produced by a concrete mixing plant acceptable to the Authority. All constituents, including admixtures, shall be batched at the plant.

B. Measure materials for batching concrete by weighing in conformity with and within the tolerances given in ASTM C94 except as otherwise specified.

C. Measure the amount of free water in fine aggregates within 0.3 percent with a moisture meter. Compensate for varying moisture contents of fine aggregates. Record the number of gallons of water as-batched on printed batching tickets.

3.12 MIXING AND TRANSPORTING

A. Concrete shall be ready-mixed concrete; no hand-mixing will be permitted. Clean each transit mix truck drum and reverse drum rotation before the truck proceeds under the batching plant. Equip each transit-mix truck with a continuous, nonreversible, revolution counter showing the number of revolutions at mixing speeds.

B. Ready-mix concrete shall be transported to the site in watertight agitator or mixer trucks loaded not in excess of their rated capacities as stated on the name plate.

C. Keep the water tank valve on each transit truck locked at all times. Any addition of water must be directed by the Authority. Added water shall be incorporated by additional mixing of at least 35 revolutions. All added water shall be metered and the amount of water added shall be shown on each delivery ticket.

D. All central plant and rolling stock equipment and methods shall comply with ACI 318 and ASTM C94.

E. Select equipment of size and design to ensure continuous flow of concrete at the delivery end. Metal or metal-lined non-aluminum discharge chutes shall be used and shall have slopes not exceeding 1 vertical to 2 horizontal and not less than 1 vertical to 3 horizontal. Chutes more than 20 feet long and chutes not meeting slope requirements may be used if concrete is discharged into a hopper before distribution.

F. Retempering (mixing with or without additional cement, aggregate, or water) of concrete or mortar which has reached initial set will not be permitted.

G. Handle concrete from mixer to placement as quickly as practicable while providing concrete of required quality in the placement area. Dispatch trucks from the batching plant so they arrive at the work site just before the concrete is required, thus avoiding excessive mixing of concrete while waiting or delays in placing successive layers of concrete in the forms.

H. Furnish a delivery ticket for ready mixed concrete to the Authority as each truck arrives. Each ticket shall provide a printed record of the weight of cement and each aggregate as batched individually. Use the type of indicator that returns to zero after a batch is discharged. Clearly indicate the weight of fine and coarse aggregate, cement and water in each batch, the quantity delivered, the time any water is added, and the numerical sequence of the delivery. Show the time of day batched and time of discharge from the truck. Indicate the number of revolutions of the truck mixer.

I. Temperature and Mixing Time Control:

1. In cold weather, do not allow the as-mixed temperature of the concrete and concrete temperatures at the time of placement in the forms to drop below 40 degrees F.
2. If water or aggregate has been heated, combine water with aggregate in the mixer before cement is added. Do not add cement to mixtures of water and aggregate when the temperature of the mixture is greater than 90 degrees F.
3. In hot weather, cool ingredients before mixing to maintain temperature of the concrete below the maximum placing temperature of 90 degrees F. If necessary, substitute well-crushed ice for all or part of the mixing water.

J. The maximum time interval between the addition of mixing water and/or cement to the batch and the placing of concrete in the forms with concrete agitated shall not exceed the following:

1. If the air or concrete temperature (whichever is higher) is between 80 to 90 Degree F, the maximum time shall not exceed 45 minutes.
2. If the air or concrete temperature (whichever is higher) is between 70 to 79 Degree F, the maximum time shall not exceed 60 minutes.
3. If the air or concrete temperature (whichever is higher) is between 40 to 69 Degree F, the maximum time shall not exceed 90 minutes.

If an approved high-range water-reducer (plasticizer) is used to produce plasticized concrete, the maximum time interval shall not exceed 90 minutes.

K. Concrete Stain: Apply concrete stain to installed cured concrete according to manufacturer's written instructions for areas to receive stained concrete. Verify locations for color concrete. Concrete to be stained to be clean, dry and cured. Mix stain and apply as directed by manufacturer. Follow manufacturer's recommendations for installation

3.13 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other trades to permit installation of their work. Concrete shall not be placed until Contractor and Construction Manager complete each of their checklists.

1. Formwork inspection check list to have the following minimum requirements.

   a. Formwork is installed per most recent shop drawings and Section 3.02.
   b. If formwork was modified, verify it was approved by formwork design structural engineer and 3rd party structural engineer.
   c. Concrete temperature is at or above design temperature.
   d. Concrete crew is to be notified of the maximum pour rate that is allowed per design.
   e. Concrete mix being used matches design mix.
   f. Verify maximum pour rate is not exceeded.

2. Concrete inspection check list to have the following minimum requirements:

   a. Rebar sizes and quantities are verified with most recently approved shops.
   b. Rebar spacing, clearances and concrete cover is verified with most recently approved shop drawings and design drawings.
   c. All defects in epoxy coating have been repaired per specifications.
   d. All steel and miscellaneous structural embeds are verified installed per most recently approved shop drawings and design drawings.
   e. All MEP and all other non-structural embeds are verified installed per most recently approved shop drawings and design drawings.
   f. Verify that dowels extending out of formwork will not interfere with future work, i.e., pipe sleeves or other formwork.
   g. Hot/cold weather measures are in place per specifications.
   h. Verify all items inside of pour area are supported adequately to avoid displacement during concrete placement.
   i. Equipment and accessories are in place for proper finishing, curing and jointing.

B. No concrete shall be placed without 24-hour advance notice to the Authority nor before the formwork and setting of reinforcement has been inspected and approved by the Authority.

C. General: Comply with ACI 304,"Guide for Measuring, Mixing, Transporting, and Placing Concrete," and as specified.

D. Verify that all formwork completely encloses concrete to be placed and is securely braced prior to concrete placement. Remove ice, excess water, dirt and other foreign materials from forms and exposed concrete joints. Voids in sleeves, inserts, etc., shall be filled temporarily with readily removable material to prevent entry of concrete. Confirm that reinforcement and other embedded items are securely in place. Have a competent workman at the location of the placement who can assure that reinforcing steel and embedded items remain in designated locations while concrete is being placed. Sprinkle semi-porous subgrades or forms to eliminate suction of water from the mix. Seal extremely porous subgrades in an approved manner.

E. Deposit concrete as near its final position as possible to avoid segregation due to rehandling or flowing. Place concrete continuously at a rate which ensures the concrete is being integrated with fresh plastic concrete. Do not deposit concrete which has partially hardened or has been contaminated by foreign materials or on concrete which has hardened sufficiently to cause formation of seams or planes of weakness within the section. If the section cannot be placed continuously, place construction joints as specified or as approved.

F. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers no deeper than 24 inches and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid coldjoints.

1. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete complying with ACI 309.
2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the machine. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix to segregate.

G. Pumping of concrete will be permitted. Use a mix design and aggregate sizes suitable for pumping and submit for approval.

H. Remove temporary spreaders from forms when the spreader is no longer useful. Temporary spreaders may remain embedded in concrete only when made of galvanized metal or concrete and if prior approval has been obtained.

I. Do not place concrete for supported elements until concrete previously placed in the supporting element (columns, slabs and/or walls) has reached adequate strength.

J. Where surface mortar is to form the base of a finish, especially surfaces designated to be painted, work coarse aggregate back from forms with a suitable tool to bring the full surface of the mortar against the form. Prevent the formation of excessive surface voids.

K. All exposed concrete edges shall have a ¾ inch chamfer.

L. Provide concrete footings, walls, slabs, steps, pits, thickened slabs, piers for light poles and bollards, and other concrete installations as shown on the drawings. Form and provide for pockets for rails, trench drains, and drop concrete at doors as shown on the drawings. Provide dowels where new concrete meets existing as detailed on the drawings.

3.14 COLD WEATHER CONCRETING:

A. "Cold weather" is defined as a period when for more than 3 successive days, the average daily outdoor temperature drops below 40 degrees F. The average daily temperature shall be calculated as the average of the highest and the lowest temperature during the period from midnight to midnight.

B. Cold weather concreting shall conform to ACI 306.1 and with the applicable provisions of the Standard Specifications. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

C. Discuss a cold weather work plan with the Authority. The discussion shall encompass the methods and procedures proposed for use during cold weather including the production, transportation, placement, protection, curing and temperature monitoring of the concrete. The procedures to be implemented upon abrupt changes in weather conditions or equipment failures shall also be discussed. Cold weather concreting shall not begin until the work plan is acceptable to the Authority.

D. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.

1. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
2. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.

E. During periods of cold weather, concrete shall be protected to provide continuous warm, moist curing (with supplementary heat when required) for a total of at least 350 degree-days of curing.

1. Degree-days are defined as the total number of 24 hour periods multiplied by the weighted average daily air temperature at the surface of the concrete (e.g., 5 days at an average 70 degrees F = 350 degree-days).
2. To calculate the weighted average daily air temperature, sum hourly measurements of the air temperature in the shade at the surface of the concrete taking any measurement less than 50 degrees F as 0 degrees F. Divide the sum thus calculated by 24 to obtain the weighted average temperature for that day.

F. Salt, manure or other chemicals shall not be used for protection.

G. The protection period for concrete being water cured shall not be terminated during cold weather until at least 24 hours after water curing has been terminated.

3.15 HOT WEATHER CONCRETING

A. "Hot weather" is defined as any combination of high air temperatures, low relative humidity and wind velocity which produces a rate of evaporation estimated in accordance with ACI 305R, approaching or exceeding 0.2 lbs/sqft/hr.

B. Concrete placed during hot weather, shall be batched, delivered, placed, cured and protected in compliance with the recommendations of ACI 305 and the additional requirements specified herein.

C. Temperature of concrete being placed shall not exceed 90 degrees F and every effort shall be made to maintain a uniform concrete mix temperature below this level. The temperature of the concrete shall be such that it will cause no difficulties from loss of slump, flash set or cold joints.

D. All necessary precautions shall be taken to promptly deliver, to promptly place the concrete upon its arrival at the site and to provide vibration immediately after placement.

E. The Authority may direct the Contractor to immediately cover plastic concrete with sheet material.

F. Discuss with the Authority a work plan describing the methods and procedures proposed to use for concrete placement and curing during hot weather periods. Hot weather concreting shall not begin until the work plan is acceptable to the Authority.

G. Hot-Weather Placement:

1. Cool ingredients before mixing to maintain concrete temperature at time of placement to below 90 deg F (32 deg C). Mixing water may be chilled or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedding in concrete.
3. Fog spray forms, reinforcing steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without puddles or dry areas.
4. Use water-reducing retarding admixture when required by high temperatures, low humidity, or other adverse placing conditions, as acceptable to Authority.

H. Do not apply unbalanced loads, such as hydrostatic pressure or backfill against structural components until the concrete has attained its design strength.

3.16 CONCRETE STAIRS

A. Pitch stair treads and landings for drainage purposes. Use minimum slope of 0.1% without reducing the thickness of the stair slabs and landings.

3.17 SLABS

A. After suitable bulkheads, screeds and jointing materials have been positioned, the concrete shall be placed continuously between construction joints beginning at a bulkhead, edge form, or corner. Each batch shall be placed into the edge of the previously placed concrete to avoid stone pockets and segregation.

B. Avoid delays in casting. If there is a delay in casting, the concrete placed after the delay shall be thoroughly spaded and consolidated at the edge of that previously placed to avoid cold joints. Concrete shall then be brought to correct level and struck off with a straightedge. Bullfloats or darbies shall be used to smooth the surface, leaving it free of humps or hollows.

C. Provide tape or other approved means to separate between concrete slab that is to be stained and concrete slab that is to remain natural. Lay out straight and even joints. Verify and set dimensions and locations for extent of stained concrete.

D. All new slabs shall be placed on minimum 6” engineered fill compacted to 95% relative density.

3.18 COMPACTING FORMED CONCRETE

A. Consolidate concrete by mechanical vibration, puddling, spading, rodding or forking so that concrete is thoroughly worked around reinforcement, embedded items and openings and into corners of forms. Puddling, spading, etc., shall be continuously performed along with vibration of the placement to eliminate air or stone pockets which may cause honeycombing, pitting or planes of weakness.

B. Vibrators are to be used to consolidate properly placed concrete but shall not be used to move or

transport concrete in the forms. Vibration shall continue until:

1. Frequency returns to normal.
2. Surface appears liquefied, flattened and glistening.
3. Trapped air ceases to rise.
4. Coarse aggregate has blended into surface, but has not disappeared.

3.19 FINISHING FORMED SURFACES

A. Rough-Formed Finish:

1. Provide as-cast rough-formed finish to formed concrete surfaces that are not exposed to view in the finished work or to be concealed in the finished work by other construction.
2. Standard rough-formed finish shall be the concrete surface having the texture impated by the form facing material used, with tie holes and defective areas repaired and patched and all fins and other projections exceeding ¼" in height rubbed down or chipped off.

B. Smooth-Formed Finish:

1. Provide as-cast smooth form finish for formed concrete surfaces that are to receive further finishing or that are to be covered with a coating material applied directly to the concrete, or a covering material bonded to the concrete (such as waterproofing).
2. Produce smooth form finish by selecting form material to impact a smooth, hard, uniform texture and arranging them orderly and symmetrical with a minimum of seams. Fill tie holes, repair and patch defective areas and rub down fins.

C. Smooth Rubbed Finish:

1. Provide smooth rubbed finish on exposed to view concrete surfaces not later than the day after form removal.
2. Produce smooth form finish by selecting form material to impart a smooth, hard, uniform texture and arranging them orderly and symmetrical with a minimum of seams. Fill the holes, repair and patch defective areas and rub down fins.
3. Moisten concrete surfaces and rub with carborundum brick or other abrasive until a uniform color and texture is produced. Do not apply cement grout other than that created by the rubbing process.

D. Architectural Finish: Brush off abrasive blast smooth form finish to obtain uniform light exposure or aggregate.

E. Related Unformed Surfaces: At tops of walls, horizontal offsets and similar unformed surfaces occurring adjacent to formed surfaces, strike off smooth and finish with a texture matching the adjacent formed surfaces. Continue the final surface treatment of formed surfaces uniformly across the adjacent unformed surfaces.

3.20 MONOLITHIC SLAB FINISHES

A. Unless noted otherwise, concrete slabs to be 6" thick and reinforced with wire mesh. Provide vapor barrier under slab unless indicated otherwise.

B. Pitch slabs to drains where drains are indicated without reducing the thickness of the slab. Minimum slope is 0.1%. Provide recesses or drop top of slab as required for finish floor materials. Verify locations.

C. Scratch Finish: While still plastic, texture concrete surface that has been screeded or bull-floated or darbied. Use stiff brushes, brooms or rakes to produce a profile amplitude of ¼ inch in one direction.

1. Apply scratch finish to surfaces to receive concrete floor toppings, to receive mortar

setting beds for bonded cementitious floor finishes or where otherwise indicated on the drawings.

D. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as specified.

1. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared and concrete has sufficiently stiffened. Finish surfaces to tolerances of F(F) 18 (floor flatness) and F(L) 15 (floor levelness) measured according to ASTM E 1155. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.
2. Water is never to be added to surface of concrete to assist in finishing process.

E. Trowel Finish: Apply a trowel finish to monolithic slab surfaces exposed to view.

1. After floating, begin troweling operation, free of trowel marks, uniform in texture and appearance, and finish surfaces to tolerances of F(F) 20 (floor flatness) and F(L) 17 (floor levelness) measured according to ASTM E 1155. Grind smooth any surface defects.

F. Coefficient of Friction: All interior and exterior floors or walking surfaces shall be finished or treated to provide the required slip resistant coefficient of friction:

1. Slip Resistance: Concrete walking surface to have a minimum value of 0.42 DCOF measured with the BOT-3000E and using a 0.05% SLS water solution per the specified test method.
2. Coefficient of friction shall be measured after the application of any sealants or other coatings.
3. Contractor to provide a sample panel of broom finish and/or non-slip aggregate finish for Authority's review and approval in accordance with the requirements of the submittal section of these specifications.
4. Contractor to provide test results indicating that the required coefficient of friction has been achieved. Test to be paid for by the Contractor, testing agency and test method to be approved by the Authority and test location(s) to be as directed by the Authority.

G. Nonslip Broom Finish: Apply a nonslip broom finish to concrete walks, platforms, stair treads, ramps, driveways, floors and elsewhere as indicated on the drawings.

1. Immediately after float finishing, slightly roughen concrete surface by brooming perpendicular to main traffic route.
2. Use a Marshall Town extra fine horse hair broom or a similar broom approved by the Authority.
3. Nonslip Broom Finish to match approved sample and provide the required slip resistant coefficient of friction.

H. Sawing of control joints shall commence as soon as the concrete has hardened sufficiently to permit sawing without excessive raveling and no later than 12 hours after concrete is poured. All joints shall be a minimum of one inch deep and sawed to the length shown on the drawing before uncontrolled shrinkage cracking takes place.

3.21 NON-SLIP AGGREGATE FINISH

A. Apply non-slip aggregate finish to concrete stair treads, platforms, ramps, and elsewhere where shown on the drawings.

B. After completion of float finishing, and before starting trowel finish, uniformly spread 25 lbs. of dampened non-slip aggregate per 100 sq. ft. of surface. Tamp aggregate flush with the surface using a steel trowel, but do not force the non-slip aggregate particles below the surface. After broadcasting and tamping, apply trowel finishing as herein specified.

C. After curing, lightly work the surface with a steel wire brush, or an abrasive stone, and water to expose the non-slip aggregate.

D. Non-slip aggregate finish to match approved sample and provide the required slip resistant coefficient of friction.

3.22 CONCRETE CURING AND PROTECTION

A. Curing shall be in accordance with the applicable portions of Section 1020.13 of the IDOT Standard Specifications. Concrete floor slabs to be cured per IDOT Standard Specifications section 1020.13.a.5 for 3 days.

B. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. In hot, dry, and windy weather protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material.

C. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 7 days.

D. Curing Methods: Cure concrete by curing compound, by moist curing, by moisture-retaining cover curing, or by combining these methods, as specified.

1. Water Curing: Provide water curing by continuous water-fog spray or cover concrete surface with approved absorptive cover and thoroughly saturate cover with water. Begin wet cure as soon as concrete attains an initial set and maintain wet cure 24 hours a day for 3 continuous days
2. Sheet Material Curing: Cover entire surface with sheet material. Securely anchor sheeting to prevent wind and air from lifting the sheeting or entrapping air under the sheet. Place and secure sheet as soon as initial concrete set occurs.
3. Liquid Membrane Curing: Apply over the entire concrete surface except for surfaces to receive additional concrete. Curing compound shall NOT be placed on any concrete surface where additional concrete is to be placed, where concrete sealers or surface coatings are to be used, or where the concrete finish requires an integral floor product. Curing compound shall be applied as soon as the free water on the surface has disappeared and no water sheen is visible, but not after the concrete is dry or when the curing compound can be absorbed into the concrete. Application shall be in compliance with the manufacturer's recommendations. Apply curing compound on exposed interior slabs and on exterior slabs as soon as final finishing operations are complete (within 2 hours and after surface water sheen has disappeared). Apply uniformly in continuous operation according to manufacturer's directions.

E. Specified applications of curing methods.

1. Slabs for Water Containment Structures and Chemical Spill Basins: Water curing only.
2. Footings (not used to contain water): Water curing, sheet material curing or liquid membrane curing.
3. Slabs on Grade and Structural Slabs (other than water containment): Water curing.
4. Horizontal Surfaces which will Receive Additional Concrete, Coatings, Grout or Other Material that Requires Bond to the Substrate: Water curing.
5. Formed Surfaces: None if nonabsorbent forms are left in place 7 days. Water cure if absorbent forms are used. Sheet cure or liquid membrane cure if forms are removed prior to 7 days.
6. Concrete Joints: Water cured or sheet material cured.

F. Finished surfaces and slabs shall be protected from the direct rays of the sun to prevent checking and crazing.

G. The Contractor shall provide all necessary measures to prevent any water, frost or ice from

penetrating the concrete prior to and after placement of concrete and until the concrete has obtained required strength.

H. Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.23 REMOVING FORMS

A. General: Formwork not supporting weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form-removal operations, and provided curing and protection operations are maintained.

B. Forms shall not be removed before the concrete has attained a strength of at least 30 percent of its specified design strength. Shores shall not be removed until the concrete has attained at least 60 percent of its specified design strength and also sufficient strength to support safely its own weight and construction live loads.

3.24 SHORING AND RESHORING INSTALLATION

A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.

1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.

B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.

C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.25 CONCRETE SURFACE REPAIRS

A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removing forms, when acceptable to Authority.

1. Remove and replace cast-in-place concrete that cannot be repaired and cured to match the existing and to the Authority's satisfaction.

B. The external surface of all concrete shall be thoroughly worked during the operations of placing in such a manner as to work the mortar against the forms to produce a smooth finish free of honeycombs and with a minimum of water and air pockets.

C. Depressions resulting from the removal of ties, and holes left by attachments to rod or bolt anchorages, shall be carefully and neatly pointed with a mortar of sand and cement mixed in the proportions used in the concrete.

D. Air pockets or rough areas larger than 1/2 inch diameter occurring in any surface shall be pointed as specified in the foregoing paragraph. Honeycombed areas shall be chipped out by the Contractor and inspected by the Authority before being pointed. Pointed areas mentioned in this paragraph shall then be given a normal finish in accordance with the requirements of the Standard Specifications.

E. As soon as the forms have been stripped and the concrete surfaces exposed, fins and other projections shall be removed; clean all exposed concrete surfaces and adjoining work stained by leakage of concrete, to approval of the Authority.

F. When patching defects in exposed surfaces the same source of cement and sand as used in the parent concrete shall be employed. Adjust color if necessary by addition of proper amounts of white cement. Rub lightly with a fine Carborundum stone at an age of 1 to 5 days if necessary to bring the surface down with the parent concrete. Exercise care to avoid damaging or staining the virgin skin of the surrounding parent concrete. Wash thoroughly to remove all rubbed matter.

G. Remove and replace concrete that is not true to formed line, level, configuration, detail, location and finish as rejected.

H. Repair of Formed Surfaces:

1. Repair exposed-to-view formed concrete surfaces, where possible, that contain defects which adversely affect the appearance of the finish. Remove and replace the concrete having defective surfaces if the defects cannot be repaired to the satisfaction of the Architect. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, and holes left by the rods and bolts; fins and other projections on the surface; and stains and other discolorations that cannot be removed by cleaning.

2. Repair concealed formed concrete surfaces, where possible, that contain defects that adversely affect the durability of the concrete. If defects cannot be repaired, remove and replace the concrete having defective surfaces. Surface defects, as such, include cracks in excess of 0.01" wide, cracks of any width and other surface deficiencies which penetrate to the reinforcement or completely through non-reinforced sections, honeycomb, rock pockets, holes left by tie rods and bolts, and spalls, except minor breakage at corner.

I. Patching Defective Formed Areas:

1. Repair and patch defective areas with cement mortar immediately after removal of forms, but only when acceptable by the Authority.
2. Cut out honeycomb, rock pockets, voids over 1/2" diameter, and holes left by tie rods and bolts, down to solid concrete but, in no case, to a depth of less than 1". Make edges of cuts perpendicular to the concrete surface. Before placing the cement mortar, thoroughly clean, dampen with water, and brush-coat the area to be patched with neat cement grout.

J. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in

diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch (19-mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

7. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

K. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

L. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.26 CONCRETE TOPPING

A. See Section 03 53 00, Concrete Topping.

3.27 CONCRETE SEALER

A. Unless indicated otherwise on the drawings or approved shop drawings, all exposed concrete shall receive a coat of concrete sealer meeting requirements of IDOT Standard Specifications Article 1026, Concrete Sealer.

B. Penetrating Liquid Sealer: Prepare, apply and finish penetrating liquid sealer to all concrete surfaces according to manufacturer’s written instructions. Apply according to manufacturer’s recommended temperature range and when precipitation is not expected. Apply to all concrete floor slabs. Apply after concrete has been stained, where applicable, and stain has fully dried.

1. Apply sealer to sample areas prior to overall application to determine its effect to the concrete color and finish.
2. Remove non compatible curing compounds, old sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
3. Apply sealer to concrete that is 28 days old unless approved otherwise by the manufacturer of the sealer.
4. Apply sealer when the surface water has disappeared and the concrete surface will not be marred by the walking applicator.
5. Apply sealer with low-pressure spray, brush or roller. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Apply a uniform coat leaving no gaps. Apply subsequent coats wet on wet. Do not allow the material to puddle.

    a. Follow manufacturer’s recommendations for coverage rates for fresh concrete and aged concrete. On broom or rough finished concrete, increase the coverage rate to compensate for the added surface area. Coverage to also vary based on the porosity and conditions of the concrete.

6. Apply a second coat in a similar manner for floors to remain exposed or if the surface is rough or porous.
7. Apply sealer to all surfaces, including edges and under sides of concrete platforms.
8. Allow sealer to dry according to manufacturer’s recommendations. Protect freshly applied sealer from rain for at least three hours.

C. Slip Resistant Additive: Slip resistant additive must be compatible with sealer. Use materials from same manufacturer and follow all of the manufacturer’s recommendations and instructions for use,

preparation, mixing, environmental conditions and application.

3.28 QUALITY CONTROL TESTING DURING CONSTRUCTION

A. The Contractor will employ and pay for a testing laboratory to perform inspections and obtain sets of field control cylinder specimens during the progress of the work in compliance with ASTM C31, to perform tests and to submit test reports as directed by the Authority. The number of sets of concrete test cylinders taken of each class of concrete placed each day shall not be less than one set per day, nor less than one set for each 150 cu yds of concrete nor less than one set for each 5,000 sq ft of surface area for slabs or walls.

1. A "set" of 6 inch x 12 inch test cylinders consists of seven cylinders: two each to be tested and their strengths averaged at 7, 14, and 28 days, and the seventh may be used for a special test at 3 days or to verify strength after 28 days if 28-day test results are low.
2. When the average 28-day compressive strength of the cylinders in any set falls below the specified design strength or below proportional minimum 7-day strengths (where proper relation between seven and 28-day strengths have been established by tests), proportions, water content, or temperature conditions shall be changed to achieve the required strengths.

B. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.

1. Slump: ASTM C 143; one test at point of discharge for each day's pour of each type of concrete; additional tests when concrete consistency seems to have changed. If the slump is outside the specified range, the concrete shall be rejected.
2. Air Content: Test for air content shall be made daily on fresh concrete samples using test method ASTM C 173, volumetric method for lightweight or normal weight concrete or ASTM C 231, pressure method for normal weight concrete.
3. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4 deg C) and below, when 80 deg F (27 deg C) and above, and one test for each set of compressive-strength specimens.
4. Compression Test Specimen: ASTM C 31; one set of four standard cylinders for each compressive-strength test, unless otherwise directed. Mold and store cylinders for laboratory-cured test specimens except when field-cured test specimens are required.
5. Compressive-Strength Tests: ASTM C 39; one set for each day's pour exceeding 5 cu. yd. plus additional sets for each 50 cu. yd. more than the first 25 cu. yd. of each concrete class placed in any one day; two specimens each tested at 7, 14 and 28 days, and one specimen retained in reserve for later testing if required.
6. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the concrete.
7. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength and no individual strength test result falls below specified compressive strength by more than 500 psi.

C. Additional Tests: The testing agency will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Authority. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.

D. Should the strengths shown by the test specimens made and tested in compliance with the previous provisions fall below the required strengths, the Authority shall have the right to require changes in proportions outlined to apply to the remainder of the work. Furthermore, the Authority shall have the right to require additional curing on those portions of the structure represented by the test specimens which failed. The cost of such additional curing shall be at the Contractor's expense. In the event that such additional curing does not give the strength required, as evidenced by core and/or load tests, the Authority shall have the right to require strengthening or replacement of those portions of the structure which fail to develop the required strength. The

cost of all such core borings and/or load tests and any strengthening or concrete replacement required because strengths of test specimens are below that specified, shall be entirely at the expense of the Contractor. In such cases of failure to meet strength requirements the Contractor and Authority shall confer to determine what adjustment, if any, can be made in compliance with Sections titled "Strength" and "Failure to Meet Strength Requirements" of ASTM C94. The "purchaser" referred to in ASTM C94 is the Contractor in this Section.

E. When the tests on control specimens of concrete fall below the specified strength, the Authority will order check tests for strengths to be made by means of typical cores drilled from the structure in compliance with ASTM C42 and C39. In the case of cores not indicating adequate strength, the Authority, in addition to other recourses, may require, at the Contractor's expense, load tests on any one of the concrete structures in which such concrete was used. Tests need not be made until concrete has aged 60 days.

F. Compression Test Reports: In addition to reporting as outlined in ASTM C39, present the following data in tabular form and distribute after recording test results:

1. Identity of project, Contractor, supplier.
2. Identity of mix and required strength.
3. Pour location of sampled concrete.
4. Slump, air content, truck number, time and date sampled, air temperature, concrete temperature, consistency.
5. Curing history.
6. Date tested.
7. Compressive strength.
8. Type of fracture.
9. Compliance with specification.

G. At the Authority’s direction, concrete shown by test not to meet the specified strength requirements shall be removed and replaced at no additional cost to the Authority.

H. Inspections:

1. Steel reinforcement placement.
2. Steel reinforcement welding.
3. Headed bolts and studs.
4. Verification of use of required design mixture.
5. Concrete placement, including conveying and depositing.
6. Curing procedures and maintenance of curing temperature.
7. Verification of concrete strength before removal of shores and forms from beams and slabs.

I. Formed Concrete Dimensional Tolerances:

1. Formed concrete having any dimension smaller or greater than required, and outside the specified tolerance limits, will be considered deficient in strength and subject to additional testing as herein specified.
2. Formed concrete having any dimension greater than required will be rejected if the appearance or function of the structure is adversely affected, or if the larger dimensions interfere with other construction. Repair, or remove and replace rejected concrete as required to meet the construction conditions. When permitted, accomplish the removal of excessive material in a manner to maintain the strength of the section without affecting function and appearance.

J. Defective Work: Concrete work which does not conform to the specified requirements, including strength, tolerances, and finishes, shall be corrected at the Contractor's expense, without extension of time thereafter. The Contractor shall also be responsible for the cost of corrections to any other work affected by or resulting from corrections to the concrete work.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of CAST-IN-PLACE CONCRETE shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of CAST-IN-PLACE CONCRETE shall be included in the contract lump sum price as shown in the Schedule of Prices for STRUCTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Structural Work: 030000

END OF SECTION

SECTION 03 41 00

PRECAST CONCRETE PLATFORM

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. General Conditions, Special Conditions, Division One Specification Sections, other Specification Sections and the Drawings apply to this section.

1.02 SUMMARY

A. This Section specifies requirements for precast concrete platform system. The work under this Section shall consist of furnishing all labor, materials, and equipment required to provide and install the precast concrete platform system, including reinforced precast concrete platform panels with specified walking surface finish, hoisting and attachment plates and accessories, concrete sealer, expansion joints, joint sealant and backer rod, edge options, etc., as shown on the drawings, specified herein and as otherwise required for a complete installation including all accessories other appurtenant work required to complete this work.

B. Related Sections: The following sections contain requirements that relate to this Section.

1. Section 03 20 10 – Concrete Reinforcement Epoxy Coated
2. Section 03 30 00 – Cast-In-Place Concrete
3. Section 07 90 00 – Joint Sealers
4. Section 07 95 13 – Expansion Joint Cover Assemblies
5. Section 09 30 10 – Tactile Tile

1.03 REFERENCES

A. Precast and Prestressed Concrete Institute PCI MNL 117 – Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products.

B. Testing: In compliance with applicable provisions of Prestressed Concrete Institute PCI MNL 117– Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products.

C. Requirements for regulatory agencies: All local codes plus the following specifications, standards and codes are a part of these specifications:

1. Illinois Department of Transportation (IDOT) Standard Specifications for Road and Bridge Construction, latest edition.
2. ACI 318 – Building Code Requirements for Reinforced Concrete.
3. AWS D1.1 – Structural Welding Code.
4. ASTM Specifications as referenced in Part 2 – Products of this Specification.
5. Chicago Building Code.

D. American National Standards Institute. (ANSI)

1. ANSI B 101.1 – Test Method for Measuring Wet Static Coefficient of Friction of Common Hard-Surface Floor Materials.
2. ANSI B 101.3 – Test Method for Measuring Wet Dynamic Coefficient of Friction of Common Hard-Surface Floor Materials.
3. ANSI A 326.3 – American National Standard Test Method for Measuring Dynamic Coefficient of Friction of Hard Surface Flooring Materials.

E. ASTM E 303 – Standard Test Method for Measuring Surface Functional Properties Using the

British Pendulum Tester.

1.04 PERFORMANCE REQUIREMENTS

A. Concrete platform walking surface test on samples of concrete platform with specified finish for the project.

1. Slip resistance: Test each concrete surface finish to be used for walking surfaces. Slip resistance tests must be performed by a qualified independent testing agency approved by the Authority and the tests to be done according to ANSI B 101.3, Test Method for Measuring Wet DCOF (Dynamic Coefficient of Friction) of Common Hard Surface Floor Materials using the BOT-3000E digital tribometer measuring device and/or according to ASTM E303 using the British pendulum tester. The test device and method to be as selected by and approved by the Authority.

1.05 SUBMITTALS

A. Submit, in accordance with Section 01 33 00, Submittal Procedures, shop drawings, product data and samples as required below:

1. Erection Shop Drawings shall include:

a. Plans and/or elevations locating and defining all material to be furnished by the manufacturer.
b. Sections and details showing connections, cast-in items and their relationship to the structure.
c. Description of all loose, cast-in and field hardware.
d. Field installation and/or location drawings.
e. Erection sequences and handling requirements.
f. All dead, live and other applicable loads used in the design.

2. Production drawings shall include:

a. Elevation view of each member.
b. Sections and details indicating quantities and position of reinforcing steel, anchors, inserts, etc.
c. Erection and lifting inserts.
d. Dimensions and finishes.
e. Prestress for strand and concrete strengths.
f. Estimated Cambers.
g. Method of transportation.
h. Edge options.
i. Expansion joint details and materials.
j. Detail for tactile tiles.
k. Detail for edges between panels including backer rod and sealant.
l. Reinforcement layout, dimensions and spacings.
m. Form sizes, layout, details, type, inserts and projections.

3. Product Data:

a. The Contractor shall submit design calculations that indicate conformance with the following design requirements:

1) Initial handling and erection stresses.
2) 25 psf wind load, acting either inward or outward.
3) All other loads specified for member where they are applicable.

b. Provide product data and specifications for the concrete mix design and any additives.
c. Provide product data and specifications for reinforcing and any inserts.
d. Provide concrete pour requirements including environmental conditions and concrete curing requirements.
e. Provide product data, specifications and installation instructions for expansion joint system including cover, backer rod, sealant and other accessories.
f. Provide product data, specifications and installation instructions for concrete sealer.
g. Provide product data, specifications and installation instructions for sealant and backer rod to be used at joints between panels.

4. Design calculations of products not completed on the contract drawings shall be performed by a Licensed Structural Engineer in the State of Illinois, experienced in precast prestressed concrete design and submitted for approval upon request.

5. Samples:

a. Prior to fabrication of all the units, the Contractor shall provide a minimum of ten samples of precast concrete material as specified herein to determine an acceptable range of color and texture for the completed installed precast concrete platform deck, including the walking surface finish.

6. Mock ups:

a. Cast and finish two (2) four foot square (2 foot X 2 foot) panel samples to be reviewed and approved by the Authority. Casting and finishing methods shall be the same as those to be used for the actual platform deck panels.
b. Provide mock-up of expansion joint.
c. Provide mock-up of joint between panels with sealant and backer rod.
d. Include detail for tactile tiles.
e. Provide mock-up of any optional edge details.
f. Provide sample finish for precast concrete walking surface.

B. Test reports:

1. Reports of tests on concrete and other materials.
2. Test report for coefficient of friction for precast concrete walking surface.

C. Concrete Sealer: Provide product data, specifications and installation instructions for concrete sealer.

D. Provide specifications, installation instructions and manufacturer's recommendations for sealant, backer rod and expansion joint materials.

E. Certifications: Submit copies of current certifications in good standing from PCI for both the proposed fabricator of the precast concrete panels and the proposed erector of the precast concrete panels for the Authority's verification and approval prior to contracting with the respective subcontractor.

F. Expansion Joint Cover Installer: Provide certification from manufacturer of expansion joint system stating that installer of the system is approved to install the manufacturer's system.

G. Sealant Installer: Provide certification from manufacturer of sealant stating that installer of sealant is approved to install the manufacturer's sealant.

1.06 QUALITY ASSURANCE

A. Acceptable Manufacturers: A Company specializing in providing precast concrete products and services associated with the industry for at least five years. Written evidence shall be submitted documenting experience and plant adequacy to fulfill the contract requirements. Precaster must be PCI certified.

B. Installer qualifications: An authorized representative who is trained and approved by the manufacturer.

1. Installer of the panels shall be regularly engaged for at least five years in the erection of precast structural concrete products similar to the requirements of this contract. Erector must be PCI certified.
2. Installer of the expansion joint cover assembly and the installer of the sealant and backer rod at joints between panels must be experienced in the installation of their respective systems and must be approved by the respective manufacturers for proper installation of the materials.

1.07 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery and Handling: Precast members shall be lifted and supported only at lifting or supporting points, or both, and with the approved lifting devices during manufacturing, stockpiling, transporting and erecting operations. All lifting devices shall have a minimum safety factor of 4.

B. Storage:

1. Minimize on-site storage of stockpiled materials.
2. Store all units off ground.
3. Place stored units so that identification marks are discernable.
4. Separate stacked members by battens across full width of each bearing point.
5. Stack so that lifting devices are accessible and undamaged.
6. Do not use upper member of stacked tier as storage area for shorter member or heavy equipment.

1.08 COORDINATION

A. Coordinate work of this section with other subcontractors to verify required dimensions and locations including for inserts, anchors, anchor bolts, plates, conduit, and other items to be embedded in the concrete or installed with the concrete.

B. Coordinate the delivery of embedded items or items to be installed with the precast concrete so as to avoid delays to the installation of the new work.

1.09 WARRANTY

A. Concrete Precast Platform Panels: Furnish a twenty year from date of final acceptance written warranty in form stipulated by the Authority, signed by the Contractor, agreeing to repair or replace work which has failed in resistance to abrasion, weather, discoloration or otherwise failed as a result in materials or workmanship. Failure includes deflection of the panels, cracking of the concrete and spalling at the concrete surface. Upon notice of such defects, within the warranty period, make necessary repairs or replacement as approved by the Authority and at no cost to the Authority.

B. Expansion Joint Assemblies: Furnish a one year from date of final acceptance written warranty in form stipulated by the Authority, signed by the manufacturer and installer of the expansion joint assembly, agreeing to repair or replace work which has failed to provide airtight or watertight joints, failed in resistance to abrasion and weather or otherwise failed as a result in materials or workmanship. Failures also include degradation of the finish, dislodging of the components, bending, denting, cracking and its attachment to the substrate failing or loosening. If applicable,

the warranty shall also cover the elastomeric parts of the assembly. The manufacturer and installer shall repair or replace the expansion joint cover assembly to the Authority's satisfaction and at no cost to the Authority.

C. Joint Sealant: Furnish a five year from date of final acceptance written warranty in form stipulated by the Authority, signed by the Contractor, Sealant Manufacturer and Sealant Installer; agreeing to repair or replace work which has failed to provide airtight or watertight joints, failed in adhesion or cohesion, failed in resistance to abrasion, weather, extrusion, migration, staining or otherwise failed as a result in materials or workmanship. Upon notice of such defects, within the warranty period, make necessary repairs or replacement as approved by the Authority and at no cost to the Authority.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Portland Cement: ASTM C150, domestic brand, Type 1, normal Portland Cement.

B. Type III high early-strength Portland Cement may be used subject to approval of the Authority. All provisions of the specifications shall apply except that the 7 day compressive strength shall equal the 28 day strength required for normal concrete.

C. The same brand of Portland Cement shall be used for exposed concrete throughout the project unless approved otherwise in writing by the Authority. Air entraining cement is not acceptable.

D. Coarse Aggregate: ASTM C33.

E. Fine Aggregate: ASTM C33.

F. Water Reducing admixture: ASTM C494, Type A, "Pozzolith 322N" (Master Builders Co.) "WRDA" (W.R. Grace & Co.) or "Plastocrete 161" (Sika Chemical Corp.), or approved equal.

G. Fly Ash: Should be used conforming to Section 1010 and Article 1020.05 of the IDOT Standard Specifications.

H. Calcium Chloride: Shall not be used.

I. Water: Should be potable.

J. Reinforcing Steel: Shall be in accordance with Section 03 20 10, Concrete Reinforcement Epoxy Coated.

K. Strand: Uncoated 7-wire, Stress-Relieved Strand: ASTM A416 – Grade 270K.

L. Anchors and Inserts:

1. Materials:

    a. Structural Steel: ASTM A36.
    b. Malleable Irons: ASTM A47.
    c. Stainless Steel: ASTM A666.

2. Finish: Hot-Dipped Galvanized: ASTM A153.

M. Grout: Shall be non-metallic, non-gaseous, non-shrink type in accordance with ASTM C1107 and GRD-C 621, Corps of Engineers specification for non-shrink grout. Compressive strength of grout shall be a minimum of 7500 psi in accordance with ASTM C109. Duragrout (L&M Construction Chemical), NS Grout (Euclid) or set grout (Master Builders Co.)

N. Expansion Joint Cover Assemblies: See Specification Section 07 95 13.

O. Joint Sealers: See Specification Section 07 90 00.

2.02 CONCRETE MIXES

A. 28-day compressive strength: Minimum of 6000 psi.

B. Release strength: Minimum of 5000 psi.

C. Use of calcium chloride, chloride ions or other salts will not be permitted.

D. Maximum concrete slump shall be 3 inches.

E. Admixtures shall conform to ASTM C260 and be approved by the Authority.

2.03 FABRICATION

A. Manufacturing procedures shall be in accordance with PCI MNL-117 and as necessary to fulfill the requirements specified herein.

B. Dimensional Tolerances of Finished Units: Comply with PCI MNL-117. Overall height and width measured at face adjacent to mold at time of casting:

1. 10 feet or under: plus or minus 1/8 inch.
2. 10 feet to 20 feet: plus 1/8 inch and minus 3/16 inch.
3. Out of square (difference in length of two diagonal measurements): 1/8 inch per 10 feet.
4. Thickness: plus or minus 1/8 inch.
5. Tolerances of other dimensions not otherwise indicated: plus or minus 1/16 inch per 10 feet.

C. Slope or Bow: Provide camber as required to allow panels to lay flat after installation compensating for deflection and depending upon actual span and loading. Provide any slope at top surface of panels shown on drawings for drainage in direction of drainage.

D. Position Tolerances: For cast-in items measured from datum line locations as shown on shop drawings.

1. Anchors and inserts: within 3/8 inch of centerline location.
2. Blackouts and reinforcements: within ¼ inch of position shown on the shop drawings.
3. Bearing Plates: within ¼ inch transverse (measured perpendicular to platform stringers) and 3/8 inch longitudinal (measured parallel to platform stringers) of position shown on the shop drawings.

E. Fabrication:

1. Fabricate units, smooth, and true to line, size and shape, with exposed edges and precise and square corners, unless otherwise indicated. Provide notches or box-outs in the precast concrete platform panels as required for the installation of the expansion joint systems according to recommendations and dimensions supplied by the expansion joint system manufacturer.
2. The finished surface shall be even in texture and uniform in color. Pointing or patching surfaces, lines or corners shall not be permitted. Precast units which are warped, cracked, broken, spalled, stained, badly formed, have surface imperfections or are otherwise defective will not be accepted.

F. Built-in Items: Provide slots, holes and other precast accessories in units to receive attachments

and other similar work as indicated below and as required by the Drawings.

1. Provide stainless steel or galvanized steel inserts and sleeves cast into units for attachment of loose hardware, connection of structural members or installation of miscellaneous components.
2. Provide ASTM A36 steel bearing plates with welded studs cast into units for field attachment of the Precast Concrete Platform to the supporting members.

G. Anchorages: Provide loose stainless steel, galvanized steel or primed steel items such as plates, shims, clip angles, seat angles, anchors, dowels, clamps, hangers and other miscellaneous steel shapes not provided by other trades, as necessary to secure precast unit to supporting and adjacent members as required by the drawings.

H. The color and surface texture of the precast concrete platform shall be similar for the entire project. All panels for the station shall be supplied by the same precast manufacturer.

I. Finishes:

1. Exposed Walking Surfaces:

a. Precast concrete platform walking surface shall be aggressively sandblasted in the factory in accordance with PCI's "Heavy Blasting" and to match the sample approved by the Authority.
b. Slip Resistance: Concrete platform walking surface finish to have a minimum value of 0.42 DCOF (Dynamic Coefficient of Friction) measured with the BOT-3000E and using a 0.05% SLS water solution per the specified test method.

2. Non-walkable Surfaces: Result of casting against approved steel forms. Normal color variations permitted. Minor indentations, minor chips and spalls will not be permitted. No major imperfections, honeycombing or other defects will be permitted.
3. Exposed Vertical Ends: Strands shall be recessed and the corners of the members shall have ¾ inch chamfers as shown on the Drawings.

J. Openings: The manufacturer shall provide additional reinforcing for those openings 10 inches round or square or larger as shown on the drawings. The Contractor shall be responsible for providing and coordinating all openings necessary for all systems. Openings not shown to be provided in the casting process shall be field located and drilled or cut by the trade after the precast products have been erected.

K. Edge Recess: The manufacturer shall control the depth of the tactile edge strip recess as required to conform to tolerance requirements for finish installation.

L. Patching: Patching is not acceptable without the prior approval of the authority. In no case shall the Contractor install patching that compromises the structural performance or appearance of the installed product.

M. Fasteners: The manufacturer shall cast in structural inserts, bolts and plates as detailed or required by the drawings.

2.04 DECK JOINTS

A. Expansion Joints: The Contractor shall provide expansion joints between adjacent precast concrete platform panels and at locations shown on the drawings. The installed precast concrete platform or the installed expansion joint system shall not bridge or impede the expansion or contraction movements of the structural framing members.

1. See Section 07 95 13, Expansion Joint Cover Assemblies, for details and sizes, including

installation details and requirements, for expansion joints at concrete panels.

2. Verify sizes and details for block out or recess as required for flush installation of the actual expansion joint cover assembly submitted and approved by the Authority for this project.
3. Provide all required materials and accessories to insure a complete installation.

B. Control Joints: The Contractor shall provide all materials and accessories required for the installation of sealed control joints as detailed on the Drawings. Provide scored joints if indicated on the Drawings; at locations shown on the Drawings. Size to match actual joints between panels.

C. Joints between panels shall have a design width of 3/8". Provide a backer rod and sealant at joints between panels. Sealant shall be continuous and joint shall be water proof. Sealant shall be installed strictly in accordance with sealant and backer rod manufacturer's recommendations and instructions for conditions for installation, preparation of the materials, installation, depth of sealant in relation to width of joint and curing. See sealant specification section.

1. Recommended Sealants for Joints between Precast Concrete Platform Panels:

a. Flexprene PSI-952 One-Part Self-leveling Urethane Sealant as manufactured by Polymeric Systems, Inc.
b. MasterSeal SL 100 as manufactured by BASF Corporation.
c. Approved equal.

2.05 TACTILE TILE

A. The manufacturer of the Precast Concrete Platform shall coordinate with the Tactile Tile supplier and installer to obtain the final tile dimensions and any other special conditions required by the Tactile Tile supplier for a successful installation of the tile.

B. The Tactile Tile shall conform to the requirements of the specification Section 09 30 10, Tactile Tile.

2.06 CONCRETE COATING

A. The Precast Concrete Platform shall be sealed with a clear, water-based penetrating sealer for protection against water, chloride ions and stains. Sealer to be VOC complaint and abrasion-resistant. Sealer to be "Enviroseal 20" as manufactured by Harris Specialty Chemicals, or approved equal.

PART 3 – EXECUTION

3.01 FABRICATION

A. Construction methods and testing shall be in accordance with the applicable provisions of the specification Section 03 30 00, Cast-In-Place Concrete, and with Section 504, Precast Concrete Structures of the Standard Specifications unless otherwise specified herein.

1. Precast concrete platform panels to be of dimensions and thickness as shown on Drawings and approved shop drawings.
2. Provide cut out for canopy columns and other construction. Size and location as shown on approved shop drawings. Depress surfaces as shown and detailed on the Drawings.
3. Provide block out or recess as required for flush installation of expansion joint cover assembly for those panels at either side of an expansion joint.

3.02 ARCHITECTURAL SURFACE TEXTURE

A. The architectural surface texture and finish of all precast members, including the walking surface, shall match the surface and texture of the approved test panels specified herein.

3.03 CURING

A. The Precast Concrete Platform panels shall be kept in their casting position until they are cured sufficiently to meet the handling stresses during installation. Cracked, spalled, chipped, bowed or damaged panels shall be replaced at the Contractor's own expense.

3.04 ERECTION

A. Preparation: The General Contractor shall be responsible for:

1. Providing true, level bearing surfaces on all field placed bearing walls and other field placed supporting members.
2. The placement and accurate alignment of anchor bolts, plates, stringers, required shim plates and other field placed supporting members. Coordinate with precast supplier.

B. Precast panel supplier shall inspect and approve support structure for precast panels. Verify dimensions and location and size of openings. Any discrepancies between approved shop drawings and actual installation shall be resolved prior to installation of the panels.

C. Installation: Installation of the precast concrete platform panels shall be performed by a competent erector approved by the manufacturer. Members shall be lifted by means of suitable lifting devices at points provided by the manufacturer. Temporary shoring and bracing, if necessary, shall comply with the manufacturer's recommendations.

D. Alignment: Precast Concrete Platform members must be properly aligned and leveled as required by the drawings and approved shop drawings. Variations between adjacent members must be within the tolerances specified in PCI MNL-117.

1. The edge of the platform from the centerline of the track and the height of the platform from the top of rail must be as shown on the drawings. These dimensions must be strictly and consistently maintained as they are critical to the gap between the platform and the train and to the vertical alignment with the train.

E. Panels shall create a continuous flush walking surface for the platform. There shall be no tripping hazard at the joints between panels. Panels that are excessively bowed or otherwise compromised in their dimensional tolerances shall not be used.

3.05 JOINTS BETWEEN PANELS

A. Joints between adjacent precast concrete panels shall be filled with backer rod and sealant as shown on the drawings.

B. The Contractor shall adjust the panels prior to the connection of the panels to the steel platform stringers such that the control joint tolerances are maintained.

C. Joints between panels shall have a backer rod and sealant installed. Sealant shall be continuous and joint shall be water proof. Sealant shall be installed strictly in accordance with sealant and backer rod manufacturer's recommendations and instructions for conditions for installation, preparation of the materials, installation, depth of sealant in relation to width of joint and curing. See sealant specification section.

3.06 EXPANSION JOINTS

A. Install expansion joints between adjacent precast concrete platform panels at all locations shown on the Drawings. Install expansion joints between panels set at clearances with the manufacturer's installation requirements to provide for a watertight seal.

B. The precast concrete platform panels shall be installed such that the expansion joint measurements (face to face of panel edges) match the clear dimensions shown on the Drawings, adjusted for temperature, and to the tolerances required by the expansion joint manufacturer. Contractor shall adjust the panels prior to the connection of the panels to the steel platform stringers such that the expansion joint tolerances are maintained.

3.07 FIELD WELDING

A. Field welding of the platform panel bearing plate to the steel stringer is to be performed by a qualified welder using equipment and materials compatible to the base material.

3.08 ATTACHMENTS AND PENETRATIONS

A. Subject to the approval of the Authority, precast concrete platform panels may be drilled or “shot” provided that no contact is made with the reinforcement bars. Should spalling occur, it shall be repaired by the Contractor to the satisfaction of the Authority or the panel shall be replaced.

3.09 TOLERANCES

A. The precast concrete platform deck shall be fabricated and erected such that when assembled the joints between panels shall be 3/8 inch in width within the tolerance of plus or minus 1/16 inch.

B. The precast concrete platform decks shall be fabricated and erected such that when assembled the inner edge of the platform, adjacent to the track, shall be in perfect alignment. The outer edge of the precast platform deck shall be in alignment, however, a deviation of plus or minus 1/8 inch at this location will be acceptable.

3.10 PLACEMENT

A. Placement of the precast concrete platform shall be coordinated with adjacent elements of construction to assure proper installation, bearing and conformance with the requirements for tolerances.

3.11 INSPECTION

A. The precast concrete platform will be shop and field inspected by the Authority. Units with spalled or cracked concrete will be rejected. Bowed or dimensionally incorrect panels will be rejected. Visible chips larger than 1/8 inch deep, ½ inch wide and ¾ inch long will be rejected. All panels with such spalling, cracks, chips, other surface defects, bowing, dimensional irregularities or other defects not meeting the approval of the Authority shall be replaced by the Contractor, at the direction of the Authority and at no expense to the Authority and no delay to the completion of the work.

3.12 CONCRETE COATING

A. The Concrete Sealer shall be applied in the field after the Precast Concrete Platform has been installed and according to the sealer manufacturer’s directions and recommendations. Sealer shall not reduce the coefficient of friction of the walking surface of the panels.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of PRECAST CONCRETE PLATFORM shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of PRECAST CONCRETE PLATFORM shall be included in the contract lump sum price as shown in the Schedule of Prices for STRUCTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Structural Work: 030000

END OF SECTION

SECTION 03 53 00.S
CONCRETE TOPPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:

1. Providing and installing concrete topping where shown on the drawings including, but not exclusive of, transit passenger platforms, station house floors and other floors.

B. Related Sections:

1. Section 03 20 10, Concrete Reinforcement Epoxy Coated.
2. Section 03 30 00, Cast-In-Place Concrete.
3. Section 03 74 00, Concrete Repairs
4. Section 07 90 00, Joint Sealants.
5. Section 07 95 13, Building Expansion Joint Assemblies.

1.03 REFERENCES AND STANDARDS

A. ACI 302.1 – Guide to Concrete Floor and Slab Construction

B. ACI 211.1 - Proportions for Normal, Heavyweight, and Mass Concrete

C. ACI 224 – Control of Cracking in Concrete Structures

D. ACI 201.2 – Guide to Durable Concrete

E. ACI 305.1 – Specification for Hot Weather Concreting.

F. ACI 306.1 – Standard Specification for Cold Weather Concreting.

G. ACI 304 – Guide for Measuring, Mixing, Transporting and Placing Concrete.

H. ACI 308.1 – Specifications for Curing Concrete.

I. ACI 117 – Specifications for Tolerances for Concrete Construction and Materials.

J. ASTM C 33 – Specification for Concrete Aggregates.

K. ASTM C 150 – Specification for Portland Cement.

L. ASTM C 171 – Specification for Sheet Materials for Curing Concrete.

M. ASTM C 309 – Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

N. ASTM C 494 – Specification for Chemical Admixtures for Concrete.

O. ASTM C 920 – Specification for Elastomeric Joint Sealants.

P. ASTM C 1059 – Specification for Latex Agents for Bonding Fresh to Hardened Concrete.

Q. ASTM C 1077 – Practice for Laboratories Testing Concrete and Concrete Aggregates for use in Construction and Criteria for Laboratory Evaluation.

R. ASTM D 1751 – Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction.

S. ASTM D 4263 – Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.

T. ASTM E 303 – Standard Test Method for Measuring Surface Functional Properties Using the British Pendulum Tester.

U. ASTM E 329 – Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction.

V. ASTM E 1155 – Test Method for Determining F_f Floor Flatness and F_l Floor Levelness Numbers.

W. IDOT Standard Specification Article 1026 – Concrete Sealer.

X. UL – Underwriter's Laboratories.

Y. American National Standards Institute. (ANSI)

1. ANSI B 101.1 – Test Method for Measuring Wet Static Coefficient of Friction of Common Hard-Surface Floor Materials.
2. ANSI B 101.3 – Test Method for Measuring Wet Dynamic Coefficient of Friction of Common Hard-Surface Floor Materials.
3. ANSI A 326.3 – American National Standard Test Method for Measuring Dynamic Coefficient of Friction of Hard Surface Flooring Materials.

1.04 PERFORMANCE REQUIREMENTS

A. Concrete topping walking surface test on samples of concrete topping with specified finish for the project.

1. Slip resistance: Slip resistance tests must be performed by a qualified independent testing agency approved by the Authority and the tests to be done according to ANSI B 101.3, Test Method for Measuring Wet DCOF (Dynamic Coefficient of Friction) of Common Hard Surface Floor Materials using the BOT3000E digital tribometer measuring device and/or according to ASTM E303 using the British pendulum tester. The test device and method to be as selected and approved by the Authority.

1.05 SUBMITTALS

A. Product Data: For each type of product.

1. Concrete Topping Materials
2. Reinforcing
3. Bonding Agents
4. Joint Materials
5. Sealers
6. Curing Materials per ACI 308.1.

B. Concrete Mix Design: Submit mix design sealed by an Illinois Professional Engineer or Structural Engineer. Submittal must include the following:

1. W/C vs strength history for the last year
2. Material certifications
3. Course aggregate gradation
4. Fine aggregate gradation
5. Admixtures with letter certifying compatibility with all materials mix

C. Shop Drawings: Shop drawings showing location of any required reinforcement in Contract Drawings, layout of all joint types and any required materials, any required column isolation joints, formwork, and installation of tactile edge and details for installation.

D. Process Plans:

1. Detailed plans, sections and details showing entire installation.
2. Detailed curing procedure including schedule of activities for the duration of curing. Including approved curing product data and manufacturer's curing procedure.
3. Cold Weather – Submit cold weather curing procedures at least 1 month before cold-weather concreting.
4. Hot Weather – Submit hot weather curing procedures at least 1 month before use and data demonstrating that proposed materials meet specification requirements.

E. Field quality-control test reports.

F. Test report for coefficient of friction for concrete topping walking surface.

1.06 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

B. Mockups: Provide concrete floor topping mockups to demonstrate typical joints, surface finish, non-slip finish bonding, texture, tolerances, and standard of workmanship.

1. Build mockups with area equal the width of platform by 16 ft, in the location indicated or, if not indicated, as directed by Authority.

2. If Authority determines that mockups do not meet requirements, demolish and remove them from the site and cast others until mockups are approved.

3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

4. Certify that the nonslip finish will achieve the required coefficient of friction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with ACI 304, Chapter 2.

1.08 PREINSTALLATION MEETING

B. Conduct field pre-construction activity meeting upon approval of process plans.

C. Conduct a pre-construction activity meeting to review cured mock-ups and make final determinations.

1.09 FIELD CONDITIONS

A. Environmental Limitations: Comply with any governing requirements for substrate temperature and moisture content, ambient temperature and humidity, ventilation, and other conditions affecting concrete floor topping performance including curing.

1. Place concrete floor topping when ambient temperature and temperature of base slabs are between 50 and 86 degrees F.

2. When approved by Authority, placement of concrete outside of temperature ranges in Section 1.8, A.1 shall be governed by ACI 305.1 or ACI 306.1. Process plans for anticipated use of ACI 305.1 and/or ACI 306.1 shall be submitted in advance.

B. Close areas to traffic during topping application and for duration of curing time.

PART 2 - PRODUCTS

2.01 CONCRETE FLOOR TOPPING

A. Provide Ready–Mix Concrete:

1. Unless required otherwise on the drawings, provide a mix with a minimum compressive strength of 3,000 psi @ 28 days. Goal of the mix is to yield durable hardened concrete.
2. Water to cementitious materials ratio: Maximum of 0.45, minimum of 0.4
3. Course Aggregate: Unless required otherwise in drawing drawings, provide 3/4 inch maximum size
4. Course Aggregate: Provide gradation per ASTM C33.
5. Provide mix with 3 inch maximum slump before the addition of an admixture.
6. Provide mix containing fly ash in amounts from 15% to 35% of cementitious materials.

7. Provide air entrainment between 5% +/-1%.
   a. Concrete mix additives may be used provided they are certified compatible with concrete mix submitted for approval. B. Color must be uniform.

2.02 CURING MATERIALS

A. All curing materials shall be as specified in in ACI 308.1, except as specified otherwise or supplemented here.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet. Use black or dark-colored plastic sheeting when daily high ambient temperature is below 50 deg F. Use white or similarly reflective plastic sheeting when daily high ambient temperature is above 85 deg F. Use any color or transparent plastic sheet at temperatures between 50 and 85 deg F.

D. Water: Potable

E. Liquid membrane-forming curing compound: ASTM C309, Type 1 or 2 (pigment must be removed prior to application of sealer), Class A, 200 ft2/gal application rate.

2.03 RELATED MATERIALS

A. Reinforcing Materials:

1. Refer to Drawings and Concrete Reinforcement section(s) of these specifications for concrete reinforcing materials.

B. Polysulfide Joint Sealant: ASTM C920, elastomeric, two-component, for horizontal and vertical applications, color to be light gray.

C. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber

D. Portland Cement: ASTM C 150, Type I or II.

E. Course Aggregate: ASTM C33, normal weight

F. Fine Aggregate: ASTM C33, with gradation per ACI 302.1R-15 Table 8.5.1 for “Normal weight aggregate”. G. Water: Potable.

H. Acrylic-Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

I. Power-Actuated Fasteners: Fastener systems with an evaluation report based on ICC-ES AC70.

J. Chemical Admixtures: ASTM C 494

K. Concrete Sealer: Silane based, odorless, colorless; that penetrates, hardens and densifies concrete surfaces and leaves a non-darkening film that protects the concrete

surface from moisture, water, oil, grease, dirt, deicing salts and other contaminant penetration. Sealer must be compatible with any concrete admixtures, color stains, curing compounds, hardeners, and any other concrete treatments used. Sealer must meet current local VOC restrictions and be non-flammable.

1. Manufacturers of concrete sealers, concrete curing and sealer compound and slip resistant additive that may be used for this project include, but are not limited to, the following:

    a. BASF Chemical Company.
    b. ChemMasters.
    c. Custom Building Products, Aqua Mix Sealer's Choice Gold.
    d. H & C Concrete Coatings.
    e. Sika.
    f. SpecChem.
    g. TK Products.
    h. Approved Equal.

2. Concrete sealer for concrete that has been thoroughly cured and concrete has obtained a minimum of 80% its design strength (14-28 days).

3. Slip Resistant Additive: Where required, provide slip resistant additive for concrete sealer to improve the slip resistance of the sealer; for interior and exterior applications.

PART 3 - EXECUTION

3.01 GENERAL

A. Work must conform to all requirements of ACI 308.1, Specification for Curing Concrete, except as modified herein.

3.02 EXAMINATION

A. Examine substrates for conditions affecting performance of the Work. Identify and document all unsound concrete for repair.

B. Verify that base slabs are visibly dry and free of moisture. Test for capillary moisture by the plastic sheet method per ASTM D 4263.

C. Proceed with application only after unsatisfactory conditions have been corrected.

3.03 PREPARATION

A. Existing Concrete: Remove and repair existing surface treatments and unsound concrete per specification 03 74 00, Concrete Repairs. Mechanically abrade base slabs to produce a heavily scarified surface profile with an amplitude of 1/4 inch.

1. Prepare and clean existing base slabs. Fill voids, cracks, and cavities in base slabs.

2. Mechanically remove contaminants from existing concrete that might impair bond of floor topping.

B. Formwork: Install formwork within train clearance envelope.

C. Install joint-filler strips where topping abuts vertical surfaces, such as column isolation joints, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with topping surface unless otherwise indicated. Fabricate strips as necessary for slopping surfaces.
2. Terminate full-width, joint-filler strips 1/2 inch below topping surface, 1/2 inch behind vertical surfaces where joint sealants.
3. Install joint-filler strips in lengths as long as practical. Where more than one length is required, lace or clip sections together.

D. Install power-actuated fasteners per written directions of floor topping manufacturer at perimeter of areas that are to receive floor topping, including both edges of locations where joints will be formed in floor topping.

E. Provide and install epoxy coated wire mesh reinforcing in concrete topping slab as shown or required. Provide type and sizes of mesh and wire size as shown or required. Provide proper concrete cover, overlap ends as required and secure into place to avoid displacement during pouring operations.

3.04 FLOOR TOPPING APPLICATION

A. Application procedures used in approved mock-up must be used provided temperatures are similar.

B. Existing Concrete: Apply bonding agent, mixed per manufacturer's written instructions and recommendations, and scrub into dry base slabs to a thickness of 1/16 to 1/8 inch, without puddling. Place floor topping while adhesive is still tacky and within manufacturer’s recommended time frame. Apply bonding agent to any vertical surfaces that topping will abut, if shown or required.

C. Place concrete floor topping continuously in a single layer, tamping and consolidating to achieve tight contact with bonding surface. Do not permit cold joints or seams to develop within pour strip. Install concrete topping slab to limits indicated on approved shop drawings. Float finish topping slab and trowel to the correct height.

1. Screed surface with a straightedge and strike off to correct elevations.
2. Slope surfaces uniformly where indicated.
3. Begin initial floating, using bull floats to form a uniform and open-textured surface plane free of humps or hollows.

D. Construction Joints: Construct joints as shown on approved shop drawings.

E. Contraction Joints: Commence sawing of joints as soon as the concrete has hardened sufficiently to permit sawing and no later than 12 hours after concrete is poured. Form weakened-plane contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete floor topping when

cutting action will not tear, abrade, or otherwise damage surface and before random contraction cracks develop.

1. If applicable, form joints in concrete floor topping over contraction joints in base slabs
2. Construct joints for a depth equal to 1/2 of the average topping thickness, but not less than 1/2 inch deep.
3. Joints to be straight and parallel. Follow pattern shown on drawings or as otherwise dictated. Align with column lines or other structure elements.
4. Inspect and repair damage to liquid curing membrane, if used.

F. Expansion Joints: Expansion joints shall be compatible with size and location on base slab.

G. Tactile Edge: Allow for tactile edge installation at locations where shown or required. Provide a 1/4-inch (or as otherwise shown or required) depression for flush installation of tactile edge. Coordinate with tactile edge supplier for dimensions, depths and installation details and requirements. Remove any curing compound residue d prior to the installation of tactile edge.

3.05 CONCRETE TOPPING TOLERANCES

A. Deviation from Slope or Plane: Comply with requirements of ACI 117, Section 4.8.3, Class B Surface.

1. Where specified or shown, finish surfaces to specified overall values of flatness, F(F) 25; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and of levelness, F(L) 15, and measure notify independent testing agency to permit measurement within 24 hours per ASTM E 1155 for a randomly trafficked floor surface.
2. Finish and measure surface tolerance such that gap at any point between surface and an unleveled freestanding 5-foot- long straightedge, resting on two high spots and placed anywhere on the surface, does not exceed 1/4 inch.

3.06 CONCRETE TOPPING FINISHES

A. Concrete topping finish(es) as indicated on the drawings.

B. Troweled Finish: Provide where specified or shown:

1. Float finish topping slab and trowel to a smooth, uniform, level finish and to the correct height. Finish surfaces to overall values of flatness of 25 and levelness of 20.

C. Nonslip Broom Finish: Apply a nonslip broom finish, unless shown otherwise.

1. Do not finish the surface until bleeding is complete.
2. Immediately after float finishing, slightly roughen concrete surface by brooming perpendicular to main traffic route.
3. Use a *Marshalltown* extra fine horse hair broom or a similar broom approved by the Authority.
4. Nonslip Broom Finish to match approved mock up sample and provide the required slip resistant coefficient of friction.

a. Slip Resistance: Concrete topping walking surface to have a minimum value of 0.42 DCOF measured with the BOT-3000E and using a 0.05% SLS water solution per the specified test method.
b. Coefficient of friction shall be measured after the application of any sealants or other coatings.

D. Non-Slip Aggregate Finish, where specified or shown:

1. Apply non-slip aggregate finish to concrete stair treads, platforms, ramps, and elsewhere as shown.
2. After completion of float finishing, and before starting trowel finish, uniformly spread 25 lbs. of dampened non-slip aggregate per 100 sq. ft. of surface. Tamp aggregate flush with the surface using a steel trowel, but do not force the non-slip aggregate particles below the surface. After broadcasting and tamping, apply trowel finishing as herein specified.
3. After curing, lightly work the surface with a steel wire brush, or an abrasive stone, and water to expose the non-slip aggregate.

3.07 PROTECTING AND CURING

A. Comply with ACI 308.1 Part 3-Execution and approved process plan.

B. Protect freshly placed concrete floor topping from premature drying and excessive cold or hot temperatures, per ACI 305.1 or ACI 306.1 and per approved process plan.

C. Begin 'Final Curing' immediately after finishing concrete floor topping. Cure by one or a combination of the following methods and per manufacturer's written instructions:

1. ACI 305.1 or ACI 306.1 provisions govern when the temperatures will fall outside the 50 to 86 degree Fahrenheit temperature range any time during the required 7-day curing process.
2. Moisture Curing: Keep surfaces continuously moist for <u>not less than seven days</u> with water continuous water-fog spray or absorptive cover, water saturated and kept continuously wet. Cover topping surfaces and edges with 12-inch lap over adjacent absorptive covers.
3. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. <u>Cure for not less than seven days</u>. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
4. Liquid membrane-forming curing compounds: Begin immediately after final finishing – no square foot area shall be without first coat for more than 10 minutes from final finishing. Apply uniformly in two coats applied at right angles to each other and in continuous operations only and in accordance to manufacturer's written instructions. Application rate for each coat should be approximately 200 sq. ft./gal. <u>Cure for not less than seven days.</u> Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair any damage during curing period.

3.08 JOINT FILLING

A. Prepare and clean contraction joints and install approved semi-rigid joint filler.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.

C. Install semi-rigid joint filler full depth of contraction joints. Overfill joint and trim semi-rigid joint filler flush with top of joint after hardening.

3.09 REPAIR

A. Defective Topping: Repair and patch defective concrete floor topping areas, including areas that have not bonded to concrete substrate.

3.10 CONCRETE SEALER

A. Concrete sealer shall be per approved submittals and approved process plans.

B. Unless indicated otherwise on the drawings or approved shop drawings, all exposed concrete shall receive a coat of concrete sealer meeting requirements of IDOT Standard Specifications Article 1026, Concrete Sealer.

C. Penetrating Liquid Sealer: Prepare, apply and finish penetrating liquid sealer to all concrete surfaces according to manufacturer's written instructions. Apply according to manufacturer's recommended temperature range and when precipitation is not expected. Apply after concrete has been stained, where applicable, and stain has fully dried.

1. Apply sealer to sample areas prior to overall application to determine its effect to the concrete color and finish.
2. Remove non compatible curing compounds, old sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
3. Apply sealer to concrete that is 28 days old unless approved otherwise by the manufacturer of the sealer.
4. Apply sealer when the surface water has disappeared and the concrete surface will not be marred by the walking applicator.
5. Apply sealer with low-pressure spray, brush or roller. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Apply a uniform coat leaving no gaps. Apply subsequent coats wet on wet. Do not allow the material to puddle. .

    a. Follow manufacturer's recommendations for coverage rates for fresh concrete and aged concrete. On broom or rough finished concrete, increase the coverage rate to compensate for the added surface area. Coverage to also vary based on the porosity and conditions of the concrete.

6. Apply a second coat in a similar manner for floors to remain exposed or if the surface is rough or porous.
7. Apply sealer to all surfaces, including edges of concrete platforms.
8. Allow sealer to dry according to manufacturer's recommendations. Protect freshly applied sealer from rain for at least three hours.

D. Slip Resistant Additive

3.11 FIELD QUALITY CONTROL

A. Testing Agency: Contractor to engage a qualified independent testing and inspecting agency approved by the Authority to perform field tests and inspections and prepare test reports.

B. Testing Services: Testing and inspecting of completed applications of concrete floor toppings shall take place in successive stages, in areas of extent and using methods as follows:

1. Sample Sets: At point of placement, a set of three samples shall be taken from the topping mix for each delivery truck. Samples shall be tested for strength per appropriate methods.
2. Concrete floor topping shall be tested for compliance with “flat” tolerance conforming to ACI 117.

C. Remove and replace applications of concrete floor topping where test results indicate that it does not comply with specified requirements.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of CONCRETE TOPPING shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of CONCRETE TOPPING shall be included in the contract lump sum price as shown in the Schedule of Prices for STRUCTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Structural Work: 030000

END OF SECTION

SECTION 03 64 10.S
CRACK REPAIR IN TUNNELS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section specifies requirements for crack repair in tunnel concrete. The Contractor must furnish, deliver and install all labor, materials, tools and equipment required for placing, curing, protecting, finishing and all other appurtenant work required for the satisfactory completion of crack repair work using grouting compounds applied by injection or other Authority approved means.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. 03 74 00 Concrete Repairs

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM)

2. ASTM C273 “Standard Test Method for Shear Properties of Sandwich Core Materials"
3. ASTM D93 “Standard Test Methods for Flash Point by Pensky-Martens Closed Cup Tester”
4. ASTM D1475 “Standard Test Method for Density of Liquid Coatings, Inks, and Related Products”
5. ASTM D2842 “Standard Test Method for Water Absorption of Rigid Cellular Plastics”
6. ASTM D3574 “Standard Test Methods for Flexible Cellular Materials—Slab, Bonded, and Molded Urethane Foams”
7. ASTM D4016 “Standard Test Method for Viscosity and Gel Time of Chemical Grouts by Rotational Viscometer (Laboratory Method)"

1.04 SUBMITTALS

A. Submit manufacturer’s qualifications and current printed technical information as follows:

1. Product data sheets that also include installation instructions, use limitations and recommendations for the grout material.
2. Material safety data sheets.
3. Documentation showing producer has manufactured Hydrophobic Chemical Grout for the minimum timeframe in Part 1, Quality Assurance Section of this Specification.
4. Documentation verifying the grout has been used on at least 5 projects of similar magnitude. The performance history must also be for a minimum of three (3) years in a similar environment as the intended use.

a. Past project references denoting project location, date, quantities of product used, owner's name, and contact information.

5. Manufacturer must have an established quality training program for instructing and technically supporting the Contractor. Provide details on training program for the installers:

   a. Specified grout type
   b. Surface preparation
   c. Storage requirements
   d. Adequate joint preparation
   e. Injection equipment installation
   f. Injection techniques
   g. Training validation timeframe
   h. Names of individuals who completed the training program

6. Onsite field representative(s) qualifications and contact information referenced in Part 1, Quality Assurance Section of this Specification.

B. Submit Contractor's qualifications as follows:

1. Documentation of grout installation on at least 5 projects of similar magnitude. The performance history must also be for a minimum of three (3) years in a similar environment as the intended use.

   a. Past project references denoting project location, date, quantities of product installed, owner's name, and contact information.

2. Provide letter stating that the Contractor's installers are approved by the manufacturer for the installation of their products and completed the training program. Letter must include the trained personnel names and training expiration dates.

C. Independent Testing Agency Personnel qualifications:

1. Provide letter stating that the Independent Testing Agency's inspectors meet the requirements of Part 1, Quality Assurance Section of this Specification. Letter must include the trained personnel names and training expiration dates.

D. Submit a crack injection survey in order to validate the scope of work. Survey is to include:

1. Track stationing
2. Crack length
3. Crack width
4. Crack location (such as crown, high walkway wall, etc.)
5. Estimated water flow (such as moist, past moisture, glistening surface, flowing, or dry).

E. Submit hot and cold weather plan for review and approval.

F. Prior to the start of crack repair the Contractor must submit process plan detailing the following:

1. Survey of cracks to be repaired
2. Sequence of cracks to be repaired
3. Required concrete repairs before and after grouting
4. Protection of adjacent infrastructure
5. Obstacles with existing equipment
6. Anticipated substrate temperatures
7. Installation equipment
8. Injection procedure
9. Curing times
10. Pump flush schedule
11. Finish details

G. Daily Reports: Provide reports to the Authority by the Independent Inspection Agency's representative per requirements of Part 3, Field Quality Control Section of this Specification.

H. Warranty: Provide a copy of the written product warranty from the grout manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturing Qualifications

1. Manufacturer of the specified product must have an established program of training, certifying, and technically supporting the Contractor.
2. Manufacturer must supply the Contractor with an authorized and competent field representative to advise the Contractor of the proper procedures and quality control techniques including adequate joint preparation and installation of polyurethane grout. Representative must continue to instruct until the crew has mastered the technique of installing the system. The representative must also make periodic site visits to verify installation of the crack injection and to advise the Contractor as work progresses.
3. Manufacturer must have been engaged in the manufacture of Hydrophobic Chemical grout for a minimum of 10 years.

B. Contractor Qualifications

1. Contractor must be an Approved Contractor of the manufacturer for the specified product, who has completed a program of instruction in the use of the specified repair material, and provide letter from the manufacturer attesting to the completion of the training program.
2. Contractor must demonstrate past performance using the type of grout specified herein on five (5) projects of similar size and nature.

C. Independent Inspection Agency Qualifications:

Representatives of the Inspection Agency must receive the same manufacturer's training as the Contractor's installers per Part 1, Submittal Section of this Specification.

D. Pre-installation Meeting

1. Conduct meeting at project site to discuss process plan submittal.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver the specified product in original, unopened containers with the manufacturer's name, labels, product identification, and batch numbers.

B. Store the specified product in a condition as recommended by the manufacturer.

C. All rejected product must be removed from the project.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Polyurethane Hydrophobic Chemical Grout

1. The grout must be a polyurethane hydrophobic liquid that reacts with water to foam and expand to form a flexible, tough, rubber type gasket polyurethane grout, developed to stop highly active leaks.
2. Grout materials must be solvent free, non-corrosive, non-toxic, non-magnetic, non-conductive, non-flammable, non-explosive, and contain no sodium or chloride.
3. When cured, grout materials must be non-flammable and non-toxic.
4. Product: Mountain Grout Flexible as manufactured by Green Mountain International of Waynesville, NC; or approved equivalent.
5. Product Properties of Uncured Chemical Grout:

a.	Viscosity	(ASTM D4016)	<1000 cps
b.	Specific Gravity	(ASTM D1475)	1.12 to 1.15
c.	Flash Point	(ASTM D93)	>200 °F
d.	Shipping requirements		Class 55 Non-hazardous

6. Product Properties of the Cured Polyurethane Hydrophobic Chemical Grout:

a.	Elongation	(ASTM D3574)	>60%
b.	Tensile Strength	(ASTM D3574)	>24 psi
c.	Shear Strength	(ASTM C273)	>17 psi
d.	Water Absorption	(ASTM D2842)	<1%

B. The accelerator must be compatible with the resin and as recommended by the grout manufacturer.

C. The pump flush must be as recommended by the grout manufacturer.

D. Injection Equipment:

1. Injection equipment must be used to meter the grout and dispense the product into the prepared crack, hole, or joint.
2. Unit must be portable and equipped with positive displacement type pumps with interlock to provide positive control of the grout at the nozzle.
3. Pumps must be air or electric powered and must contain drain back plugs.

4. Packers are required for injection. Packers for injection must be supplied by the grout manufacturer.
5. Hoses: Moisture impermeable hoses are required for use where grout material is being pumped.

E. Water: Potable, non-polluted.

F. Oil Free Oakum: Commercial grade and as required by the manufacturer.

G. Miscellaneous materials used in the formulation must be approved in writing by the manufacturer of the resin material.

PART 3 - EXECUTION

3.01 GENERAL

A. Adhere to all manufacturers' caution notes appearing in product literature.

1. Compare drawings and map of the areas to be repaired.
2. Identify cracks that need to be prepped.
3. Minimum substrate and material temperatures.
4. All equipment in contact with grout shall be dry.

B. Basic steps for crack or joint repair are as follows:

1. Surface Preparation – clean area to be grouted.
2. Drill holes for grout injection.
3. Flush defect with water.
4. Mix grout as recommended by manufacturer.
5. Grout injection.
6. Remove injectors.
7. Patch injector holes.
8. Remove excess surface grout.
9. Apply a surface sealer to defect surfaces.

3.02 EXAMINATION

A. Cracks, holes, cold joints, and fractures must be clean and sound. Remove dust, laitance, grease, curing compounds, waxes, impregnations, foreign particles, coatings, fireproofing, efflorescence, rust stains, and disintegrated materials from the defects by wire brushing and scraping or mechanical means as approved by the manufacturer. All cracks, fractures, holes, joints, etc. must be thoroughly flushed with clean water to remove dirt, dust, and other contaminants.

3.03 PREPARATION

A. Protection of Adjacent Infrastructure

The grout must not be allowed to spill over onto the surface of the concrete walls, floors, or tracks. The Contractor must provide suitable canvass or plastic tarps to protect the floors and tracks during injection.

B. Surface Preparation

1. The area surrounding the crack must be cleaned of efflorescence, deteriorated concrete, calthemite, and other contaminants that may be detrimental to the grout. If unsound or deteriorated concrete is located adjacent to the crack, which could prevent the complete injection of the crack, the unsound or deteriorated concrete should be removed prior to the injection.
2. If joints or cracks that are being sealed are dry, water must be pumped into the cold joint or crack before injecting grout.
3. Flush the crack to be injected with clean potable water prior to the installation of the grout. Observe the return of the water from the surface of the crack prior to moving to the next injection port for water flushing. The entire crack must be flushed prior to the injection of polyurethane grout.

3.04 APPLICATION

A. Follow manufacturer's recommendations for the use of safety equipment required for the handling and storage of the grout.

B. Repair cracks and cold joints by drilling offset test holes at a distance from the defect/joint as shown on the drawings, at an angle sufficient to intersect the defect at approximately half the thickness of the concrete.

C. Space injection holes as needed to fully seal the crack as recommended by the grout manufacturer. Drill holes in an alternating pattern at a 45-degree angle from the wall surface to intersect crack/joint at mid-depth of the concrete element. Maintain angle at all possible; deviations from angle must be approved by the inspector.

D. Pump grout between 250 psi and 1000 psi, behind fissure, or into voids which allow water to infiltrate into unwanted areas. If concrete being injected contains insufficient moisture to activate the grout, inject the defect with water prior to injecting the grout.

E. Pump until grout surfaces or back pressure on the pump is observed and then pause to allow the material to flow into all the cracks and crevices. When movement stops, begin injection into the next packer. When sealing vertical cracks, begin injecting at the bottom of the crack and work vertically. If faster reaction time is needed, or if grout is being pumped at cold temperature, an Accelerator may be added to base material. Consult manufacturer before adding an Accelerator. Reinject to assure that all voids are properly sealed off.

F. Completely flush the pump and hoses with approved pump flush material. Use sharp sided tool such as putty knife or trowel to remove excess material from walls, floors, etc. Excess material may be sanded off if necessary.

3.05 RESTORATION

A. Uncured grout can be cleaned from tools with an approved pump flush. Cured grout can only be removed mechanically. Mechanical means to remove any spilled grout must be approved by the Authority without evidence of spillovers onto adjacent areas.
B. Remove packers and other injection equipment embedded in the substrate.

3.06 CLEANING

A. Leave finished work and work area in a neat, clean condition without evidence of spillovers onto adjacent areas.

3.07 FIELD QUALITY CONTROL

A. All work must be in strict compliance with the approved method including the mix and application of the material according to the manufacturer's recommendations.

B. Before the grouting operation is started the contactor must inspect the area surrounding the crack for unsound concrete, deteriorated concrete, calthemite, and all other deleterious materials that are detrimental to the repair work. All defective concrete material and calthemite must be removed prior to the injection.

C. Materials and finished work must be protected against damage from mechanical abuse, plaster, salts, acids, staining and other foreign matter during transportation, storage and erection and until completion of construction work. All unsatisfactory materials and applications must be removed from the premises and all damaged materials replaced with new materials at no extra Contract time or Contract cost.

D. Inspection representatives must be present on-site during all grouting operations to confirm proper execution of design and application of grout product. Submit daily shift reports in accordance with submittal Part 1, Submittal Section of this Specification and notify the Authority of any unsuitable installation method or material.

E. Daily reports must be submitted and validated by the Independent Inspection Agency showing compliance with the manufacturer's written instructions for substrate temperature and moisture content, ambient temperature and humidity, ventilation and other conditions affecting grouting performance.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of CRACK REPAIR IN TUNNELS shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of CRACK REPAIR IN TUNNELS shall be included in the contract lump sum price as shown in the Schedule of Prices for STRUCTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Structural Work: 030000

END OF SECTION

SECTION 03 74 00.S

CONCRETE REPAIRS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Contractor is to provide all labor, materials, equipment and tools required for preparing, placing, curing, protecting, finishing and all other appurtenant work required to perform all concrete repairs and concrete crack repairs as shown, noted and verified in the field.

B. This Section includes the following:

1. Remove loose and spalling concrete.
2. Fill and grout cracks; patch spalled concrete, holes and voids; and repair surface deficiencies in existing concrete floor, ceilings, walls and other concrete structures and surfaces.
3. Apply protection on existing reinforcement; drill and grout additional reinforcement; and/or remove and replace existing reinforcement.
4. Apply waterproof coating or sealer where indicated.
5. Any other concrete related repairs to existing concrete.

C. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 03 Sections, Concrete Reinforcement and Cast-in-Place Concrete.
2. Division 09 Section, Painting.

1.03 REFERENCES

A. American Concrete Institute (ACI).

1.04 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct Conference at Project site.

1. Review extent of required concrete repairs, locations of required repairs, project conditions, access, limits of the work, condition of the concrete, and other conditions.
2. Review methods of procedures related to the concrete repair work.
3. Review requirements for protecting the adjacent surfaces.
4. Review means and methods to protect the concrete repair work during and after performing the repairs, including diverting pedestrian and vehicular traffic.

1.05 SUBMITTALS

A. Submit for the Authority’s review and approval according to Division One section, 01 33 00, “Submittal Procedures”.

B For each product to be used including concrete repair and patch materials; grout; mortar; sealant; reinforcement protection, repair or replacement reinforcement materials; bonding agents, curing compounds, and other additional agents; waterproofing coating, and sealers; submit the following:

1. Product data.
2. Specifications.
3. Manufacturer's recommendations, installation instructions and recommended procedures for the preparation and installation of each product to be used. Include manufacturer's recommended instructions for preparation of the surfaces, environmental considerations and curing requirements of each product.
4. Qualifications of the installer, including certification from manufacturer indicating installer has been approved and is experienced in the installation of each of the manufacturer's products.
5. Copy of the manufacturer's and installer's warranty for each component of the work and each product to be used.

C. Unless directed otherwise by the Authority in writing, provide an on-site sample or mockup of the concrete repair work.

1. The sample or mock-up to demonstrate how the various types of concrete repair work will be executed and how the finished, cured repair material will blend in with the existing concrete to remain.
2. The location(s) of the sample(s) and/or mock-up(s) of the concrete repair work as determined by the Authority.
3. The repairs performed as a sample or mock-up will be reviewed by the Authority for approval prior to beginning the work. The subsequent repair work will be expected to match the approved samples.
4. The repairs performed as a sample or mock-up, once approved by the Authority, to be retained as a part of the completed work.

1.06 QUALITY ASSURANCE

A. Qualifications Manufacturer: Products used in the work included in this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the Authority. The manufacturer must be capable of providing adequate onsite technical assistance as requested by the Authority.

B. Qualifications of Contractor: The Contractor and his personnel shall be qualified to do concrete repair and be certified as an installer by the manufacturer. The Contractor shall have at least five years of experience performing concrete repair work of a similar type and scope. The Contractor shall be approved by the manufacturer for proper installation of the concrete repair and patch materials.

1.07 PROJECT CONDITIONS

A. Contractor required to survey existing conditions to verify all existing dimensions and conditions and areas to be repaired or patched and the extent required. Contractor to survey the extent of the existing cracks, spalling and other deficiencies with the existing concrete surfaces. Contractor to verify the location, extent and condition of the existing reinforcement.

B Contractor to verify the existing conditions, the conditions under which he is to do the work, access and existing environmental conditions.

C. Comply with the manufacturer's written instructions for substrate temperature and moisture content, ambient temperature and humidity, ventilation and other conditions affecting concrete repair performance.

D. There will be no extras allowed to compensate Contractor for his failure to review and verify existing conditions and dimensions.

E. Contractor required to review and coordinate the work of other contractors performing work of this project to determine areas of the concrete that will be required to be patched after demolition, installation of new work and other work that will affect the condition of the concrete surfaces and the extent required.

1.08 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Keep bags of patching materials, cement, mortar and grout intact, dry and free from contaminants. All materials shall be delivered to the project site in sealed containers.
1. Store in a dry area between 40 degrees F. and 80 degrees F.

B. Keep new reinforcing above ground and dry.

1.09 ENVIRONMENTAL REQUIREMENTS

A. Concrete repair and patching work shall not be performed if the ambient temperature is below 40 degrees F. unless a cold weather application is submitted to the Authority for review and approval.

B. Comply with manufacturer's written instructions for substrate temperature, ambient temperature and humidity, ventilation, and other conditions affecting concrete patch and repair material and grout performance.

C. Comply with manufacturer's written instructions for substrate temperature, ambient temperature and humidity, ventilation, condition of substrate and other conditions affecting installation of waterproof coating on existing concrete roof deck.

1.10 WARRANTY

A. The materials used for the crack and concrete repair work shall be warranted by the manufacturers to be free of defects and perform as specified for a period of five (5) years after the date of final acceptance.

B. The crack repair and concrete repair installation work shall be warranted by the installer(s) of the materials to be free of defects and perform as specified for a period of five (5) years after the date of final acceptance.

C. The waterproof coating material and installation work shall be warranted by both the manufacturer of the material and the installer of the material to be free of defects and perform as specified for a period of five (5) years after the date of final acceptance.

D. Contractor to provide a written warranty for materials and labor as specified above signed by both the manufacturer and installer of each different material.

PART 2 - PRODUCTS

2.01 GENERAL

A All products shall be non-toxic, non-magnetic, non-conductive, non-flammable, will not produce toxic fumes, and contain no sodium or chloride.

B. The repair materials shall be self-healing.

C. Finished appearance of repair materials shall be even, uniform finish similar to a sand float finish; and match existing.

2.02 MATERIALS

A. Portland Cement: ASTM C 150, Type I.

B. Aggregates: ASTM C 33.

C. Water: Potable.

D. Patching Mortar: Portland cement, ASTM C 150, Type I, and clean, natural sand, ASTM C 404. Mix at a ratio of 1 part cement to 2 ½ parts sand, by volume, with minimum water required for placement hydration.

2.03 STEEL REINFORCEMENT PROTECTION MATERIAL

A. Three component, solvent-free, moisture-tolerant, epoxy-modified, cementitious product to protect reinforcement. Product to bond to concrete, cement, epoxy mortars and steel and act as a barrier against penetration of water and chlorides. Product to contain corrosion inhibitors and not be affected by moisture when cured.

B. Available Products: Subject to compliance with requirements, reinforcement protection material that may be incorporated into the work include, but is not limited to, the following:
1. Armatec 110 EpoCem as manufactured by Sika Corporation or an approved equal.

2.04 GROUT MATERIAL

A. Grout to be hydrophilic that reacts with water to seal leaks. Hydrophilic grout to be an urethane injection resin providing a resilient and flexible foam capable of withstanding severe thermal cycles. Hydrophilic grout to bond readily with concrete.

B. Properties: Uncured:

1. Solids Content per ASTM D-2939 to be 90%.
2. Viscosity per ASTM D-4016 to be 450-650 cps @ 70 degrees F.
3. Flash Point per ASTM D-93 to be greater than 212 degrees F. or 100 degrees C.
4. Grout to be non-corrusive.
5. Reaction time to be 30 seconds @ 70 degrees F.

C. Properties: Cured Foam:

1. Tensile Strength per ASTM D-3574 Test E to be between 350 and 400 psi.
2. Elongation per ASTM D-3574 Test E to be between 300 and 400%.

3. Shrinkage to be less than 2% after initial cure.
4. Bonding Strength to be between 250 and 300 psi.
5. Foam to be nontoxic.

D Available Products: Subject to compliance with requirements, grout that may be incorporated into the work include, but is not limited to, the following:

1. AV-330 Safeguard Hydrophilic grout as manufactured by Avanti Corporation or an approved equal.

2.05 WATERPROOF COATING MATERIAL

A. Polymer-modified, two-component, cementitious coating for use on concrete substrates; for protection against chlorides and for dampproofing or waterproofing. Product to adhere to vertical and horizontal concrete surfaces.

B. Available Products: Subject to compliance with requirements, cement based waterproof coating material that may be incorporated into the work include, but is not limited to, the following:

1. SikaTop 144 as manufactured by Sika Corporation or an approved equal.

2.06 CONCRETE REPAIR MATERIAL

A. Two component, polymer-modified, portland cement, fast-setting, non-sag repair mortar for vertical and horizontal surfaces. Material to also include a penetrating corrosion inhibitor. .

B. Concrete repair material to have high compressive and flexural strength and high early strength. Material to have high freeze-thaw durability and be resistant to chlorides. Material to be compatible with coefficient of thermal expansion of the concrete and comply with ASTM C-884 (modified). Material to have a density affording carbon dioxide resistance (carbonation) without adversely affecting water vapor transmission. C. Material to be non-flammable and non-toxic.

D. Available Products: Subject to compliance with requirements, concrete repair material that may be incorporated into the work include, but is not limited to, the following:

1. SikaTop 123 Plus as manufactured by Sika Corporation or an approved equal.

PART 3 - EXECUTION

3.01 GENERAL

A. Prepare all surfaces according to product manufacturer’s recommendations.

B. Conditions for installation of the products for reinforcement protection, crack repair, concrete repair, waterproof coating, and grout must conform to the manufacturer’s requirements and recommendations.

1. Cracks, voids, and other surfaces to receive patching material, grout, or sealant to be solid, dry, and dust free. All loose or spalling material to be removed.
2. Environmental conditions during and after the work to be within the manufacturer’s recommendations. Temperatures to be within the recommended range with no moisture or frost during the installation of the work or as it cures.

C. Store, mix and apply all products according to manufacturer's directions. Use brush, roller, trowel or caulking gun as specified by manufacturer.

D Wet areas to receive patching material or grout if required by the manufacturer's instructions.

E. Use bonding agents, curing compounds and other additional agents only when required by the manufacturer and only those materials recommended by the manufacturer as compatible with their products and approved by the Authority.

F. Provide proper curing time between successive coatings and materials as recommended by the manufacturer for proper application and adhesion.

G. All work, including the preparation, mix and application of the material, shall be in strict compliance with the manufacturer's recommendations and instructions.

3.02 INSPECTION

A. Before installation, the Contractor shall examine the substrate surfaces to determine that it is free of conditions that may be detrimental to the proper and timely completion of the work.

B. Start of work shall indicate acceptance of the substrate.

3.03 PREPARATION

A. Contractor is to provide protection to other parts of the building, contents, and occupants to assure that other areas, surfaces or occupants are not harmed.

B. Areas to receive grout repairs, patching or coating shall be cleaned of all loose materials, dust, dirt, paint, oil, grease, bitumen or other foreign substances.

C. Areas to receive waterproof coating to be clean, dry and free of dust, dirt and other deleterious substances. All cracks should be properly repaired and filled flush with the existing concrete surfaces with approved repair materials. All repair materials shall be fully dry and cured prior to installing waterproof coating.

3.04 CONCRETE CRACK REPAIR

A. Sound and remove all loose concrete at existing cracks. Remove dust and debris.

B. Grout cracks to prevent water infiltration with Hydrophilic foam grout as required.

3.05 SPALLED CONCRETE REPAIR

A. Remove all loose concrete to sound substrate. Expose reinforcing where required. Remove all dust and debris.

B. Apply steel reinforcement protection material on existing reinforcement.

C. Apply concrete repair material patching all voids and holes. Trowel to a smooth, even surface.

3.06 CONCRETE REINFORCEMENT

A. Replace existing rebar with more than 20% diameter loss by cutting and splicing new bar using mechanical splice coupler or replacing the entire length of existing bar.

B. New full length bars to be epoxy-coated. See Specification Section for Concrete Reinforcement and drawings for coupler notes.

3.07 NEW CONCRETE IN CONTACT WITH STEEL

A. Existing rebar that can be reused and existing structural steel surfaces to be in contact with new concrete to remain shall be cleaned using SSPC – SP 2 (Hand Tool Cleaning). Areas that have excessive rust-packing shall be cleaned per SSPC-SP 3 (Power Tool Cleaning).

B. After cleaning rebar and structural steel apply a coating of Sika Armatec 110 or approved equal.

3.08 SACRIFICIAL ZINC ANODS

A. Where indicated on the drawings, provide and install sacrificial zinc anodes per ASTM B418 Type II zinc. Zinc anodes to be distributed uniformly and tied to existing black bars. See drawings for approximate quantities and follow manufacturer's installation instructions.

3.09 CONCRETE WALL REPAIR

A. Sound and remove all loose concrete to sound substrate.

B. Drill and grout new No. 4 galvanized reinforcing Bar at intersection of existing vertical and horizontal bars. Remove and replace existing vertical and horizontal bars with No. 5 galvanized bars.

C. Patch area with minimum 3" cover of concrete repair patching material.

3.10 CONCRETE SURFACE PREPARATION

A. All surface areas of concrete walls, floor, ceiling and deck to be smooth, level, clean and dry. Remove protrusions. Holes, voids and cracks to be patched. Scrape and remove all loose paint.

B. All surfaces to receive cement based waterproof coating as noted on the drawings.

C. See painting section for primer and finish coats of paint on all concrete surfaces. Concrete floor to be finished with epoxy paint.

3.11 CURRING AND CLEAN UP

A. Protect repaired areas from damage or infiltration with water, salts or acid until fully cured.

B. Allow all materials to thoroughly cure and dry before allowing foot traffic, concentrated or rolling loads, or application of epoxy paint.

C. Remove and replace repairs that evidence lack of bond with substrate, including areas that emit a "hollow" sound when tapped.

D. Clean building areas. Upon completion of the floor repair work, remove all construction debris and equipment from the site.

3.12 FIELD QUALITY CONTROL

A. Repaired concrete areas to blend in with the existing concrete in color and texture. Surfaces to be smooth and even.

B. Concrete repairs to be solid and secure.

C. Repaired areas that are loose, cracked, or otherwise deteriorated to be removed and the area re-patched. Finish any patched areas that are discolored to be repaired or re-patched as directed and approved by the Authority.

D. Defects or deterioration that occurs within the warranty period to be repaired or replaced as directed by the Authority and at no cost to the Authority.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of CONCRETE REPAIRS shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of CONCRETE REPAIRS shall be included in the contract lump sum price as shown in the Schedule of Prices for STRUCTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Structural Work: 030000

END OF SECTION

SECTION 04 40 13

GRANITE MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Granite unit paver
2. Removal and reinstallation of existing granite pavers
3. Granite planter walls
4. Granite Curb
5. Granite treads
6. Masonry anchored to the following:

    a. Concrete foundation.

B. Related Sections:

1. Division 03 Section "Cast-in-Place Concrete" for dovetail slots in concrete for anchoring stone.

1.2 REFERENCES

A. ASTM A 123-02: Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

B. ASTM C 97-02: Test Methods for Absorption and Bulk Specific Gravity of Dimension Stone.

C. ASTM C 119-04: Terminology Relating to Dimension Stone

D. ASTM C 170-90 (1999): Test Method for Compressive Strength of Dimension Stone

E. ASTM C 270-03: Specification for Mortar for Unit Masonry

F. ASTM C 615-03: Specification for Granite Dimension Stone

G. ASTM C 568-03: Specification for Limestone Dimension Stone

H. ASTM C 1242-03: Guide for the Selection, Design, and Installation of Exterior Dimension Stone Anchors and Anchoring Systems

I. ASTM C 1354-96: Test Method for Strength of Individual Stone Anchorages in Dimension Stone

1.3 DEFINITIONS

A. Definitions contained in ASTM C 119 apply to this Section.

1.4 SUBMITTALS

A. Product Data: For each stone type and each manufactured product shown on Drawings or specified.

1. For each stone variety used on Project, include physical property data.
2. Manufacturer's data sheets on each stone type and each manufactured product to be used.
3. Manufacturer’s Product Literature and Specification Data.
4. Manufacturer’s written instructions for recommended maintenance practices.
5. Color samples for verification and selection.
6. Written manufacturer’s warranty.
7. Product liability insurance certificate with project owner as certificate holder.
8. MSDS for items in Part 2 “Products.”
9.

B. Shop Drawings: Show fabrication and installation details:

1. Include dimensions and profiles of stone units.
2. Show locations and dimensions of existing conditions to ensure alignment
3. Show locations and details of joints.
4. Show locations and details of anchors.
5. Show locations and details of engraving text.

C. Samples: Submit samples for each stone type required, exhibiting the full range of color characteristics expected.

1. Submit a minimum of 2 each, 12 inches x 12 inches in size, in each color and finish specified.
2. In the case of more variegated stones, color photos shall be submitted in addition to the number of samples to show the full range of color and markings to be expected.
3. Mortar Samples: Full range of exposed color and texture.

D. INFORMATIONAL SUBMITTALS

1. Qualification Data: For Installer, Manufacturer, and Testing agency.
2. Material Certificates: signed by manufacturers:
3. Material Test Reports: from a qualified testing agency:
4. Maintenance Instructions.
5. Warranty: Written manufacturer’s warranty.

1.5 QUALITY ASSURANCE

A. Source Limitations for Stone: Obtain each stone variety from a single quarry.

B. Visual Mockup: Provide full sized mock-up of the approved stone or stones in the approved finishes, erected at a site agreed to by the Architect, Contractor, and the Fabricator. The approved mock-up shall become the standard for the project.

1. Build mockup of typical wall.
2. Size: full 10’ wall
3. Color consistency: demonstrate color consistency with mockup; color range shall not exceed range of color established by samples.
4. Included typical components and anchors.

5. Mockup may become part of the completed Work if approved.

C. Manufacturer Qualifications: Provide manufacturer qualifications as follows:

1. Submit a list of ten completed installations. For each installation provide: name and type of facility; its location; the date of installation; name and telephone number of contact at the facility familiar with the installation.
2. Submit qualifications of manufacturer.
3. Submit manufacturer's quality control program.
4. Submit example of Material Warranty and any other applicable warranties.
5. Engage experienced fabricator that has completed stone fabrication similar in material, design, and extent to that indicated for the project.

D. Installer Qualifications: Provide installer qualifications as follows:

1. Submit a list of ten completed installations. For each installation provide: name and type of facility; its location; the date of installation; name and telephone number of contact at the facility familiar with the installation.
2. Submit resumes and/or qualifications of installation manager(s).
3. Submit fabrication quality control program.
4. Submit installation quality control program.
5. Submit example of Material Warranty and any other applicable warranties.
6. Engage experienced installer that has completed stone installation similar in material, design, and extent to that indicated for the project.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store and handle materials to prevent deterioration or damage.

1. Stone shall be carefully packed and loaded for shipment using reasonable care and customary precautions against damage in transit. Material, which may cause staining or discoloration shall not be used for blocking or packing.

B. Properly store cementitious materials. Do not use damp cementitious materials.

C. Store masonry accessories, including metal items, to prevent corrosion and contamination.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with granite fabrications by field measurements before fabrication.

B. Protect stone as follows:

1. At the end of each day's work, cover tops of walls with nonstaining, waterproof covering. Protect partially finished work when not being worked on.
2. Prevent staining of stone from mortar, grout, and other sources. Immediately remove such materials without damaging stone.
3. Protect base of walls using coverings spread on ground and over wall surface.

C. Cold-Weather Requirements: Comply with ACI 530.1/ASCE 6/TMS 602.

D. Hot-Weather Requirements: Comply with ACI 530.1/ASCE 6/TMS 602.

1.8 EXCAVATING AND GRADING AROUND UTILITIES

A. Contractor shall carefully examine the civil, record, and survey drawings to become familiar with the existing underground conditions before digging.

B. Determine location of underground utilities and perform work in a manner that will avoid damage. Hand excavate as required. Maintain grade stakes set by others until parties concerned mutually agree upon removal.

C. Notification of the utility locate services is required for all Excavation and grading deeper than 12 inches: The Contractor is responsible for knowing the location and avoiding utilities that are not covered by the local utility locator service.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components that fail in materials or workmanship within specified warranty period.

1) Failures include, but are not limited to, the following:
   a) Deterioration of finishes beyond normal weathering and wear.
   b) Separation or delamination of materials and components.
2) Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 STONE SOURCE

A. Varieties and Source: Subject to compliance with requirements, provide stone from the following source:

1. Granite Source: ASL Stone Contract: Doug Hahn
2. D: 847.975.2228, https://aslstone.com/, doughahn68@gmail.com

B. Each color of granite shall come from a single quarry, with sufficient reserves to satisfy the requirements of the project. Colors are intended to match existing. The granite supplier shall have the capabilities to cut and finish the stone without delaying the project.

C. Stone Source Examination: Make quarried blocks available for examination by Architect.

2.2 STONE MATERIAL

A. Granite: ASTM C 615.

B. Cut stone from one block or contiguous, matched blocks in which natural markings occur.

C. Match Architect's samples and existing conditions where applicable

D. Granite Type:

a. As shown on hardscape schedule

2. Wall Thickness: As described on plans

3. Tolerance: Plus or Minus 1/16 inch from target dimension

2.3 MORTAR MATERIALS

A. Portland Cement: ASTM C 150, Type I or Type II, except Type III may be used for cold-weather construction.

1. Provide natural color or white cement as required to produce mortar color indicated.

B. Hydrated Lime: ASTM C 207.

C. Portland Cement-Lime Mix: ASTM C 150, Type I or Type III and lime.

1. Low-Alkali Cement: ASTM C 114.

D. Colored Portland Cement-Lime Mix: ASTM C 150, Type I or Type II, lime, and mortar pigments.

E. Aggregate: ASTM C 144

F. Mortar Pigments: Natural and synthetic iron oxides. Use only pigments with a record of satisfactory performance in mortar and containing no carbon black.

G. Water: Potable.

2.4 ANCHORS AND FASTENERS

A. Hot-Dip Galvanized-Steel Wire: ASTM A 82, with ASTM A 153/A 153M, Class B-2.

B. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304.

C. Hot-Dip Galvanized-Steel Sheet: ASTM A 1008/A 1008M, cold-rolled, carbon-steel sheet hot-dip galvanized after fabrication to comply with ASTM A 153/A 153M, Class B-2.

D. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304.

E. Stone Anchors: Anchors designed to engage holes for anchor bolts for fastening to substrates or framing.

1. Anchor Material: Stainless steel, ASTM A 666, Type 304
2. Dowels and Pins Material: Stainless steel, ASTM A 276, Type 304

F. Post installed Anchor Bolts: Provide the following for installation into concrete and masonry:

1. Expansion anchors
2. Stainless Steel Bolts: ASTM F 593, Alloy Group 1 or 2.
3. Stainless Steel Nuts: ASTM F 594, Alloy Group 1 or 2.
4. Anchor Material: ASTM A 666 or ASTM A 276, Type 304 or 316.
5. Capacity:
   a. Concrete: Sustain load equal to 4 times the required loads

b. Masonry: Sustain load equal to 6 times the required loads
c. Test: ASTM E 488.

2.5 MORTAR MIXES

A. Preblended, Dry Mortar Mix: Type S.

1. Furnish preblended mix.
2. Measure quantities by weight to ensure accurate proportions.
3. Thoroughly blend ingredients before delivering to Project site.

B. Mortar for Stone Masonry: Comply with ASTM C 270 Type S, Proportion Specification.

C. Pigmented Mortar: Provide pigments to produce color required**.**

1. Pigments shall not exceed 10 percent of portland cement by weight.
2. Pigments shall not exceed 5 percent of masonry cement or mortar cement by weight.
3. Mix to match Architect's sample.

2.6 STONE FABRICATION

A. Fabricate stone to comply with applicable stone association or, by recommendations of stone source.

1. Granite: NBGQA's "Specifications for Architectural Granite."

B. Fabricate stone to produce pieces indicated on Drawings, including details on Drawings. Dress joints (bed and vertical) as indicated on drawings.

C. Cut and drill sinkages and holes in stone for anchors and supports.

D. Inspect stone at quarry or fabrication plant for compliance with requirements for appearance, material, and fabrication. Replace defective units before shipment.

E. Shape stone as indicated on drawings:

F. Finish exposed faces and edges of stone to comply with requirements indicated for finish and to match approved samples and mockups.

1. Finish exposed ends of wall to match exposed face, unless otherwise noted.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces and conditions with Installer present.

B. Examine foundation to verify that inserts, reinforcement, and other items installed in foundation and required for or extending into stone masonry are correctly installed

1. Ensure top of foundation wall maintains a consistent dimension from top of existing top of curb.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean surfaces that are dirty or stained. Scrub with fiber brushes, then drench with clear water. Use cleaning compounds recommended by manufacturer.

3.3 SETTING OF STONE MASONRY

A. Perform all necessary cuts in shop during stone fabrication. Allow no field cutting.

B. Set stone to comply with requirements indicated on Drawings. Install supports, fasteners, and other attachments indicated or necessary to secure stone masonry in place. Set stone accurately in locations indicated with edges and faces aligned according to established relationships and indicated tolerances.

C. Maintain uniform joint widths. Minor variations are required to maintain bond alignment.

1. At narrowest points, joints not less than: 3/16 inch.
2. At widest points, joints not more than: 5/16 inch.

D. Provide sealant joints of widths and at locations indicated.

1. Sealants: Refer to Division 07 Section "Joint Sealants."
2. Keep sealant joints free of mortar and other rigid materials.

E. Install expansion strips in sealant joints at locations indicated.

F. Place weep holes and vents in joints where moisture may accumulate, including at base of cavity walls, above shelf angles, and at flashing.

1. Space weep holes 24 inches maximum o.c.
2. Space weep holes formed from plastic tubing or wicking material 16 inches o.c.
3. Trim wicking material used in weep holes flush with outside face of wall after mortar has set.
4. Place cavity drainage material in cavities.

3.4 CONSTRUCTION TOLERANCES

A. For external corners, expansion joints, control joints, and other conspicuous lines, do not exceed 1/4 inch in 20 feet or 1/2 inch in 40 feet or more.

B. Variation from Plumb:

1. Vertical Lines and Surfaces of Walls not to exceed:
   a. 1/4 inch in 10 feet (6 mm in 3 m).
   b. 3/8 inch in 20 feet (10 mm in 6 m).
   c. 1/2 inch in 40 feet (12 mm in 12 m) or more.
2. External corners, expansion joints, and other conspicuous lines not to exceed:
   a. 1/8 inch in 10 feet (3 mm in 3 m).
   b. 1/4 inch in 20 feet (6 mm in 6 m) or more.

C. Variation from Level:

1. Bed joints and other conspicuous lines, not to exceed:
   a. 1/4 inch in 20 feet (6 mm in 6 m).
   b. 1/2 inch in 40 feet (12 mm in 12 m) or more.

D. Measure variation from level, plumb, and position shown in plan as variation of the average plane of the face of each stone from level, plumb, or dimensioned plane.

E. Variation in Mortar-Joint Thickness: Do not vary from joint size range indicated.

3.5 ANCHORED MASONRY INSTALLATION

A. Anchor stone masonry to concrete and unit masonry with stainless steel anchors.

B. Set stone in full bed of mortar with full head joints. Build anchors into mortar joints as stone is set.

3.6 ADJUSTING

A. Remove and replace damaged stone masonry. Repair stone masonry using methods approved by Architect.

B. Remove and replace stone masonry not complying with other requirements indicated.

C. Replace stone masonry to match approved Samples and mockups, comply with other requirements, and show no evidence of replacement.

3.7 CLEANING

A. In-Progress Cleaning: Clean stone masonry as work progresses.

B. Final Cleaning: Clean stone masonry as recommended by fabricator.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. The Work of GRANITE MASONRY will not be measured for payment.

4.2 PAYMENT

A. No separate payment will be made for the work covered in this section. Payment for the work of GRANITE MASONRY will be included in the contract lump sum price as shown in the Schedule of Prices for CIVIL WORK.

4.3 PAY ITEM ACCOUNT NUMBER

A. CIVIL WORK: 020000

END OF SECTION

SECTION 04 80 00
UNIT MASONRY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditionsand Division 01 Specification sections, apply to this section.

1.02 SUMMARY

A. This Section includes the following:

1. Brick Masonry.
2. Glazed Brick.
3. Structural Glazed Facing Tile.
4. Concrete Block.
5. Bond Beams.
6. Precast Concrete.
7. Mortar and Grout for Masonry.
8. Masonry Joint Reinforcement.
9. Steel Lintels.
10. Anchors, Ties, Accessories.
11. Embedded Flashing.
12. Wall Insulation.
13. Vapor Retarder.

B. Related sections:

1. Division 07 Section, “Joint Sealants”.
2. Division 08 Section, “Standard Steel Doors and Frames”.
3. Division 09 Section, “Painting”.

1.03 REFERENCES

A. Masonry Standards Joint Committee (MSJC):

1. “Building Code Requirements and Specifications for Masonry Structures”, 2008.

B. Technical Notes on Brick Construction.

C. American Concrete Institute (ACI):

1. ACI 315, Details and Detailing of Concrete Reinforcement.

D. ASTM:

1. ASTM C-90, Standard Specification for Load Bearing Concrete Masonry Units.
2. ASTM C216, Standard Specification for Facing Brick.
3. ASTM A 240, Standard Specification for Chromium-Nickel Stainless Steel Plate,Sheet and Strip for Pressure Vessels and for General Applications.
4. ASTM C270, Standard Specifications for Mortar for Unit Masonry.

5. ASTM C476, Standard Specification for Grout for Masonry.
6. ASTM A 666, Standard Specification for Annealed or Cold-Worked AusteniticStainless Steel Sheet, Strip, Plate and Flat Bar.

1.04 SYSTEM PERFORMANCE REQUIREMENTS

A. Provide unit masonry that develops the following installed compressive strengths (f'm):

1. For clay unit masonry: f'm = 2000 psi.
2. For concrete unit masonry: f'm = 1500 psi.

B. Structural glazed facing tile (SGFT) shall be of uniform texture and color, and shall be certified by U.L. to meet requirements of UL 723 Surface Burning Characteristics for zerosmoke developed and zero flame spread.

1.05 SUBMITTALS

A. General: For all masonry units, submit product data, specifications, test reports andactual samples for review, selection, and approval for each type of masonry unit.

B. Provide shop drawings for reinforcing steel. Detail bending and placement of unit masonry around reinforcing bars. Comply with ACI 315, “Details and Detailing of Concrete Reinforcement”. Show elevations of reinforced walls with openings indicated andmaximum pour height indicated on drawings.

C. Provide shop drawings indicating sizes and shapes of all masonry units to be used, including concrete block, brick, glazed brick, structural glazed facing tile, precast concreteand bond beams.

D. Mix designs indicating type and proportions of ingredients for mortar and grout accordingto the requirements of ASTM C270 and ASTM C 476 respectively.

E. Samples for verification, selection and approval by the Authority of the following:

1. Color and texture charts and samples for initial selection of brick, glazed brick,structural glazed facing tile, precast concrete and mortar.
2. Full-size units for each different exposed brick, glazed brick, structural glazed facing tile and precast concrete required, showing full range of exposed colors,texture, and dimensions to be expected in completed construction. Include sizevariation data verifying that actual range of sizes, finishes and colors.

    a. See drawings for size of new glazed brick and types of glazed brick required. See drawings for indication of which bricks are to be glazedand on which side(s). Finish, texture and color of glazing to match approved sample.

3. Colored masonry mortar samples for each color required showing the full rangeof colors expected in the finished construction. Label samples to indicate type and amount of colorant used.

F. Material certificates for the following signed by manufacturer and Contractor certifyingthat each material complies with requirements.

1. Each different cement product required for mortar and grout including name ofmanufacturer, brand, and type.
2. Each type and size of joint reinforcement, anchors, ties and metal accessories.
3. Each type of masonry accessories.
4. Rigid insulation.
5. Vapor retarder.

G. Qualification Data: For testing agency.

H. Test Reports:

1. Include test reports, per ASTM C 67 for each type of clay masonry unitrequired.to comply with specification.
2. Include test reports, per ASTM C 140 for each type of concrete masonry unitrequired to comply with specification.
3. Include test reports, per ASTM C 780 for mortar mixes required to comply withproperty specification.
4. Include test reports, per ASTM C 1019 for grout mixes required to comply withcompressive strength requirement.

1.06 QUALITY ASSURANCE

A. Unit Masonry Standard: Comply with TMS 6021 ACI 530.1/ASCE 6 "Specifications for Masonry Structures," except revise to exclude Articles 1.4 and 1.7; Paragraphs 2.1.2, 3.1.2, and 4.1.2; and Subparagraphs 1.5.1.2, 1.5.1.3, 2.1.1.1 and to modify Subparagraph 2.1.1.5 by deleting requirement for installing vent pipes and conduits builtinto masonry.

B. Provide Level B Quality Assurance RE Table 4 of TMS 6021 ACI 530.1 (ASCE 6Specification).

C. Masonry Units must meet the following ASTM standards:

1. Glazed Brick: ASTM C 1405, Standard Specification for Ceramic Glazed BrickUnits, Grade S, Type I & II (Glaze as indicated on Drawings), Class Exterior.
2. Structural Glazed Tile (SGT): ASTM C 126, Standard Specification for StructuralGlazed Tile Units, Grade S, Type I & II.

D. Single-Source Responsibility for Masonry Units: Obtain exposed masonry units of each type of uniform texture and color, or a uniform blend within the ranges accepted for thesecharacteristics, from one manufacturer for each different product required for each continuous surface or visually related surfaces.

E. Single-Source Responsibility for Mortar Materials: Obtain mortar ingredients of uniformquality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source and producer for each aggregate.

F. Testing Agency Qualifications: An independent agency qualified according to ASTM C1093 for testing indicated, as documented according to ASTM E 548.

G. Preconstruction Testing Service: Contractor will engage and pay for a qualified independent testing agency, approved by the Authority, tp perform preconstructiontesting as follows:

1. Clay Masonry Unit Test: For each type of unit required, per ASTM C 67, “TestMethods for Sampling and Testing Brick and Structural Clay Tile”.
2. Concrete Masonry Unit Test: For each type of unit required per ASTM C 140,“Test Methods for Sampling and Testing Concrete Masonry Units”.
3. Mortar Test (Property Specification): For each mix required, per ASTM C 780, “Test Method for Preconstruction and Construction Evaluation of Mortars for Plainand Reinforced Unit Masonry”.
4. Grout Test: (Compressive Strength): For each mix required, per ASTM C 1019,“Method of Sampling and Testing Grout”.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver masonry materials to project in undamaged condition.

B. Store and handle masonry units and cementitious materials off the ground, under cover,and in a dry location to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion, and other causes. If units become wet, do not place until units are in an air-dried condition.

C. Avoid cracking, chipping or other damage to brick, glazed brick, SGFT or precastconcrete during delivery, storage, or handling.

D. Ceramic glazed brick units or SGFT to be packaged and shipped in protective trays withseparators on wooden pallets. Do not remove from protective packaging until units are installed.

1.08 PROJECT CONDITIONS

A. Protection of Masonry: During erection, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry whenconstruction is not in progress.

1. Extend cover a minimum of 24 inches down both sides and hold cover securely inplace.
2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructedwythe and hold cover in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads forat least 3 days after building masonry walls.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to beleft exposed or painted. Remove immediately any grout, mortar, and soil that come in contact with masonry.

1. Protect base of walls from rain-splashed mud and mortar splatter by means ofcoverings spread on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products withpainted and integral finishes from mortar droppings.

D. Cold-Weather Construction: No masonry work shall be installed in an atmosphere withtemperature less than 40 degrees F unless the work is protected using the

following procedures.

1. Do not lay masonry units that are wet, frozen or covered with frost or ice.
2. Remove masonry damaged by freezing conditions.
3. In heating mortar materials, maintain mixing temperatures selected within 10degrees F; do not heat water for mortar to above 160 degrees F.
4. Mortar: At 40 degrees F and below, produce mortar temperatures between 40 degrees F and 120 degrees F by heating mixing water and, at temperatures of 32degrees F and below, sand as well. Always maintain temperature of mortar on boards above freezing.
5. At 25 degrees F to 20 degrees F, heat both sides of walls under construction anduse windbreaks or enclosures when wind is in excess of 15 mph.
6. At 20 degrees F and below, provide enclosure and auxiliary heat to maintain anair temperature of at least 40 degrees F for 24 hours after setting dimension stonework, and heat stones so that they are above 20 degrees F at time of installation.
7. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperatureis 40 degrees F. and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.

E. Hot-Weather Construction: Protect masonry construction from direct exposure to wind and sun when ambient temperature of 90 degrees F with relative humidity less than 50%.

F. Field verify sizes, lengths and conditions for steel lintels in the field prior to fabricatingand installing lintels. Deliver lintels to site in sufficient time to not delay construction.

PART 2 - PRODUCTS

2.01 GENERAL

A. Comply with referenced unit masonry standard and other requirements specified in thisSection applicable to each material indicated.

2.02 BRICK

A. General: Comply with the following requirements applicable to each form of brickrequired:

1. Provide units without cores and with all exposed surfaces finished for ends of sills, caps, and similar applications that otherwise would be concealed from view.

B. Face Brick Standard: ASTM C 216 and as follows:

1. Grade and Unit Compressive Strength: Provide units of grade and minimumaverage net area compressive strength indicated below:

    a. Grade SW.
    b. Not less than the unit compressive strengths required to produce claymasonry construction of compressive strength indicated.

2. Type FBX (for general use in exposed masonry requiring minimum variations

insize and color ranges).

3. Application: Use where brick is exposed, unless otherwise indicated.

2.03 CONCRETE MASONRY UNITS

A. General: Comply with requirements indicated below applicable to each form of concretemasonry unit required.

1. Provide special shapes where indicated and as follows:

a. For lintels, corners, jambs, control joints, headers, bonding, bond beamsand other special conditions.
b. Units for outside corners at lintels etc., unless otherwise indicated.

2. Size: Provide concrete masonry units complying with requirements indicated below for size that are manufactured to specified face dimensions within tolerances specified in the applicable referenced ASTM specification for concretemasonry units.

a. Concrete Masonry Units: 7-5/8" High x 15-5/8" long x thickness indicatedon the drawings.
b. Provide Type I, moisture-controlled units.

B. Exposed Faces: Manufacturer's standard color and texture, unless otherwise indicated.

C. Hollow Load-Bearing Concrete Masonry Units: ASTM C 90-00, Grade N and as follows:

1. Unit Compressive Strength: Provide units with minimum average net areacompressive strength of 1900 psi.
2. Weight Classification: Normal weight.

D. Solid Load-Bearing Concrete Masonry Units: ASTM C 90-00, Grade N and as follows:

1. Unit Compressive Strength: Provide units with minimum average net areacompressive strength of 1800 psi.
2. Weight Classification: Normal weight.

E. Split-faced concrete block with standard pattern, scoring, aggregate, color, finish andtexture as selected by the Authority from manufacturer’s standards.

F. Masonry Lintels: Prefabricated masonry lintels made from bond beam concrete masonry units and split-faced concrete masonry units with reinforcing bars placed as indicated andfilled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in place lintels until cured.

2.04 GLAZED BRICK UNITS

A. Glazed brick units shall be a clay unit with a ceramic facing at all exposed sides, suitablefor exterior use. Provide units which comply with requirements of ASTM C 1405, Grade S, and as follows:

1. Provide the following: Elgin-Butler Brick Company, Ceramic Glazed Fire ClayBrick Units, 4S Series, All finishes to be fused to the body of the brick unit at temperatures of 2000 degrees F minimum.
2. Glaze colors and textures: Colors and/or textures same as selected by

the Authority from samples submitted to the Authority for review, selection andapproval.

3. Sizes: As indicated on the drawings and as required. Sized for 3/8” mortar joints.
4. Special shapes as indicated on the drawings such as for lintels, corners, etc. See drawings for which sides of each brick to be glazed. Do not glaze sides ofbrick that will receive mortar or grout.
5. Units exposed to view one side only may be Type I.
6. Provide Type II units, or units without cores and with all exposed surfaces finished for ends of sills, caps, and for similar applications that otherwise wouldbe concealed from view.

2.05 STRUCTURAL GLAZED FACING TILE UNITS

A. Structural glazed facing tile units shall be a clay unit with a ceramic facing at all exposedsides. Provide units which comply with requirements of ASTM C 126, Grade S (Select), and as follows:

1. Provide the following: Elgin-Butler Brick Company, 4” wide, 4W Series, 8" X 8"nominal size (or as shown on the drawings) Structural Glazed Tile Units.
2. Glaze colors and textures: Colors and as selected by the Authority frommanufacturer’s standards.
3. Sizes: As indicated on the drawings.
4. Unit Compressive Strength: Provide units with minimum average net areacompressive strength of 1900 psi.
5. Special shapes as indicated on the drawings such as for bond beams, lintels,corners, jambs, etc.
6. Bond beam units formed from hollow SGFT units with reinforcing bars placed asindicated and filled with coarse grout. Temporarily support built-in-place beams until cured.

2.06 PRECAST CONCRETE

A. Precast concrete to be of size and shape shown. Concrete to be 3000psi minimum,reinforced as required, with smooth exposed surfaces.

2.07 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold- weather construction. Provide natural color or white cement as required to producerequired mortar color.

B. Hydrated Lime: ASTM C 207, Type S.

C. Aggregate for Mortar: ASTM C 144, except for joints less than 1/4 inch use aggregategraded with 100 percent passing the No. 16 sieve. White Mortar Aggregates: Natural white sand or ground white stone.

D. Aggregate for Grout: ASTM C 404.

E. Water: Clean and potable.

F. Colored Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with record of satisfactoryperformance in masonry mortars.

G. Subject to compliance with requirements, colored mortar pigments that may beincorporated in the Work include, but are not limited to, the following:

1. "Centurion Pigments," Centurion.
2. "True Tone Mortar Colors," Davis Colors, A Subsidiary of Rockwood Industries,Inc.
3. "SGS Mortar Colors," Solomon Grind-Chem Services, Inc.

2.08 MORTAR AND GROUT MIXES

A. General: Do not add admixtures including coloring pigments, air-entraining agents, accelerators, retarders, water repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated. Do not use calcium chloride in mortar or grout.

B. Mortar for concrete masonry units, brick, glazed brick and SGFT to comply withrequirements of ASTM C 270, Type N; unless indicated otherwise.

1. Mortar for all exposed glazed brick and SGFT joints shall be held back fromsurface and pointed with non-staining joint filler mortar formulated for use aspointing mortar for, and approved by manufacturer of SGFT units in color indicated, or if not otherwise indicated, as selected by the Authority. Use Hydroment Joint Filler or approved equal.

C. Colored Pigmented Mortar: Select and proportion pigments with other ingredients toproduce color selected by the Authority.

D. Grout for Unit Masonry: Comply with ASTM C 476 and referenced unit masonry standard.

2.09 JOINT REINFORCEMENT

A. General: Provide joint reinforcement complying with requirements of referenced unit masonry standard and this article, formed from galvanized carbon steel wire, coatingclass as required by referenced unit masonry standard for application indicated.

B. Description: Welded-wire units prefabricated with deformed continuous side rods and plain cross rods into straight lengths of not less than 10 feet, with prefabricated cornerand tee units, and complying with requirements indicated below:

1. Wire Diameter for Side Rods: 0.1483 inch (9 gage).
2. Wire Diameter for Cross Rods: 0.1483 inch (9 gage).
3. For single-wythe masonry provide truss or ladder design with continuous diagonal or perpendicular cross rods spaced not more than 16 inches o.c. with single pair of side rods.
4. For multiwythe masonry provide truss or ladder design with diagonal or perpendicular cross rods spaced not more than 16 inches o.c. and one side rodfor each face shell of hollow masonry units more than 4 inches in nominal width,plus one side rod for each wythe of masonry 4 inches or less in nominal width.

C. Subject to compliance with requirements, manufacturers offering joint reinforcement thatmay be incorporated in the Work include, but are not limited to, the following:

1. AA Wire Products Co.
2. Dur-O-Wal, Inc.
3. Heckman Building Products, Inc.
4. Hohmann & Barnard, Inc.
5. Masonry Reinforcing Corp. of America.
6. National Wire Products Industries.
7. Southern Construction Products, Inc.

2.10 TIES AND ANCHORS, GENERAL

A. General: Provide ties and anchors specified in subsequent articles that comply with requirements for metal and size of referenced unit masonry standard and of this article.

B. Galvanized Steel Sheet: ASTM A 366/A366M (commercial quality) cold-rolled carbon steel sheet, hot-dip galvanized after fabrication to comply with ASTM A 924, Class B3.

C. Corrugated Wall Ties: Galvanized steel 7/8 inch wide and 7 inches long, 20 gauge.

D. Products: Subject to compliance with requirements, provide one of the following:

1. AA Wire Products Co.
2. Dur-O-Wal, Inc.
3. Heckman Building Products, Inc.
4. Hohmann & Barnard, Inc.
5. Masonry Reinforcing Corp. of America.
6. National Wire Products Industries.
7. Southern Construction Products, Inc.

2.11 ANCHOR BOLTS

A. Anchor Bolts: Nonheaded steel bolts complying with A 36, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A153, Class C; of diameter and length indicated and bent in manner indicated.

B. Anchors as described below, with capability to sustain, without failure, load imposed within factors of safety indicated, as determined by testing per ASTM E 488, conductedby a qualified independent testing laboratory.

1. Type: Expansion anchors.
2. Corrosion Protection: Carbon steel components zinc-plated to comply with ASTMB 633, Class Fe/Zn 5 (5 microns) for Class SC 1 service condition (mild).
3. For post-installed anchors in grouted concrete masonry units: Capability tosustain, without failure, a load equal to 6 times loads imposed by masonry.

2.12 REINFORCEMENT

A. Vertical and horizontal reinforcement shall be deformed bars, epoxy-coated, from concrete pier or foundation continuous to top of masonry wall, including bond beam.

Size of bars as shown on drawings or, if not shown, No. 4. Fully grout reinforcing bar into cells.Vertical bars to be set into concrete for minimum depth indicated. All bars shall be ASTM A615, Grade 60 epoxy-coated per ASTM A775.

2.13 LINTELS

A. Lintels to be steel angles, ASTM A 36, sizes as shown on the drawings, lengths as verified in the field to provide proper bearing at each side of the opening. All steel lintelsto be hot dipped galvanized after fabrication, complying with ASTM A 123.

2.14 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural SheetMetal Manual and as follows:

1. Stainless Steel: ASTM A 240/A 240M, Type 304, 0.016 inch (0.4 mm) thick.
2. Copper: ASTM B 370, Temper H00 or H01, cold-rolled copper sheet, 10-oz./sq. ft. (3kg/sq. m) weight or 0.0135 inch (0.34 mm) thick for fully concealed flashing; 16-oz./sq. ft. (5-kg/sq. m) weight or 0.0216 inch (0.55 mm) thick elsewhere.
3. Fabricate continuous flashings in sections 96 inches (2400 mm) long minimum,but not exceeding 12 feet (3.6 m). Provide splice plates at joints of formed, smooth metal flashing.

B. Fabricate through-wall metal flashing embedded in masonry from stainless steel orcopper, with ribs at 3-inch (75-mm) intervals along length of flashing to provide an integral mortar bond.

1. Products:

a. Cheney Flashing Company.
b. Keystone Flashing Company, Inc.
c. Approved equal.

2. Fabricate through-wall flashing with drip edge where indicated. Fabricate by extending flashing 1/2 inch (13 mm) out from wall, with outer edge bent down 30degrees.
3. Metal Drip Edges: Fabricate from stainless steel. Extend at least 3 inches into walland ½ inch out from wall, with outer edge bent down 30 degrees and hemmed.
4. Metal Flashing Terminations: Fabricate from stainless steel. Extend at least 3 inches (75 mm) into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for 3/4 inch (19 mm) and down into joint 3/8 inch (10 mm)to form a stop for retaining sealant backer rod.
5. Metal Expansion-Joint Strips: Fabricate from stainless steel or copper to shapesindicated.

C. Flexible Flashing: For flashing not exposed to the exterior, use one of the following,unless otherwise indicated:

1. Copper-Laminated Flashing: 5-oz./sq. ft. (1.5-kg/sq. m)] [7-oz./sq. ft. (2-kg/sq. m)] copper sheet bonded with asphalt between 2 layers of glass-fiber cloth. Useonly where flashing is fully concealed in masonry.
2. Available Products:

a. Advanced Building Products Inc.; Copper Fabric Flashing.
b. AFCO Products Inc.; Copper Fabric.
c. Hohmann & Barnard, Inc.; H & B C-Fab Flashing.
d. Phoenix Building Products; Type FCC-Fabric Covered Copper.
e. Polytite Manufacturing Corp.; Copper Fabric Flashing.
f. Sandell Manufacturing Co., Inc.; Copper Fabric Flashing.
g. York Manufacturing, Inc.; York Copper Fabric Flashing.
h. Approved Equal.

D. Asphalt-Coated Copper Flashing: 5-oz./sq. ft. (1.5-kg/sq. m), 7-oz./sq. ft. (2-kg/sq. m) copper sheet coated with flexible asphalt. Use only where flashing is fully concealed inmasonry.

1. Available Products:

a. Advanced Building Products Inc.; Cop-R-Cote.
b. AFCO Products Inc.; Cop-A-Cote.
c. Hohmann & Barnard, Inc.; H & B C-Coat Flashing.
d. Phoenix Building Products; Type ACC-Asphalt Bituminous Coated.
e. Polytite Manufacturing Corp.; Coated Copper Flashing.
f. Sandell Manufacturing Co., Inc.; Coated Copper Flashing.
g. York Manufacturing, Inc.; Copperseal.
h. Approved Equal.

E. Rubberized-Asphalt Flashing: Composite flashing product consisting of a pliable, adhesive rubberized-asphalt compound (or comparable approved material), bonded to ahigh-density, cross-laminated polyethylene film (or comparable approved material) to produce an overall thickness of not less than 0.040 inch (1.0 mm).

1. Available Products:

a. Advanced Building Products Inc.; Peel-N-Seal.
b. Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing.
c. Dayton Superior Corporation, Dur-O-Wal Division; Dur-O-Barrier-44.
d. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Perm-A-Barrier Wall Flashing.
e. Heckmann Building Products Inc.; No. 82 Rubberized-Asphalt Thru-WallFlashing.
f. Hohmann & Barnard, Inc.; Textroflash.
g. Polyguard Products, Inc.; Polyguard 300.
h. Polytite Manufacturing Corp.; Poly-Barrier Self-Adhering Wall Flashing.
i. Williams Products, Inc.; Everlastic MF-40.
j. Approved Equal.

F. Elastomeric Thermoplastic Flashing: Composite flashing product consisting of apolyesterreinforced ethylene interpolymer alloy as follows:

1. Monolithic Sheet: Elastomeric thermoplastic flashing, 0.040 inch (1.0 mm) thick.Self-Adhesive Sheet: Elastomeric thermoplastic flashing, 0.025 inch (0.6 mm) thick, with a 0.015-inch- (0.4-mm-) thick coating of rubberized-asphalt adhesive.
2. Self-Adhesive Sheet with Drip Edge: Elastomeric thermoplastic flashing, 0.025inch (0.6 mm) thick, with a 0.015-inch- (0.4-mm-) thick coating of rubberized- asphalt adhesive. Where flashing extends to face of masonry,

rubberized- asphalt coating is held back approximately 1-1/2 inches (38 mm) from edge.

a. Color: Black.

3. Accessories: Provide preformed corners, end dams, other special shapes, andseaming materials produced by flashing manufacturer.
4. Available Products:

a. Hyload, Inc.; Hyload Cloaked Flashing System.
b. Approved Equal.

G. EPDM Flashing: Sheet flashing product made from ethylene-propylene-dieneterpolymer, complying with ASTM D 4637, 0.040 inch (1.0 mm) thick.

1. Available Products:

a. Carlisle Coatings & Waterproofing; Pre-Kleened EPDM Thru-WallFlashing.
b. Firestone Building Products; FlashGuard.
c. Heckmann Building Products Inc.; No. 81 EPDM Thru-Wall Flashing.
d.Approved Equal.

H. Solder and Sealants for Sheet Metal Flashings:

1. Solder for Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of typerecommended by stainless-steel sheet manufacturer.
2. Solder for Copper: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead.
3. Elastomeric Sealant: ASTM C 920, chemically curing silicone sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashingand trim and remain watertight.

I. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheetsto each other and to substrates.

2.15 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2, Class A, Grade 1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene urethane or PVC.

B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 or PVC, complying with ASTM D2287, Type PVC65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226,Type I (No. 15 asphalt felt).

D. Weep/Vent Products: Use one of the following, unless otherwise indicated:

1. Wicking Material: Absorbent rope, made from cotton or UV-resistant synthetic fiber, 1/4 to 3/8 inch (6 to 10 mm) in diameter, in length required to

produce 2- inch (50-mm) exposure on exterior and 18 inches (450 mm) in cavity betweenwythes. Use only for weeps.

2. Round Plastic Weep/Vent Tubing: Medium-density polyethylene, 3/8-inch (9- mm) OD by 4 inches (100 mm) long.
3. Rectangular Plastic Weep/Vent Tubing: Clear butyrate, 3/8 by 1-1/2 by 3-1/2 inches (9 by 38 by 89 mm) long.
4. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth1/8 inch (3 mm) less than depth of outer wythe, in color selected from manufacturer's standard.
5. Available Products:

    a. Advanced Building Products Inc.; Mortar Maze weep vent.
    b. Dayton Superior Corporation, Dur-O-Wal Division; Cell Vents.
    c. Heckmann Building Products Inc.; No. 85 Cell Vent.
    d. Hohmann & Barnard, Inc.; Quadro-Vent.
    e. Wire-Bond; Cell Vent.
    f. Approved Equal.

E. Mesh Weep/Vent: Free-draining mesh; made from polyethylene strands, full height andwidth of head joint and depth 1/8 inch (3 mm) less than depth of outer wythe; in color selected from manufacturer's standard.

1. Available Products:

    a. Mortar Net USA, Ltd.; Mortar Net Weep Vents.
    b. Approved Equal.

F. Aluminum Weep Hole/Vent: One-piece, L-shaped units made from sheet aluminum, designed to fit into a head joint and consisting of a vertical channel with louvers stampedin web and with a top flap to keep mortar out of the head joint; painted before installationto comply with painting Section in color approved by Authority to match that of mortar.

1. Available Products:

    a. Hohmann & Barnard, Inc.; #343W - Wilko Weep Hole.
    b. Approved Equal.

G. Vinyl Weep Hole/Vent: One-piece, offset, T-shaped units made from flexible, injection- molded PVC, designed to fit into a head joint and consisting of a louvered vertical leg, flexible wings to seal against ends of masonry units, and a top flap to keep mortar out ofthe head joint; in color approved by Commissioner to match that of mortar.

1. Available Products:

    a. Hohmann & Barnard, Inc.; #343 Louvered Weep Hole.
    b. Williams Products, Inc.; Williams-Goodco Brick Vent.
    c. Wire-Bond; Louvered Weepholes.
    d. Approved Equal.

H. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity, .4 inch thick, reticulated, nonabsorbent mesh and

shapedto maintain drainage at weep holes without being clogged by mortar droppings.

1. Provide one of the following configurations:

    a. Strips, full-depth of cavity and 10 inches (250 mm) wide, with dovetail shaped notches 7 inches (175 mm) deep that prevent mesh from beingclogged with mortar droppings.
    b. Strips, not less than 3/4 inch (19 mm) or 1-1/2 inches (38 mm) thick and 10 inches (250 mm) wide, with dimpled surface designed to catch mortardroppings and prevent weep holes from being clogged with mortar.
    c. Sheets or strips full depth of cavity and installed to full height of cavity.
    d. Sheets or strips not less than 3/4 inch (19 mm) or 1 inch (25 mm) thick and installed to full height of cavity with additional strips 4 inches (100 mm) high at weep holes and thick enough to fill entire depth of cavity andprevent weep holes from being clogged with mortar.

2. Available Products:

    a. Advanced Building Products Inc.; Mortar Break.
    b. Archovations, Inc.; CavClear Masonry Mat.
    c. Dayton Superior Corporation, Dur-O-Wal Division; Polytite MortarStop.
    d. Mortar Net USA, Ltd.; Mortar Net.
    e. Approved Equal.

I. Insulation: Extruded Polystyrene Board Insulation: Rigid cellular polystyrene thermal insulation with closed cells and integral high-density skin, formed by the expansion of polystyrene base resin in an extrusion process to comply with ASTM C 578, Type IV; inmanufacturer's standard lengths and widths; thicknesses as indicated.

1. Adhesive: Type recommended by insulation board manufacturer for applicationindicated.

J. Polyethylene Vapor Retarder: ASTM D 4397, 6 mil thick sheet, with maximumpermeance rating of 0.1 perm.

1. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.
2. Adhesive for Vapor Retarders: Product recommended by vapor-retarder manufacturer and has demonstrated capability to bond vapor retarders securelyto substrates indicated.
3. Vapor-Retarder Fasteners: Pancake-head, self-tapping steel drill screws; withfender washers

K. Termination Bar: Type 304 stainless steel termination bar.

1. Size: Minimum 1/8” thick x 1” wide with pre-drilled holes to provide specifiedanchor installation. Termination Bar manufactured by one of the following:

    a. Hohmann & Barnard.
    b. Trufast Sales and Service.

c. Heckmann Building Products, Inc.
d. Approved equal.

L. Drip Edge: Drip edge with hemmed edge to be 26 gauge, Type 304 grade stainless steelmaterial that complies with ASTM A240 and ASTM A666.

2.16 MASONRY CLEANERS

A. Job-Mixed Detergent Solution: Solution of trisodium phosphate (½-cup dry measure) andlaundry detergent (½-cup dry measure) dissolved in one gallon of water.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine conditions for compliance with requirements for installation tolerances and otherspecific conditions, and other conditions affecting performance of unit masonry. Verify availability and locations for built-in items.

B. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

A. Comply with referenced unit masonry standard and other requirements indicatedapplicable to each type of installation included in Project.

B. Thickness: Build masonry walls and other masonry construction to match the existing,thickness, coursing, etc.

C. Cut masonry units with motor-driven wet-cutting diamond blade saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining construction. Use full-size units without cutting to greatest extent possible.

D. Before laying, wet clay masonry with initial absorption rate of more than 1 gram per square inch per minute, when measured in accordance with ASTM C 67, using techniquethat will saturate clay masonry but leave it dry to touch.

3.03 CONSTRUCTION TOLERANCES

A. Comply with construction tolerances of referenced unit masonry standard and as follows:

1. Variation from Plumb: 1/4 inch in 10 feet; 2 inch maximum for building.
2. Variation from Level: 1/4 inch in 10 feet; 2 inch maximum.
3. Variation from Plan Lines: 2 inch in 20 feet; 3/4 inch maximum.
4. Variation in Cross Section: Do not exceed the following construction tolerancesfor thicknesses of walls and other masonry elements: Minus 1/4 inch or Plus 2inch.
5. Variation in Mortar Joint Thickness: Bed Joints: Plus or Minus 1/8 inch; HeadJoints Minus 1/4 inch, Plus 3/8 inch.

3.04 AIR SPACE

A. Provide a two inch minimum air space for cavity wall masonry construction.

3.05 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform jointwidths and for accurate locating of openings, joints, returns, and offsets.

B. Lay up walls to comply with specified construction tolerances, with courses accuratelyspaced and coordinated with other construction.

C. Do not use units with less that nominal 4-inch horizontal face dimensions at corners,jambs or other locations.

D. Vertical joint in each course centered on units in courses above and below. Provide anyrolok courses, projected courses, header courses, etc. where shown on the drawings.

E. Bond and interlock each course of each wythe. Bond together individual withes of masonry where possible. Lay exposed masonry in the bond pattern shown on thedrawings or as directed by the Authority.

F. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping notless than 2 inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

G. Stopping and Resuming Work: In each course, rack back 1/2-unit length for one-half running bond or 1/3-unit length for one-quarter running bond; do not tooth. Clean exposed surfaces of set masonry, wet clay masonry units lightly (if required), and removeloose masonry units and mortar prior to laying fresh masonry.

H. Built-In Work: As construction progresses, build-in items specified under this and otherSections of the Specifications. Fill in solidly with masonry around built-in items.

1. Fill space between hollow metal frames and masonry solidly with mortar,unless otherwise indicated.
2. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.
3. Fill cores in hollow concrete masonry units with grout 3 courses (24 inches) under bearing plates, beams, lintels, posts, and similar items, unlessotherwise indicated.
4. Fill cells of hollow masonry with grout where indicated. Fill cells with groutcontinuously vertically to secure vertical reinforcement.
5. Fill bond beams fully with grout.

3.06 MORTAR BEDDING AND JOINTING

A. Masonry Joints: Make mortar joints visually and dimensionally consistent. Unless otherwise indicated, maintain horizontal and vertical mortar joint widths of 3/8 inch.

B. Concealed Joints: Cut flush, unless otherwise detailed.

C. Exposed Joints: Tool exposed joints before mortar has assumed final set to matchexisting.

D. Resetting: Do not pound, tap, or otherwise attempt to adjust masonry units after initial set has occurred. Remove units which require adjusting, clean thoroughly, and reset in freshmortar.

E. Fill collar joints between wythes solidly with mortar as each coarse is laid for allmultiwythe applications except designated cavity walls.

F. Cavities: Keep clear of mortar droppings and strike flush mortar joints facing cavity.

G. Cut joints flush for masonry walls to be concealed or to be covered by other materials,unless otherwise indicated.

H. Lay hollow brick and structural glazed facing tile as follows:

1. Lay vertical-cell units with full head joints, unless otherwise indicated or required.Provide bed joints with full mortar coverage on face shells and webs.
2. Lay horizontal-cell units with full bed joints, unless otherwise indicated. Keep drainage channels, if any, free of mortar. Form head joints sufficient mortar so excess will be squeezed out as units are placed into position. Butter both sides ofunits to be placed, or butter one side of unit in place and one side of unit to be placed.

I. Lay hollow concrete masonry units as follows:

1. With full mortar coverage on horizontal and vertical face shells.
2. Bed webs in mortar in starting course on slabs and in all courses of piers, columns, and pilasters, and where adjacent to cells or cavities to be filled withgrout.
3. For starting course on slabs where cells are not grouted, spread out full mortarbed including areas under cells.

J. Pointing: Rake joints out to a depth of 3/8". Prepare a stiff working mortar of HydromentJoint Filler. Be certain the raked joints to be pointed are damp so the moisture in the pointing mortar is not lost. Tool all pointed joints concave with a 1 1/4" diameter strikingtool which is not metal. Clean tile after pointing and leave no film on the face of the tile.

K. As recommended by manufacturer, glazed brick or structural glazed tile exterior wall joints shall be pointed and filled with recommended impervious joint filler. Sponge overflush.

3.07 HORIZONTAL JOINT REINFORCEMENT

A. General: Provide continuous horizontal joint reinforcement as indicated or required, minimum 16" vertical. Install longitudinal side rods in mortar for their entire length with aminimum cover of 5/8 inch on exterior side of walls, 2 inch elsewhere. Lap reinforcing aminimum of 6 inches.

B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwiseindicated.

C. Provide continuity at corners and wall intersections by use of prefabricated "L" and "T" sections. Cut and bend reinforcement units as directed by manufacturer for continuity atreturns, offsets, pipe enclosures, and other special conditions.

3.08 MULTI-WYTHE MASONRY CONSTRUCTION

A. Individual Ties: Bond wythes together using galvanized metal ties spaced as shown, butnot less than one tie per 4.5 square feet, spaced at 24 inches on center maximum vertically and 36 inches on center maximum horizontally, and staggered in alternate courses. At openings, provide additional ties at 36 inches on center maximum. At intersections, provide additional ties at 24 inches on center maximum.

3.09 JOINT REINFORCEMENT, SINGLE-WYTHE WALLS

A. General: Provide continuous horizontal galvanized metal joint reinforcement for all single-wythe masonry walls, unless otherwise indicated. Lap reinforcing a minimum of 6 inches.

B. Vertical Spacing: Not more than 16 inches on center.

C. Continuity: Use prefabricated L-shaped and T-shaped sections at corners andintersections. Do not span movement joints with reinforcement.

3.10 VERTICAL REINFORCEMENT

A. Provide and install continuous full height vertical bars as shown on the drawings. Bars tobe secured at the base or into the foundation and extend full height of the masonry wall within the hollow masonry cells.

B. Fully grout the vertical reinforcing in the cells.

C. Overlap and tie vertical bars if wall is too high for a single vertical bar.

D. See drawings for size, type and spacing of vertical reinforcing bars.

3.11 MASONRY ANCHORS

A. Provide and install masonry anchors, anchor bolts and other embedded items grouted into hollow masonry cells as shown on the drawings or required to secure structural steelor other construction. Size, type spacings and locations as shown on the drawings. Anchors to be galvanized or stainless steel.

3.12 BOND BEAMS

A. Provide and install bond beam masonry members as shown on the drawings. Size, type and locations as shown on the drawings. Provide continuous horizontal reinforcement as shown on the drawings. Overlap and tie ends of bars where length exceeds the standard.Fill bond beam void fully with grout.

3.13 INSTALLATION OF REINFORCED UNIT MASONRY

A. Preparation: Clean reinforced bars of loose rust; do not use bars which have rustedexcessively or which have bends or kinks not shown on the drawings.

B. Placing Reinforcement: Secure reinforcement accurately at locations indicated and to avoid displacement; minimum spacing between bars or to masonry surfaces shall be bardiameter or 1/4 inch for fine grout and ½ inch for coarse grout, whichever is greater.

C. Splicing: Provide lapped splices of minimum size indicated or permitted by governingcode at locations shown.

3.14 GROUTING

A. Grout cells of split-faced and other hollow celled concrete block. Do not exceed 51 inchesin height for grout pours.

B. Vertical cell fins shall be no greater than ¼ inch.

C. Provide and install vertical reinforcement grouted into hollow masonry cells.

3.15 PRECAST CONCRETE

A. Install precast concrete as shown. Set in full bed of mortar. Provide concealed metal anchorage between precast concrete and masonry wall, minimum three per precast section, grout all voids. Precast concrete to be in largest sections possible. Miter precastconcrete at corners. Joints to be filled with mortar and struck flush.

3.16 INSTALLING MASONRY FLASHING

A. General: Whether or not specifically indicated, install continuous flashing at all conditionssuch as lintels, shelf angles, or at the base of the wall, where the downward flow of any water within the masonry will be interrupted, so that such water will be diverted to the exterior. Extend flashings full width at such obstructions and at least 4 inches into adjoining masonry, or turn up 1 inch minimum to form weathertight pan at non-masonry construction. Remove or cover protrusions or sharp edges on substrates which could puncture flashings. Place flashings on sloped mortar bed; seal lapped ends and penetrations of flashing before covering with mortar.

1. Extend embedded flashings through exterior face of masonry and turn down toform drip.

B. Through-Wall Flashings: Bring completely through inner wythe and turn up where concealed by other construction; otherwise stop not more than ½ inch from inner face.Drop flashing at least 4 inches before bringing through outer wythe.

C. Veneer Flashings: Turn flashings up not less than 4 inches at backup. Lap top of flashingwith building paper, or otherwise seal to prevent moisture penetration between flashing and backup.

D. Heads, Sills and Base: Turn up ends of flashing at least 2 inches at heads and sills toform a pan, and seal joints.

E. Flashing at top of wall: Provide continuous flashing at the top of masonry walls where shown, fully covering the entire top of the wall, to keep moisture from infiltrating the wall.Extend the flashing at either or both sides of the wall as a drip.

F. All flashing to be continuous. Solder joints between pieces of flashing except provide an overlap and sealer at joints required for expansion and contraction of the metal flashing.Provide drip or turn up flashing at terminations.

G. Sealing: Seal all joints in flashing to assure watertight integrity.

1. Lap end joints at non-deformed metal flashings at least 4 inches; seal laps

withelastic sealant or mastic.

3.17 VAPOR RETARDER

A. Preparation: Clean substrates of substances that are harmful to vapor retarders,including removing projections capable of puncturing vapor retarders.

B. Installation of Vapor Retarder:

1. Place vapor retarders on side of construction indicated on Drawings.
2. Extend vapor retarders to extremities of areas to protect from vapor transmission.Secure vapor retarders in place with adhesives, vapor retarder fasteners, or otheranchorage system as recommended by manufacturer. Extend vapor retarders to cover miscellaneous voids in insulated substrates.
3. Seal vertical joints in vapor retarders by lapping and sealing with vapor-retardertape according to vapor-retarder manufacturer's written instructions. Locate all joints over framing members or other solid substrates.
4. Seal joints caused by pipes, conduits and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetratingobjects and vapor retarders.
5. Repair tears or punctures in vapor retarders immediately before concealment byother work. Cover with vapor-retarder tape or another layer of vapor retarder.

3.18 AIR VENTS AND WEEP HOLES

A. Provide air vents and weep holes by eliminating mortar at head joints and fill joint with specified vent or weep material. Provide at all head joints where indicated at top of wall,base of wall and at lintels.

B. Weep Holes: Provide weep holes no less than 3/16” in diameter in head joints of the firstcourse of masonry immediately above concealed flashings at base, lintels, etc. If not at every head joint, space at intervals of 24" on center maximum.

3.19 LINTELS

A. Install galvanized steel lintels at the heads of all openings where indicated. Set lintelslevel; shim and/or grout at each end as required.

B. Provide minimum solid bearing of 8 inches at each jamb, unless otherwise indicated.

C. Cut masonry as required to fit steel lintel angle. Pack solidly with mortar.

D. Provide and install specially formed bond beam units with reinforcement bars placed asindicated and filled with coarse grout.

E. Provide masonry lintels where shown and where openings of more than 12 inches for brick size units and 24 inches for block size units are shown without structural steel orother supporting lintels.

1. Provide prefabricated or built-in-place masonry lintels. Use specially formed bondbeam units with reinforcement bars placed as indicated and filled with coarse

grout. Cure precast lintels before handling and installing. Temporarily supportbuilt-in-place lintels until cured.

3.20 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwisedamaged or if units do not match adjoining units. Install new units to match adjoining units and in fresh mortar or grout, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge any voids or holes, except weep holes, andcompletely fill with mortar. Point-up all joints including corners, openings, and adjacent construction to provide a neat, uniform appearance, prepared for application of sealants.

C. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry asfollows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallicscrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave ½ panel un-cleaned for comparison purposes. Obtain Authority's approval of sample cleaning beforeproceeding with cleaning of masonry.
3. Protect adjacent non-masonry surfaces from contact with cleaner by coveringthem with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
4. Wet wall surfaces with water prior to application of cleaners; remove cleanerspromptly by rinsing thoroughly with clear water.
5. Clean brick by means of bucket and brush hand-cleaning method described inBIA "Technical Note No. 20 Revised" using a job-mixed detergent solution.

D. Protection: Provide final protection and maintain conditions, in a manner acceptable toInstaller, that ensure unit masonry is without damage and deterioration at time of Substantial Completion.

E. Clean new brick, glazed brick and SGFT using a masonry detergent and water or asrecommended by the manufacturer.

3.21 FINISHING

A. Field prime and paint exposed portions of steel lintels. See Division 09 Section, Painting.Touch up any damaged galvanized surfaces with galvanizing repair paint prior to prime and finish coats.

3.22 FIELD QUALITY CONTROL

A. Contractor shall engage and pay for a qualified independent testing and inspecting agency, approved by the Authority, to perform field tests and inspections indicated belowand prepare test reports:

B. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.

C. Clay Masonry Unit Test: For each type of unit provided, per ASTM C 67.

D. Concrete Masonry Unit Test: For each type of unit provided, per ASTM C 140.

E. Mortar Test (Property Specification): For each mix provided, per ASTM C 780.

F. Grout Test (Compressive Strength): For each mix provided, per ASTM C 1019.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 04 80 00, Unit Masonry shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 04 80 00, Unit Masonry shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 04 80 00.S
UNIT MASONRY

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions and Division 01 Specification sections, apply to this section.

1.02 SUMMARY

A. This Section includes the following:

1. Concrete Block.
2. Structural Glazed Facing Tile.
3. Bond Beams.
4. Mortar and Grout for Masonry.
5. Masonry Joint Reinforcement.
6. Steel Lintels.
7. Anchors, Ties, Accessories.
8. Embedded Flashing.
9. Wall Insulation.
10. Vapor Retarder.

B. Related sections:

1. Division 07 Section, “Joint Sealants”.
2. Division 08 Section, “Stainless Steel Doors and Frames”.
3. Division 08 Section, “Access Doors and Frames”.
4. Division 09 Section, “Painting”.

1.03 REFERENCES

A. Masonry Standards Joint Committee (MSJC):

1. “Building Code Requirements and Specifications for Masonry Structures”, current edition.

B. Technical Notes on Brick Construction.

C. American Concrete Institute (ACI):

1. ACI 315, Details and Detailing of Concrete Reinforcement.

D. ASTM:

1. ASTM C-90, Standard Specification for Load Bearing Concrete Masonry Units.
2. ASTM C216, Standard Specification for Facing Brick.
3. ASTM A 240, Standard Specification for Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels and for General Applications.
4. ASTM C270, Standard Specifications for Mortar for Unit Masonry.

5. ASTM C476, Standard Specification for Grout for Masonry.
6. ASTM A 666, Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar.

1.04 SYSTEM PERFORMANCE REQUIREMENTS

A. Provide unit masonry that develops the following installed compressive strengths (f'm):

1. For clay unit masonry: f'm = 2000 psi.
2. For concrete unit masonry: f'm = 1500 psi.

B. Structural glazed facing tile (SGFT) shall be of uniform texture and color, and shall be certified by U.L. to meet requirements of UL 723 Surface Burning Characteristics for zero smoke developed and zero flame spread.

1.05 SUBMITTALS

A. General: For all masonry units, submit product data, specifications, test reports and actual samples for review, selection, and approval for each type of masonry unit.

B. Provide shop drawings for reinforcing steel. Detail bending and placement of unit masonry around reinforcing bars. Comply with ACI 315, “Details and Detailing of Concrete
Reinforcement”. Show elevations of reinforced walls with openings indicated and maximum pour height indicated on drawings.

C. Provide shop drawings indicating sizes and shapes of all masonry units to be used, including concrete block, structural glazed facing tile, precast concrete and bond beams.

D. Mix designs indicating type and proportions of ingredients for mortar and grout according to the requirements of ASTM C270 and ASTM C 476 respectively.

E. Samples for verification, selection and approval by the Authority of the following:

1. Color and texture charts and samples for initial selection of structural glazed facing tile, precast concrete and mortar.
2. Full-size units for each different exposed brick, glazed brick, structural glazed facing tile and precast concrete required, showing full range of exposed colors, texture, and dimensions to be expected in completed construction. Include size variation data verifying that actual range of sizes, finishes and colors.

    a. See drawings for size of new glazed brick and types of glazed brick required. See drawings for indication of which bricks are to be glazed and on which side(s). Finish, texture and color of glazing to match approved sample.

3. Colored masonry mortar samples for each color required showing the full range of colors expected in the finished construction. Label samples to indicate type and amount of colorant used.

F. Material certificates for the following signed by manufacturer and Contractor certifying that each material complies with requirements.

1. Each different cement product required for mortar and grout including name of manufacturer, brand, and type.
2. Each type and size of joint reinforcement, anchors, ties and metal accessories.
3. Each type of masonry accessories.
4. Rigid insulation.
5. Vapor retarder.

G. Qualification Data: For testing agency.

H. Test Reports:

1. Include test reports, per ASTM C 67 for each type of clay masonry unit required.to comply with specification.
2. Include test reports, per ASTM C 140 for each type of concrete masonry unit required to comply with specification.
3. Include test reports, per ASTM C 780 for mortar mixes required to comply with property specification.
4. Include test reports, per ASTM C 1019 for grout mixes required to comply with compressive strength requirement.

1.06 QUALITY ASSURANCE

A. Unit Masonry Standard: Comply with TMS 6021 ACI 530.1/ASCE 6 "Specifications for Masonry Structures," except revise to exclude Articles 1.4 and 1.7; Paragraphs 2.1.2, 3.1.2, and 4.1.2; and Subparagraphs 1.5.1.2, 1.5.1.3, 2.1.1.1 and to modify Subparagraph 2.1.1.5 by deleting requirement for installing vent pipes and conduits built into masonry.

B. Provide Level B Quality Assurance RE Table 4 of TMS 6021 ACI 530.1 (ASCE 6 Specification).

C. Masonry Units must meet the following ASTM standards:

1. Structural Glazed Tile (SGT): ASTM C 126, Standard Specification for Structural Glazed Tile Units, Grade S, Type I & II.

D. Single-Source Responsibility for Masonry Units: Obtain exposed masonry units of each type of uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from one manufacturer for each different product required for each continuous surface or visually related surfaces.

E. Single-Source Responsibility for Mortar Materials: Obtain mortar ingredients of uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source and producer for each aggregate.

F. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1093 for testing indicated, as documented according to ASTM E 548.

G. Preconstruction Testing Service: Contractor will engage and pay for a qualified independent testing agency, approved by the Authority, tp perform preconstruction testing as follows:

1. Clay Masonry Unit Test: For each type of unit required, per ASTM C 67, “Test Methods for Sampling and Testing Brick and Structural Clay Tile”.
2. Concrete Masonry Unit Test: For each type of unit required per ASTM C 140, “Test Methods for Sampling and Testing Concrete Masonry Units”.
3. Mortar Test (Property Specification): For each mix required, per ASTM C 780, “Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry”.
4. Grout Test: (Compressive Strength): For each mix required, per ASTM C 1019, “Method of Sampling and Testing Grout”.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver masonry materials to project in undamaged condition.

B. Store and handle masonry units and cementitious materials off the ground, under cover, and in a dry location to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion, and other causes. If units become wet, do not place until units are in an air-dried condition.

C. Avoid cracking, chipping or other damage to brick, glazed brick, SGFT or precast concrete during delivery, storage, or handling.

D. Ceramic glazed SGFT units to be packaged and shipped in protective trays with separators on wooden pallets. Do not remove from protective packaging until units are installed.

1.08 PROJECT CONDITIONS

A. Protection of Masonry: During erection, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
2. Where one wythe of multi-wythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Remove immediately any grout, mortar, and soil that come in contact with masonry.

1. Protect base of walls from rain-splashed mud and mortar splatter by means of coverings spread on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes from mortar droppings.

D. Cold-Weather Construction: No masonry work shall be installed in an atmosphere with temperature less than 40 degrees F unless the work is protected using the following procedures.

1. Do not lay masonry units that are wet, frozen or covered with frost or ice.
2. Remove masonry damaged by freezing conditions.
3. In heating mortar materials, maintain mixing temperatures selected within 10 degrees F; do not heat water for mortar to above 160 degrees F.
4. Mortar: At 40 degrees F and below, produce mortar temperatures between 40 degrees F and 120 degrees F by heating mixing water and, at temperatures of 32 degrees F and below, sand as well. Always maintain temperature of mortar on boards above freezing.
5. At 25 degrees F to 20 degrees F, heat both sides of walls under construction and use windbreaks or enclosures when wind is in excess of 15 mph.
6. At 20 degrees F and below, provide enclosure and auxiliary heat to maintain an air temperature of at least 40 degrees F for 24 hours after setting dimension stonework, and heat stones so that they are above 20 degrees F at time of installation.
7. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 degrees F. and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.

E. Hot-Weather Construction: Protect masonry construction from direct exposure to wind and sun when ambient temperature of 90 degrees F with relative humidity less than 50%.

F. Field verify sizes, lengths and conditions for steel lintels in the field prior to fabricating and installing lintels. Deliver lintels to site in sufficient time to not delay construction.

PART 2 PRODUCTS

2.01 GENERAL

A. Comply with referenced unit masonry standard and other requirements specified in this Section applicable to each material indicated.

2.03 CONCRETE MASONRY UNITS

A. General: Comply with requirements indicated below applicable to each form of concrete masonry unit required.

1. Provide special shapes where indicated and as follows:

a. For lintels, corners, jambs, control joints, headers, bonding, bond beams and other special conditions.
b. Units for outside corners at lintels etc., unless otherwise indicated.

2. Size: Provide concrete masonry units complying with requirements indicated below for size that are manufactured to specified face dimensions within tolerances specified in the applicable referenced ASTM specification for concrete masonry units.

a. Concrete Masonry Units: 7-5/8" High x 15-5/8" long x thickness indicated on the drawings.
b. Provide Type I, moisture-controlled units.

B. Exposed Faces: Manufacturer's standard color and texture, unless otherwise indicated.

C. Hollow Load-Bearing Concrete Masonry Units: ASTM C 90-00, Grade N and as follows:

1. Unit Compressive Strength: Provide units with minimum average net area compressive strength of 1900 psi.
2. Weight Classification: Normal weight.

D. Solid Load-Bearing Concrete Masonry Units: ASTM C 90-00, Grade N and as follows:

1. Unit Compressive Strength: Provide units with minimum average net area compressive strength of 1900 psi.
2. Weight Classification: Normal weight.

E. Split-faced concrete block with standard pattern, scoring, aggregate, color, finish and texture as selected by the Authority from manufacturer’s standards.

F. Masonry Lintels: Prefabricated masonry lintels made from bond beam concrete masonry units and split-faced concrete masonry units with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in place lintels until cured.

2.05 STRUCTURAL GLAZED FACING TILE UNITS

A. Structural glazed facing tile units shall be a clay unit with a ceramic facing at all exposed sides. Provide units which comply with requirements of ASTM C 126, Grade S (Select), and as follows:

1. Provide the following: Elgin-Butler Brick Company, 4” wide, 4W Series, 8" X 8" nominal size (or as shown on the drawings) Structural Glazed Tile Units.
2. Glaze colors and textures: Colors and as selected by the Authority from manufacturer’s standards.
3. Sizes: As indicated on the drawings.
4. Unit Compressive Strength: Provide units with minimum average net area compressive strength of 1900 psi.
5. Special shapes as indicated on the drawings such as for bond beams, lintels, corners, jambs, etc.
6. Bond beam units formed from hollow SGFT units with reinforcing bars placed as indicated and filled with coarse grout. Temporarily support built-in-place beams until cured.

2.06 PRECAST CONCRETE

A. Precast concrete to be of size and shape shown. Concrete to be 3000psi minimum, reinforced as required, with smooth exposed surfaces.

2.07 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce required mortar color.

B. Hydrated Lime: ASTM C 207, Type S.

C. Aggregate for Mortar: ASTM C 144, except for joints less than 1/4 inch use aggregate graded with 100 percent passing the No. 16 sieve. White Mortar Aggregates: Natural white sand or ground white stone.

D. Aggregate for Grout: ASTM C 404.

E. Water: Clean and potable.

F. Colored Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with record of satisfactory performance in masonry mortars.

G. Subject to compliance with requirements, colored mortar pigments that may be incorporated in the Work include, but are not limited to, the following:

1. "Centurion Pigments," Centurion.
2. "True Tone Mortar Colors," Davis Colors, A Subsidiary of Rockwood Industries, Inc.
3. "SGS Mortar Colors," Solomon Grind-Chem Services, Inc.

2.08 MORTAR AND GROUT MIXES

A. General: Do not add admixtures including coloring pigments, air-entraining agents, accelerators, retarders, water repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated. Do not use calcium chloride in mortar or grout.

B. Mortar for concrete masonry units, brick, glazed brick and SGFT to comply with requirements of ASTM C 270, Type N; unless indicated otherwise.

1. Mortar for all exposed glazed brick and SGFT joints shall be held back from surface and pointed with non-staining joint filler mortar formulated for use as pointing mortar for, and approved by manufacturer of SGFT units in color indicated, or if not otherwise indicated, as selected by the Authority. Use Hydroment Joint Filler or approved equal.

C. Colored Pigmented Mortar: Select and proportion pigments with other ingredients to produce color selected by the Authority.

D. Grout for Unit Masonry: Comply with ASTM C 476 and referenced unit masonry standard.

2.09 JOINT REINFORCEMENT

A. General: Provide joint reinforcement complying with requirements of referenced unit masonry standard and this article, formed from galvanized carbon steel wire, coating class as required by referenced unit masonry standard for application indicated.

B. Description: Welded-wire units prefabricated with deformed continuous side rods and plain cross rods into straight lengths of not less than 10 feet, with prefabricated corner and tee units, and complying with requirements indicated below:

1. Wire Diameter for Side Rods: 0.1483 inch (9 gage).
2. Wire Diameter for Cross Rods: 0.1483 inch (9 gage).
3. For single-wythe masonry provide truss or ladder design with continuous diagonal or perpendicular cross rods spaced not more than 16 inches o.c. with single pair of side rods.
4. For multiwythe masonry provide truss or ladder design with diagonal or perpendicular cross rods spaced not more than 16 inches o.c. and one side rod for each face shell of hollow masonry units more than 4 inches in nominal width, plus one side rod for each wythe of masonry 4 inches or less in nominal width.

C. Subject to compliance with requirements, manufacturers offering joint reinforcement that may be incorporated in the Work include, but are not limited to, the following:

1. AA Wire Products Co.
2. Dur-O-Wal, Inc.
3. Heckman Building Products, Inc.
4. Hohmann & Barnard, Inc.
5. Masonry Reinforcing Corp. of America.
6. National Wire Products Industries.
7. Southern Construction Products, Inc.

2.10 TIES AND ANCHORS, GENERAL

A. General: Provide ties and anchors specified in subsequent articles that comply with requirements for metal and size of referenced unit masonry standard and of this article.

B. Galvanized Steel Sheet: ASTM A 366/A366M (commercial quality) cold-rolled carbon steel sheet, hot-dip galvanized after fabrication to comply with ASTM A 924, Class B3.

C. Corrugated Wall Ties: Galvanized steel 7/8 inch wide and 7 inches long, 20 gauge.

D. Products: Subject to compliance with requirements, provide one of the following:

1. AA Wire Products Co.
2. Dur-O-Wal, Inc.
3. Heckman Building Products, Inc.
4. Hohmann & Barnard, Inc.
5. Masonry Reinforcing Corp. of America.
6. National Wire Products Industries.
7. Southern Construction Products, Inc.

2.11 ANCHOR BOLTS

A. Anchor Bolts: headless steel bolts complying with A 36, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153, Class C; of diameter and length indicated and bent in manner indicated.

B. Anchors as described below, with capability to sustain, without failure, load imposed within factors of safety indicated, as determined by testing per ASTM E 488, conducted by a qualified independent testing laboratory.

1. Type: Expansion anchors.
2. Corrosion Protection: Carbon steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5 (5 microns) for Class SC 1 service condition (mild).
3. For post-installed anchors in grouted concrete masonry units: Capability to sustain, without failure, a load equal to 6 times loads imposed by masonry.

2.12 REINFORCEMENT

A. Vertical and horizontal reinforcement shall be deformed bars, from concrete pier or foundation continuous to top of masonry wall, including bond beam. Size of bars as shown on drawings or, if not shown, No. 4. Fully grout reinforcing bar into cells. Vertical bars to be set into concrete for minimum depth indicated. All bars shall be ASTM A615, Grade 60 epoxy-coated per ASTM A775.

2.13 LINTELS

A. Lintels to be steel angles, ASTM A 36, sizes as shown on the drawings, lengths as verified in the field to provide proper bearing at each side of the opening. All steel lintels to be hot dipped galvanized after fabrication, complying with ASTM A 123.

2.14 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual and as follows:

1. Stainless Steel: ASTM A 240/A 240M, Type 304, 0.016 inch (0.4 mm) thick.
2. Copper: ASTM B 370, Temper H00 or H01, cold-rolled copper sheet, 10-oz./sq. ft. (3kg/sq. m) weight or 0.0135 inch (0.34 mm) thick for fully concealed flashing; 16-oz./sq. ft. (5-kg/sq. m) weight or 0.0216 inch (0.55 mm) thick elsewhere.
3. Fabricate continuous flashings in sections 96 inches (2400 mm) long minimum, but not exceeding 12 feet (3.6 m). Provide splice plates at joints of formed, smooth metal flashing.

B. Fabricate through-wall metal flashing embedded in masonry from stainless steel or copper, with ribs at 3-inch (75-mm) intervals along length of flashing to provide an integral mortar bond.

1. Products

a. Cheney Flashing Company.
b. Keystone Flashing Company, Inc.
c. Approved equal.

2. Fabricate through-wall flashing with drip edge where indicated. Fabricate by extending flashing 1/2 inch (13 mm) out from wall, with outer edge bent down 30 degrees.
3. Metal Drip Edges: Fabricate from stainless steel. Extend at least 3 inches into wall and ½ inch out from wall, with outer edge bent down 30 degrees and hemmed.

4. Metal Flashing Terminations: Fabricate from stainless steel. Extend at least 3 inches (75 mm) into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for 3/4 inch (19 mm) and down into joint 3/8 inch (10 mm) to form a stop for retaining sealant backer rod.
5. Metal Expansion-Joint Strips: Fabricate from stainless steel or copper to shapes indicated.

C. Flexible Flashing: For flashing not exposed to the exterior, use one of the following, unless otherwise indicated:

1. Copper-Laminated Flashing: 5-oz./sq. ft. (1.5-kg/sq. m)] [7-oz./sq. ft. (2-kg/sq. m)] copper sheet bonded with asphalt between 2 layers of glass-fiber cloth. Use only where flashing is fully concealed in masonry.
2. Available Products:

a. Advanced Building Products Inc.; Copper Fabric Flashing.
b. AFCO Products Inc.; Copper Fabric.
c. Hohmann & Barnard, Inc.; H & B C-Fab Flashing.
d. Phoenix Building Products; Type FCC-Fabric Covered Copper.
e. Polytite Manufacturing Corp.; Copper Fabric Flashing.
f. Sandell Manufacturing Co., Inc.; Copper Fabric Flashing.
g. York Manufacturing, Inc.; York Copper Fabric Flashing.
h. Approved Equal.

D. Asphalt-Coated Copper Flashing: 5-oz./sq. ft. (1.5-kg/sq. m), 7-oz./sq. ft. (2-kg/sq. m) copper sheet coated with flexible asphalt. Use only where flashing is fully concealed in masonry.

1. Available Products:

a. Advanced Building Products Inc.; Cop-R-Cote.
b. AFCO Products Inc.; Cop-A-Cote.
c. Hohmann & Barnard, Inc.; H & B C-Coat Flashing.
d. Phoenix Building Products; Type ACC-Asphalt Bituminous Coated.
e. Polytite Manufacturing Corp.; Coated Copper Flashing.
f. Sandell Manufacturing Co., Inc.; Coated Copper Flashing.
g. York Manufacturing, Inc.; Copperseal.
h. Approved Equal.

E. Rubberized-Asphalt Flashing: Composite flashing product consisting of a pliable, adhesive rubberized-asphalt compound (or comparable approved material), bonded to a high-density, cross-laminated polyethylene film (or comparable approved material) to produce an overall thickness of not less than 0.040 inch (1.0 mm).

1. Available Products:

a. Advanced Building Products Inc.; Peel-N-Seal.
b. Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing.
c. Dayton Superior Corporation, Dur-O-Wal Division; Dur-O-Barrier-44.
d. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Perm-A-Barrier Wall Flashing.
e. Heckmann Building Products Inc.; No. 82 Rubberized-Asphalt Thru-Wall Flashing.

f. Hohmann & Barnard, Inc.; Textroflash.
g. Polyguard Products, Inc.; Polyguard 300.
h. Polytite Manufacturing Corp.; Poly-Barrier Self-Adhering Wall Flashing.
i. Williams Products, Inc.; Everlastic MF-40.
j. Approved Equal.

F. EPDM Flashing: Sheet flashing product made from ethylene-propylene-diene-monomer polymer, complying with ASTM D 4637, 0.040 inch (1.0 mm) thick.

1. Available Products:
   a. Carlisle Coatings & Waterproofing; Pre-Kleened EPDM Thru-Wall Flashing.
   b. Firestone Building Products; FlashGuard.
   c. Heckmann Building Products Inc.; No. 81 EPDM Thru-Wall Flashing. d. Approved Equal.

G. Solder and Sealants for Sheet Metal Flashings:

1. Solder for Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.
2. Solder for Copper: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead.
3. Elastomeric Sealant: ASTM C 920, chemically curing silicone sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

H. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.15 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2, Class A, Grade 1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene urethane or PVC.

B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, Type PVC65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

D. Weep/Vent Products: Use one of the following, unless otherwise indicated:

1. Wicking Material: Absorbent rope, made from cotton or UV-resistant synthetic fiber, 1/4 to 3/8 inch (6 to 10 mm) in diameter, in length required to produce 2-inch (50-mm) exposure on exterior and 18 inches (450 mm) in cavity between wythes. Use only for weeps.
2. Round Plastic Weep/Vent Tubing: Medium-density polyethylene, 3/8-inch (9-mm) OD by 4 inches (100 mm) long.
3. Rectangular Plastic Weep/Vent Tubing: Clear butyrate, 3/8 by 1-1/2 by 3-1/2 inches (9 by 38 by 89 mm) long.

4. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch (3 mm) less than depth of outer wythe, in color selected from manufacturer's standard.

5. Available Products:

    a. Advanced Building Products Inc.; Mortar Maze weep vent.
    b. Dayton Superior Corporation, Dur-O-Wal Division; Cell Vents.
    c. Heckmann Building Products Inc.; No. 85 Cell Vent.
    d. Hohmann & Barnard, Inc.; Quadro-Vent.
    e. Wire-Bond; Cell Vent.
    f. Approved Equal.

E. Mesh Weep/Vent: Free-draining mesh; made from polyethylene strands, full height and width of head joint and depth 1/8 inch (3 mm) less than depth of outer wythe; in color selected from manufacturer's standard.

1. Available Products:

    a. Mortar Net USA, Ltd.; Mortar Net Weep Vents.
    b. Approved Equal.

F. Aluminum Weep Hole/Vent: One-piece, L-shaped units made from sheet aluminum, designed to fit into a head joint and consisting of a vertical channel with louvers stamped in web and with a top flap to keep mortar out of the head joint; painted before installation to comply with painting Section in color approved by Authority to match that of mortar.

1. Available Products:

    a. Hohmann & Barnard, Inc.; #343W - Wilko Weep Hole.
    b. Approved Equal.

G. Vinyl Weep Hole/Vent: One-piece, offset, T-shaped units made from flexible, injection-molded PVC, designed to fit into a head joint and consisting of a louvered vertical leg, flexible wings to seal against ends of masonry units, and a top flap to keep mortar out of the head joint; in color approved by Architect to match that of mortar.

1. Available Products:

    a. Hohmann & Barnard, Inc.; #343 Louvered Weep Hole.
    b. Williams Products, Inc.; Williams-Goodco Brick Vent.
    c. Wire-Bond; Louvered Weepholes.
    d. Approved Equal.

H. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity, .4 inch thick, reticulated, nonabsorbent mesh and shaped to maintain drainage at weep holes without being clogged by mortar droppings.

1. Provide one of the following configurations:

    a. Strips, full-depth of cavity and 10 inches (250 mm) wide, with dovetail shaped notches 7 inches (175 mm) deep that prevent mesh from being clogged with mortar droppings.

b. Strips, not less than 3/4 inch (19 mm) or 1-1/2 inches (38 mm) thick and 10 inches (250 mm) wide, with dimpled surface designed to catch mortar droppings and prevent weep holes from being clogged with mortar.
c. Sheets or strips full depth of cavity and installed to full height of cavity.
d. Sheets or strips not less than 3/4 inch (19 mm) or 1 inch (25 mm) thick and installed to full height of cavity with additional strips 4 inches (100 mm) high at weep holes and thick enough to fill entire depth of cavity and prevent weep holes from being clogged with mortar.

2. Available Products:
   a. Advanced Building Products Inc.; Mortar Break.
   b. Archovations, Inc.; CavClear Masonry Mat.
   c. Dayton Superior Corporation, Dur-O-Wal Division; Polytite MortarStop.
   d. Mortar Net USA, Ltd.; Mortar Net.
   e. Approved Equal.

I. Insulation: Extruded Polystyrene Board Insulation: Rigid cellular polystyrene thermal insulation with closed cells and integral high-density skin, formed by the expansion of polystyrene base resin in an extrusion process to comply with ASTM C 578, Type IV; in manufacturer's standard lengths and widths; thicknesses as indicated.

1. Adhesive: Type recommended by insulation board manufacturer for application indicated.

J. Polyethylene Vapor Retarder: ASTM D 4397, 6 mil thick sheet, with maximum permeance rating of 0.1 perm.

1. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.
2. Adhesive for Vapor Retarders: Product recommended by vapor-retarder manufacturer and has demonstrated capability to bond vapor retarders securely to substrates indicated.
3. Vapor-Retarder Fasteners: Pancake-head, self-tapping steel drill screws; with fender washers

K. Termination Bar: Type 304 stainless steel termination bar.

1. Size: Minimum 1/8” thick x 1” wide with pre-drilled holes to provide specified anchor installation. Termination Bar manufactured by one of the following:
   a. Hohmann & Barnard.
   b. Trufast Sales and Service.
   c. Heckmann Building Products, Inc.
   d. Approved equal.

L. Drip Edge: Drip edge with hemmed edge to be 26 gauge, Type 304 grade stainless steel material that complies with ASTM A240 and ASTM A666.

2.16 MASONRY CLEANERS

A. Job-Mixed Detergent Solution: Solution of trisodium phosphate (½-cup dry measure) and laundry detergent (½-cup dry measure) dissolved in one gallon of water.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine conditions for compliance with requirements for installation tolerances and other specific conditions, and other conditions affecting performance of unit masonry. Verify availability and locations for built-in items.

B. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

A. Comply with referenced unit masonry standard and other requirements indicated applicable to each type of installation included in Project.

B. Thickness: Build masonry walls and other masonry construction to match the existing, thickness, coursing, etc.

C. Cut masonry units with motor-driven wet-cutting diamond blade saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining construction. Use full-size units without cutting to greatest extent possible.

D. Before laying, wet clay masonry with initial absorption rate of more than 1 gram per square inch per minute, when measured in accordance with ASTM C 67, using technique that will saturate clay masonry but leave it dry to touch.

3.03 CONSTRUCTION TOLERANCES

A. Comply with construction tolerances of referenced unit masonry standard and as follows:

1. Variation from Plumb: 1/4 inch in 10 feet; 2 inch maximum for building.
2. Variation from Level: 1/4 inch in 10 feet; 2 inch maximum.
3. Variation from Plan Lines: 2 inch in 20 feet; 3/4 inch maximum.
4. Variation in Cross Section: Do not exceed the following construction tolerances for thicknesses of walls and other masonry elements: Minus 1/4 inch or Plus 2 inch.
5. Variation in Mortar Joint Thickness: Bed Joints: Plus or Minus 1/8 inch; Head Joints Minus 1/4 inch, Plus 3/8 inch.

3.04 AIR SPACE

A. Provide a two inch minimum air space for cavity wall masonry construction.

3.05 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint widths and for accurate locating of openings, joints, returns, and offsets.

B. Lay up walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other construction.

C. Do not use units with less that nominal 4-inch horizontal face dimensions at corners, jambs or other locations.

D. Vertical joint in each course centered on units in courses above and below. Provide any rowlock courses, projected courses, header courses, etc. where shown on the drawings.

E. Bond and interlock each course of each wythe. Bond together individual withes of masonry where possible. Lay exposed masonry in the bond pattern shown on the drawings or as directed by the Authority.

F. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

G. Stopping and Resuming Work: In each course, rack back 1/2-unit length for one-half running bond or 1/3-unit length for one-quarter running bond; do not tooth. Clean exposed surfaces of set masonry, wet clay masonry units lightly (if required), and remove loose masonry units and mortar prior to laying fresh masonry.

H. Built-In Work: As construction progresses, build-in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items.

1. Fill space between hollow metal frames and masonry solidly with mortar, unless otherwise indicated.
2. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.
3. Fill cores in hollow concrete masonry units with grout 3 courses (24 inches) under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.
4. Fill cells of hollow masonry with grout where indicated. Fill cells with grout continuously vertically to secure vertical reinforcement.
5. Fill bond beams fully with grout.

3.06 MORTAR BEDDING AND JOINTING

A. Masonry Joints: Make mortar joints visually and dimensionally consistent. Unless otherwise indicated, maintain horizontal and vertical mortar joint widths of 3/8 inch.

B. Concealed Joints: Cut flush, unless otherwise detailed.

C. Exposed Joints: Tool exposed joints before mortar has assumed final set to match existing.

D. Resetting: Do not pound, tap, or otherwise attempt to adjust masonry units after initial set has occurred. Remove units which require adjusting, clean thoroughly, and reset in fresh mortar.

E. Fill collar joints between wythes solidly with mortar as each coarse is laid for all multi-wythe applications except designated cavity walls.

F. Cavities: Keep clear of mortar droppings and strike flush mortar joints facing cavity.

G. Cut joints flush for masonry walls to be concealed or to be covered by other materials, unless otherwise indicated.

H. Lay hollow brick and structural glazed facing tile as follows:

1. Lay vertical-cell units with full head joints, unless otherwise indicated or required. Provide bed joints with full mortar coverage on face shells and webs.
2. Lay horizontal-cell units with full bed joints, unless otherwise indicated. Keep drainage channels, if any, free of mortar. Form head joints sufficient mortar so excess will be squeezed out as units are placed into position. Butter both sides of units to be placed, or butter one side of unit in place and one side of unit to be placed.

I. Lay hollow concrete masonry units as follows:

1. With full mortar coverage on horizontal and vertical face shells.
2. Bed webs in mortar in starting course on slabs and in all courses of piers, columns, and pilasters, and where adjacent to cells or cavities to be filled with grout.
3. For starting course on slabs where cells are not grouted, spread out full mortar bed including areas under cells.

J. Pointing: Rake joints out to a depth of 3/8". Prepare a stiff working mortar of Hydroment Joint Filler. Be certain the raked joints to be pointed are damp so the moisture in the pointing mortar is not lost. Tool all pointed joints concave with a 1 1/4" diameter striking tool which is not metal. Clean tile after pointing and leave no film on the face of the tile.

K. As recommended by manufacturer, glazed brick or structural glazed tile exterior wall joints shall be pointed and filled with recommended impervious joint filler. Sponge over flush.

3.07 HORIZONTAL JOINT REINFORCEMENT

A. General: Provide continuous horizontal joint reinforcement as indicated or required, minimum 16" vertical. Install longitudinal side rods in mortar for their entire length with a minimum cover of 5/8 inch on exterior side of walls, 2 inch elsewhere. Lap reinforcing a minimum of 6 inches.

B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

C. Provide continuity at corners and wall intersections by use of prefabricated "L" and "T" sections. Cut and bend reinforcement units as directed by manufacturer for continuity at returns, offsets, pipe enclosures, and other special conditions.

3.08 MULTI-WYTHE MASONRY CONSTRUCTION

A. Individual Ties: Bond wythes together using galvanized metal ties spaced as shown, but not less than one tie per 4.5 square feet, spaced at 24 inches on center maximum vertically and 36 inches on center maximum horizontally, and staggered in alternate courses. At openings, provide additional ties at 36 inches on center maximum. At intersections, provide additional ties at 24 inches on center maximum.

3.09 JOINT REINFORCEMENT, SINGLE-WYTHE WALLS

A. General: Provide continuous horizontal galvanized metal joint reinforcement for all single-wythe masonry walls, unless otherwise indicated. Lap reinforcing a minimum of 6 inches.

B. Vertical Spacing: Not more than 16 inches on center.

C. Continuity: Use prefabricated L-shaped and T-shaped sections at corners and intersections. Do not span movement joints with reinforcement.

3.10 VERTICAL REINFORCEMENT

A. Provide and install continuous full height vertical bars as shown on the drawings. Bars to be secured at the base or into the foundation and extend full height of the masonry wall within the hollow masonry cells.

B. Fully grout the vertical reinforcing in the cells.

C. Overlap and tie vertical bars if wall is too high for a single vertical bar.

D. See drawings for size, type and spacing of vertical reinforcing bars.

3.11 MASONRY ANCHORS

A. Provide and install masonry anchors, anchor bolts and other embedded items grouted into hollow masonry cells as shown on the drawings or required to secure structural steel or other construction. Size, type, spacing, and locations as shown on the drawings. Anchors to be galvanized or stainless steel.

3.12 BOND BEAMS

A. Provide and install bond beam masonry members as shown on the drawings. Size, type and locations as shown on the drawings. Provide continuous horizontal reinforcement as shown on the drawings. Overlap and tie ends of bars where length exceeds the standard. Fill bond beam void fully with grout.

3.13 INSTALLATION OF REINFORCED UNIT MASONRY

A. Preparation: Clean reinforced bars of loose rust; do not use bars which have rusted excessively or which have bends or kinks not shown on the drawings.

B. Placing Reinforcement: Secure reinforcement accurately at locations indicated and to avoid displacement; minimum spacing between bars or to masonry surfaces shall be bar diameter or 1/4 inch for fine grout and ½ inch for coarse grout, whichever is greater.

C. Splicing: Provide lapped splices of minimum size indicated or permitted by governing code at locations shown.

3.14 GROUTING

A. Grout cells of split-faced and other hollow celled concrete block. Do not exceed 51 inches in height for grout pours.

B. Vertical cell fins shall be no greater than ¼ inch.

C. Provide and install vertical reinforcement grouted into hollow masonry cells.

3.15 PRECAST CONCRETE

A. Install precast concrete as shown. Set in full bed of mortar. Provide concealed metal anchorage between precast concrete and masonry wall, minimum three per precast section, grout all voids. Precast concrete to be in largest sections possible. Miter precast concrete at corners. Joints to be filled with mortar and struck flush.

3.16 INSTALLING MASONRY FLASHING

A. General: Whether or not specifically indicated, install continuous flashing at all conditions such as lintels, shelf angles, or at the base of the wall, where the downward flow of any water within the masonry will be interrupted, so that such water will be diverted to the exterior. Extend flashings full width at such obstructions and at least 4 inches into adjoining masonry, or turn up 1 inch minimum to form weathertight pan at non-masonry construction. Remove or cover protrusions or sharp edges on substrates which could puncture flashings. Place flashings on sloped mortar bed; seal lapped ends and penetrations of flashing before covering with mortar.

1. Extend embedded flashings through exterior face of masonry and turn down to form drip.

B. Through-Wall Flashings: Bring completely through inner wythe and turn up where concealed by other construction; otherwise stop not more than ½ inch from inner face. Drop flashing at least 4 inches before bringing through outer wythe.

C. Veneer Flashings: Turn flashings up not less than 4 inches at backup. Lap top of flashing with building paper, or otherwise seal to prevent moisture penetration between flashing and backup.

D. Heads, Sills and Base: Turn up ends of flashing at least 2 inches at heads and sills to form a pan, and seal joints.

E. Flashing at top of wall: Provide continuous flashing at the top of masonry walls where shown, fully covering the entire top of the wall, to keep moisture from infiltrating the wall. Extend the flashing at either or both sides of the wall as a drip.

F. All flashing to be continuous. Solder joints between pieces of flashing except provide an overlap and sealer at joints required for expansion and contraction of the metal flashing. Provide drip or turn up flashing at terminations.

G. Sealing: Seal all joints in flashing to assure watertight integrity.

1. Lap end joints at non-deformed metal flashings at least 4 inches; seal laps with elastic sealant or mastic.

3.17 VAPOR RETARDER

A. Preparation: Clean substrates of substances that are harmful to vapor retarders, including removing projections capable of puncturing vapor retarders.

B. Installation of Vapor Retarder:

1. Place vapor retarders on side of construction indicated on Drawings.

2. Extend vapor retarders to extremities of areas to protect from vapor transmission. Secure vapor retarders in place with adhesives, vapor retarder fasteners, or other anchorage system as recommended by manufacturer. Extend vapor retarders to cover miscellaneous voids in insulated substrates.
3. Seal vertical joints in vapor retarders by lapping and sealing with vapor-retarder tape according to vapor-retarder manufacturer's written instructions. Locate all joints over framing members or other solid substrates.
4. Seal joints caused by pipes, conduits and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarders.
5. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarder.

3.18 AIR VENTS AND WEEP HOLES

A. Provide air vents and weep holes by eliminating mortar at head joints and fill joint with specified vent or weep material. Provide at all head joints where indicated at top of wall, base of wall and at lintels.

B. Weep Holes: Provide weep holes no less than 3/16” in diameter in head joints of the first course of masonry immediately above concealed flashings at base, lintels, etc. If not at every head joint, space at intervals of 24" on center maximum.

3.19 LINTELS

A. Install galvanized steel lintels at the heads of all openings where indicated. Set lintels level; shim and/or grout at each end as required.

B. Provide minimum solid bearing of 8 inches at each jamb, unless otherwise indicated.

C. Cut masonry as required to fit steel lintel angle. Pack solidly with mortar.

D. Provide and install specially formed bond beam units with reinforcement bars placed as indicated and filled with coarse grout.

E. Provide masonry lintels where shown and where openings of more than 12 inches for brick size units and 24 inches for block size units are shown without structural steel or other supporting lintels.

1. Provide prefabricated or built-in-place masonry lintels. Use specially formed bond beam units with reinforcement bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

3.20 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or if units do not match adjoining units. Install new units to match adjoining units and in fresh mortar or grout, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge any voids or holes, except weep holes, and completely fill with mortar. Point-up all joints including corners, openings, and adjacent construction to provide a neat, uniform appearance, prepared for application of sealants.

C. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave ½ panel un-cleaned for comparison purposes. Obtain Authority's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
4. Wet wall surfaces with water prior to application of cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
5. Clean brick by means of bucket and brush hand-cleaning method described in BIA "Technical Note No. 20 Revised" using a job-mixed detergent solution.

D. Protection: Provide final protection and maintain conditions, in a manner acceptable to Installer, that ensure unit masonry is without damage and deterioration at time of Substantial Completion.

E. Clean new brick, glazed brick and SGFT using a masonry detergent and water or as recommended by the manufacturer.

3.21 FINISHING

A. Field prime and paint exposed portions of steel lintels. See Division 09 Section, Painting. Touch up any damaged galvanized surfaces with galvanizing repair paint prior to prime and finish coats.

3.22 FIELD QUALITY CONTROL

A. Contractor shall engage and pay for a qualified independent testing and inspecting agency, approved by the Authority, to perform field tests and inspections indicated below and prepare test reports:

B. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.

C. Clay Masonry Unit Test: For each type of unit provided, per ASTM C 67.

D. Concrete Masonry Unit Test: For each type of unit provided, per ASTM C 140.

E. Mortar Test (Property Specification): For each mix provided, per ASTM C 780.

F. Grout Test (Compressive Strength): For each mix provided, per ASTM C 1019.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of UNIT MASONRY shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of UNIT MASONRY shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000.

END OF SECTION

SECTION 05 03 71

HISTORIC DECORATIVE METAL CLEANING

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Contractor shall provide all labor and materials for historic treatment of metal surfaces and the following specific work:

1. Cleaning metal.
2. Removing corrosion.
3. Removing paint and priming for repainting.

B. Related Requirements:

1. Section 01 35 91 Historic Treatment Procedures
2. Section 02 42 96 Historic Removal and Dismantling
3. Section 05 03 74 Historic Cast Iron Repair

1.2 DEFINITIONS

A. Low-Pressure Spray: 100 to 400 psi, 4 to 6 gpm

B. Medium-Pressure Spray: 400 to 800 psi , 4 to 6 gpm

1. Shall be used sparingly.

C. High-Pressure Spray: 800 to 1200 psi , 4 to 6 gpm

1. Shall not be used

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review minutes of Preliminary Historic Treatment Conference that pertain to historic treatment of decorative metal.
2. Review methods and procedures related to historic treatment of decorative metal including, but not limited to, the following:

a. Verify historic treatment specialist's personnel, equipment, and facilities needed to make progress and avoid delays.
b. Materials, material application, and sequencing.
c. Fire-protection plan.
d. Decorative metal historic treatment program.
e. Coordination with CTA and CTA riders.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include recommendations for product application and use.
2. Include test data substantiating that products comply with requirements.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For historic treatment specialist, chemical-cleaner manufacturer, paint-remover manufacturer.

B. Decorative Metal Historic Treatment Program: For cleaning historic decorative metalwork.

C. Preconstruction Test Reports: For chemical cleaning of and paint removal from historic decorative metal.

1.6 QUALITY ASSURANCE

A. Historic Treatment Specialist Qualifications: A qualified historic decorative metal cleaning specialist. Cleaning specialist shall be experienced in using mechanical and chemical methods on the types of metal surfaces indicated.

B. Chemical-Cleaner Manufacturer Qualifications: A firm regularly engaged in producing metal cleaners that have been used for similar historic decorative metal applications with successful results and with factory-authorized service representatives who are available for consultation and Project-site inspection, preconstruction product testing, and on-site assistance.

C. Paint-Remover Manufacturer Qualifications: A firm regularly engaged in producing paint removers that have been used for similar historic decorative metal applications with successful results and with factory-authorized service representatives who are available for consultation and Project-site inspection, preconstruction product testing, and on-site assistance.

D. Decorative Metal Historic Treatment Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for historic treatment work, including each process or phase of cleaning decorative metal, related work, and the protection of surrounding materials and Project site.

1. If materials and methods other than those indicated are proposed for any phase of historic treatment work, add a written description of such materials and methods, including evidence of successful use on comparable projects, and demonstrations to show their effectiveness for this Project.

E. Mockups: Prepare mockups of historic treatment cleaning processes on existing surfaces in inconspicuous locations to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Cleaning: Prepare an area approximately 2 ft. for each process on each type of metal element indicated for treatment.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified historic treatment specialist or one or more chemical-cleaner and paint-remover manufacturers to perform preconstruction testing on each type of historic metal.

1. Use test areas as indicated and representative of proposed materials and existing construction.
2. Propose changes to materials and methods to suit Project.

1.8 FIELD CONDITIONS

A. Weather Limitations: Proceed with historic treatment of decorative metal only when existing and forecasted weather conditions are within the environmental limits set by each manufacturer's written instructions and specified requirements.

PART 2 - PRODUCTS

2.1 CLEANING MATERIALS

A. Water: Potable.

B. Hot Water: Water heated to a temperature of 140 to 160 deg F.

C. Detergent Solution, Job Mixed: Solution prepared by mixing 2 cups of trisodium phosphate (TSP), 1/2 cup of laundry detergent, and 20 quarts of hot water for every 5 gal. of solution required.

D. Nonacidic Liquid Chemical Cleaner: Manufacturer's standard mildly alkaline liquid cleaner, formulated for removing organic soiling from ordinary building materials including polished stone, brick, copper, brass, bronze, aluminum, stainless steel, plastics, wood, and glass.

E. Abrasive Materials:

1. Abrasive Pads for cast iron Cleaning: Extra fine stainless steel wool or plastic abrasive pads.
2. Blasting Abrasive: Pulverized walnut shells. Note: Abrasive blasting is only acceptable for use only if mock-up using same technique is approved for use.
3. Abrasives for Ferrous Metal Cleaning: Aluminum oxide paper, emery paper, fine steel wool, steel scrapers, and steel-wire brushes of various sizes.

F. Rust Remover: Manufacturer's standard phosphoric acid-based gel formulation, also called "naval jelly," for removing corrosion from iron and steel.

2.2 PAINT REMOVERS

A. Alkaline-Paste Paint Remover: Manufacturer's standard alkaline-paste or gel formulation for removing paint from metals, and containing no methylene chloride.

B. Covered or Skin-Forming Alkaline Paint Remover: Manufacturer's standard covered or skin-forming alkaline paste or gel formulation for removing paint from metal, and containing no methylene chloride.

C. Solvent-Type Paste Paint Remover: Manufacturer's standard water-rinseable, solvent-type paste or gel formulation for removing paint from metals.

D. Low-Odor, Solvent-Type Paste Paint Remover: Manufacturer's standard low-odor, water-rinseable solvent-type paste, gel, or foamed emulsion formulation for removing paint from metals; and containing no methanol or methylene chloride.

E. Covered, Solvent-Type Paste Paint Remover: Manufacturer's standard, low-odor, covered, water-rinseable, solvent-type paste or gel formulation for removing paint from masonry; and containing no methanol or methylene chloride.

2.3 MISCELLANEOUS MATERIALS

A. Liquid Strippable Masking Agent: Manufacturer's standard liquid, film-forming, strippable masking material for protecting glass, metal, glazed masonry, and polished stone surfaces from damaging effects of acidic and alkaline cleaners. (Note: strippable masking agent is not appropriate for paint remover portions of the work.

B. Masking Tape: Non-staining, nonabsorbent material; compatible with chemical solutions being used and substrate surfaces; and that will easily come off entirely, including adhesive.

C. Other Products: Select materials and methods of use based on the following, subject to approval of a mockup:

1. Previous effectiveness in performing the work involved.
2. Little possibility of damaging exposed surfaces.
3. Consistency of each application.
4. Uniformity of the resulting overall appearance.
5. Do not use products or tools that could do the following:

    a. Remove, alter, or in any way harm the present condition or future preservation of existing surfaces, including surrounding surfaces not in contract.
    b. Leave an unintended residue on surfaces.

2.4 FERROUS METAL PRIMERS

A. Repair Primer: Manufacturer's standard, rust-inhibiting, fast-curing, lead- and chromate-free, universal primer, compatible with firmly adhered existing paint and applied finish. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry-film thickness.

PART 3 - EXECUTION

3.1 HISTORIC TREATMENT SPECIALIST

A. Historic Treatment Specialist Firms: provide historic decorative metal cleaning by competent, qualified contractor of metal cleaning with 5 years' experience on several projects of similar size, using similar techniques.

3.2 PROTECTION

A. Perform chemical cleaning and paint removal in the shop, to the greatest extent practicable.

B. Comply with each manufacturer's written instructions for protecting building and other surfaces against damage from exposure to its products. Prevent chemical solutions from coming into contact with people, motor vehicles, landscaping, buildings, and other surfaces that could be harmed by such contact.

1. Cover adjacent surfaces with materials that are proven to resist chemical solutions being used unless products being used will not damage adjacent surfaces. Use protective materials that are waterproof and UV resistant. Apply masking agents to comply with manufacturer's written instructions. Do not apply liquid masking agent to painted or porous surfaces. When no longer needed, promptly remove masking to prevent adhesive staining.
2. Do not apply chemical solutions during winds of sufficient force to spread them to unprotected surfaces.
3. Neutralize alkaline and acid wastes before disposal.
4. Dispose of runoff from operations by legal means and in a manner that prevents soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interiors.

3.3 HISTORIC DECORATIVE METAL CLEANING, GENERAL

A. Execution of the Work: In cleaning historic items, disturb them as minimally as possible and as follows:

1. Remove deteriorated coatings and corrosion.
2. Sequence work to minimize time before protective coatings are reapplied.
3. Clean items in place unless otherwise indicated.

B. Mechanical Coating Removal: Use only the most gentle mechanical methods, such as scraping and wire brushing, that will not abrade metal substrate. Do not use abrasive methods such as sanding or power tools except as indicated as part of the historic treatment program and approved by Architect.

C. Repaint: Where indicated, prepare painted decorative metal by cleaning surface, removing existing paint and priming for painting as specified.

3.4 CLEANING

A. General: Use only those methods indicated for each type of decorative metal and its location.

1. Brushes: If using wire brushes, use brushes of same base metal composition as metal being treated. Use brushes that are resistant to chemicals being used.
2. Spray Equipment: Use spray equipment that provides controlled application at volume and pressure indicated, measured at nozzle. Adjust pressure and volume to ensure that spray methods do not damage surfaces.

    a. Equip units with functioning pressure gages at the tip.
    b. For chemical-cleaner spray application, use low-pressure tank or chemical pump suitable for chemical cleaner indicated, equipped with nozzle having a cone-shaped spray.
    c. For water-spray application, use fan-shaped spray that disperses water at an angle of 25 to 50 degrees.
    d. Do not use high-pressure water-spray application.
    e. For heated water-spray application, use equipment capable of maintaining temperature between 140 and 160 deg F at flow rates indicated.

3. Uniformity: Perform each cleaning method indicated in a manner that results in uniform coverage of all surfaces, including corners, contours, and interstices, and that produces an even effect without streaks or damaging surfaces.
4. Protection: After cleaning is complete, remove protection no longer required. Remove tape and adhesive marks.

B. Water Cleaning: Clean with water applied by low- or medium-pressure spray. Supplement with natural-fiber or plastic bristle brush. Use small brushes to remove soil from joints and crevices.

C. Detergent Cleaning:

1. Wet surface with cold or hot water applied by low-pressure spray.
2. Scrub surface with detergent solution and natural-fiber or plastic bristle brush until soil is thoroughly dislodged and can be removed by rinsing. Use small brushes to remove soil from joints and crevices. Dip brush in solution often to ensure that adequate fresh detergent is used and that surface remains wet.
3. Rinse with cold or hot water applied by low- or medium-pressure spray to remove detergent solution and soil.
4. Repeat cleaning procedure where required to produce cleaning effect established by mockup.

D. Nonacidic Liquid Chemical Cleaning: Apply chemical cleaner to surfaces according to chemical-cleaner manufacturer's written instructions.

1. Wet surface with water applied by low-pressure spray.
2. Apply cleaner to surface in two applications by brush.
3. Let cleaner remain on surface for period recommended in writing by chemical-cleaner manufacturer and as established by mockup.
4. Non-Ferrous Metals: Rinse with water applied by low- or medium-pressure spray to remove chemicals and soil. Do not use high pressure spray.
5. Ferrous Metals: Do not rinse ferrous metals with water; neutralize chemical cleaner on ferrous metals as recommended in writing by manufacturer. Dry immediately with clean soft cloths. Follow direction of grain in metal.
6. Repeat cleaning procedure above where required to produce cleaning effect established by mockup. Do not repeat more than once.

E. Cleaning with Abrasive Pads: Clean surfaces to remove dirt, leaving uniform patina intact, by light rubbing with abrasive pads and water. Rinse with cold water to remove residue. Apply rinse by low-pressure spray. Do not rinse ferrous metals with water; wipe with damp cloths to remove residue.

F. Mechanical Rust Removal:

1. Remove rust with approved abrasives for ferrous metal cleaning.
2. Wipe off residue with mineral spirits and either stainless steel wool or soft rags.
3. Dry immediately with clean, soft cloths. Follow direction of grain in metal.
4. Prime immediately to prevent rust. Do not touch cleaned metal surface until primed.

3.5 PAINT REMOVAL

A. General: Use only those paint-removal methods indicated for each type of decorative metal.

1. Application: Apply paint removers according to paint-remover manufacturer's written instructions. Do not allow paint removers to remain on surface for periods longer than those indicated or recommended in writing by manufacturer.

    a. Apply materials to all surfaces, corners, contours, and interstices, to provide a uniform final appearance without streaks.
    b. After work is complete, remove protection no longer required. Remove tape and adhesive marks.

2. Brushes: If using wire brushes, use brushes of same base metal composition as metal being treated. Use brushes that are resistant to chemicals being used.
3. Spray Equipment: Use spray equipment that provides controlled application at volume and pressure indicated, measured at nozzle. Adjust pressure and volume to ensure that spray methods do not damage surfaces.

    a. Equip units with functioning pressure gages.
    b. Unless otherwise indicated, hold spray nozzle at least 8 inches from surface and apply material in horizontal, back-and-forth sweeping motion, overlapping previous strokes to produce uniform coverage.
    c. For chemical spray application, use low-pressure tank or chemical pump suitable for chemical indicated, equipped with cone-shaped spray.
    d. For water-spray application, use fan-shaped spray that disperses water at an angle of 25 to 50 degrees.
    e. For heated water-spray application, use equipment capable of maintaining temperature between 140 and 160 deg F at flow rates indicated.

B. Paint Removal with Alkaline-Paste Paint Remover:

1. Remove loose and peeling paint using water, scrapers, stiff brushes, or a combination of these. Let surface dry thoroughly.
2. Apply paint remover to dry, painted metal with brushes.
3. Allow paint remover to remain on surface for period recommended in writing by manufacturer or as determined by preconstruction testing.
4. Rinse with water applied by low or medium-pressure spray to remove chemicals and paint residue. Do not use high pressure.
5. Use mechanical methods recommended in writing by manufacturer to remove chemicals and paint residue.
6. Repeat process if necessary to remove all paint.

C. Paint Removal with Covered, Solvent-Type Paste Paint Remover:

1. Remove loose and peeling paint using water, scrapers, stiff brushes, or a combination of these. Let surface dry thoroughly.

2. Apply paint remover to dry, painted decorative metal with natural-fiber cleaning brush, deep-nap roller, or large paint brush or as recommended in writing by manufacturer.
3. Apply cover according to manufacturer's written instructions.
4. Allow paint remover to remain on surface for period recommended in writing by manufacturer or as determined by preconstruction testing.
5. Scrape off paint and remover.
6. Rinse with water applied by low- or medium-pressure spray to remove chemicals and paint residue. Do not use high-pressure spray. Do not use water on ferrous metals.
7. Alternately, use mechanical methods recommended in writing by manufacturer to remove remaining chemicals and paint residue.

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage chemical-cleaner and paint-remover manufacturers' factory-authorized service representatives for consultation and Project-site inspection, to perform preconstruction product testing, and to provide on-site assistance when requested by Architect.

3.7 REMOVAL, DISMANTLING, AND REINSTALLATION

A. General: Perform removal, dismantling, and reinstallation work as required in Section 02 42 96 "Historic Removal and Dismantling"

3.8 PRIMING

A. Repair Primer: Apply immediately after completing a repair.

B. Finish Primer: Apply as soon after cleaning as possible.

3.9 HISTORIC DECORATIVE METAL SCHEDULE

A. Treatment for Decorative Railing **DMR-1**: Wrought-iron railing and gate.

1. General: Perform work in the shop.
2. Paint Removal: Alkaline-paste paint remover or Covered or skin-forming alkaline paint remover or microabrasive cleaning as established by mock-up.

B. Treatment of Salvaged Historic Steel truss elements **HST-1**: Items identified to be salvaged of the triangular truss frame at each pair of columns, and associated girts and purlins.

1. General: Perform work in the shop.
2. Paint Removal: Alkaline-paste paint remover or Covered or skin-forming alkaline paint remover or Microabrasive cleaning, as established by mock-up.

C. Treatment for Decorative Cast-Iron Elements **DCIE-1**: Repair Decorative Cast-Iron Elements and replace missing components.

1. General: Perform work in the shop.
2. Cleaning: Detergent cleaning, Chemical cleaning, Microabrasive blasting, as established in mock-up.

3. Paint Removal: Alkaline-paste paint remover, or Covered or skin-forming alkaline paint remover, or Solvent-type paste paint remover, or Low-odor, solvent-type paste paint remover, or Covered, solvent-type paste paint remover.
4. Rust Removal: Chemical or Mechanical.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of HISTORIC DECORATIVE METAL CLEANING shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of HISTORIC DECORATIVE METAL CLEANING shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. ARCHITECTURAL WORK: 09000

END OF SECTION 050371

SECTION 05 03 83

HISTORIC CAST IRON REPAIR

PART 1 - GENERAL

1.1 SUMMARY OF WORK

A. Contractor shall include all labor and materials for the historic treatment of cast iron in the form of repairs as follows:

1. Dismantling and salvaging cast iron for shop repair and replacement of components.
2. Repairing cast iron and replacing damaged and missing components.
3. Painting steel uncovered during the Work.
4. Re-painting cast iron.
5. Re-anchoring cast iron to building structure.
6. Installing rails supported by or attached to cast-iron railings or brackets.

B. Related Requirements:
1. Section 01 35 91 Historic Treatment Procedures
2. Section 02 41 19 Selective Structural Demolition
3. Section 02 42 96 Historic Removal and Dismantling
4. Section 05 03 71 Historic Decorative Metal Cleaning

1.2 DEFINITIONS

A. Low-Pressure Spray: 100 to 400 psi; 4 to 6 gpm.

B. Medium-Pressure Spray: 400 to 800 psi; 4 to 6 gpm.

1. Shall be used sparingly.

C. High-Pressure Spray: 800 to 1200 psi; 4 to 6 gpm.

1. Shall not be used.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review minutes of Preliminary Historic Treatment Conference that pertain to historic treatment of decorative metal.
2. Review methods and procedures related to historic cast-iron repair including, but not limited to, the following:

a. Historic treatment specialist's personnel, equipment, and facilities needed to make progress and avoid delays.
b. Materials, material application, sequencing, tolerances, and required clearances.
c. Fire-protection plan.
d. Cast-iron historic treatment program.

e. Coordination with CTA and on behalf of CTA riders.

1.4 SEQUENCING AND SCHEDULING

A. Perform cast-iron repair in the following sequence, which includes work specified in this and other Sections:

1. Dismantle existing surface-mounted objects and hardware that overlie cast-iron surfaces except items indicated to remain in place or be salvaged. Tag items with location identification and protect.
2. Verify that temporary protections have been installed.
3. Examine condition of cast iron and document.
4. Dismantle tagged cast iron elements to be salvaged, package, and relocate to shop.
5. Clean cast-iron surface, and remove paint and other finishes to the extent required.
6. Repair and replace existing cast iron and supports to the degree required for a uniform and sound surface on which to paint or apply other finishes.
7. Cure repaired surfaces and allow them to dry for proper finishing.
8. Prepare surface for painting, prime and paint all surfaces.
9. Reinstall dismantled elements and hardware on site.
10. Touch up paint on site any scratches or chips occurring in transport or erection.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include recommendations for product application and use.
2. Include test data substantiating that products comply with requirements.

B. Shop Drawings:

1. Include plans, elevations, and sections showing locations and extent of repair and replacement work, with enlarged details of replacement parts indicating materials, profiles, methods of attachment, accessory items, and finishes.
2. Include field-verified dimensions and the following:

a. Full-size patterns with complete dimensions for new cast-iron components and their jointing, showing relation of existing to new components.
b. Templates and directions for installing anchor bolts and other anchorages.
c. Identification of each new cast-iron item and component and its location on the structure in annotated plans and elevations.
d. Provisions for expansion, weep holes, and conduits as required for each location and exposure.
e. Provisions for sealant between cast-iron components and for sealant-type joints if required.
f. Layout of metal stitching, including stitching-pin size(s) and lock length(s), spacing, and number of layers.

C. Samples for Initial Selection: For each type of cast-iron item and component with factory-applied finishes.

1. Include Samples of sealant materials, miscellaneous materials, and accessories involving size, color, or finish selection.

D. Samples for Verification: For the following products in manufacturer's standard sizes unless otherwise indicated, finished as required for use in the Work:

1. Each type of new material to be used for replacing existing or missing cast iron; 6 inches long in least dimension or whole item.

    a. Patterns for Casting: Before casting components, submit the actual patterns from which molds will be made for casting. Package and ship to prevent loss or damage, or make patterns available for inspection by Architect at fabrication plant.
    b. Casting Samples: For castings, provide one of each shape, color, and texture of component, suitable and ready for installation. Make this submittal after acceptance of patterns for casting.

2. Fittings and brackets.
3. Each type of exposed connection between components. Show method of finishing components at connections.
4. Each type of exposed finish; 6 inches long in least dimension.
5. Sealant materials.
6. Accessories: Each type of anchor, accessory, and miscellaneous support in required finishes.

E. Delegated-Design Submittal: For structural performance of repaired railings, handrail brackets and anchors, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For historic treatment specialist: historic brazing-and-welding specialist and historic metal-stitching specialist.

B. Evaluation Reports: For post-installed structural anchors, from ICC-ES.

C. Cast-Iron Historic Treatment Program: For repairing historic cast iron.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents, including material, finish, source, and location on or in building.

1. Cast-Metal Replications: Five additional castings of each type.
2. Cast-Iron Decorative Railing Posts: Five additional posts of each type.

B. Molds for Castings: On completion of manufacturing of cast components, deliver one unused mold of each shape and size of component to Project site. Deliver to a location and at a time determined by Owner, to become property of Owner.

1. Deliver molds carefully packed, protected from dirt, moisture, and breakage so as to arrive in usable, undamaged condition and enable long-term storage and possible future use.

1.8 QUALITY ASSURANCE

A. Historic Treatment Specialist Qualifications: A qualified historic cast-iron repair specialist. Experience in repairing, brazing, and welding wrought iron, steel, or cuprous metals and installing and finishing new cast-iron work is insufficient experience for historic cast-iron repair work.

1. Historic Brazing-and-Welding Specialist: A qualified brazing-and-welding-repair specialist experienced with these repairs on historic cast iron. Have the brazing-and-welding specialist work under direction of the historic treatment specialist.
2. Historic Metal-Stitching Specialist: A qualified metal-stitching-repair specialist experienced with metal stitching of historic cast iron. Have the metal-stitching specialist work under direction of the historic treatment specialist.
3. Single Specialist: Have the work of Section 05 03 71 "Historic Decorative Metal Cleaning" and this Section performed by the same historic treatment specialist firm, meeting the specialist qualifications of those Sections.

B. Cast-Iron Historic Treatment Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for historic cast-iron repair work, including each process or phase of repairing cast iron, related work, and the protection of surrounding materials and Project site.

1. If materials and methods other than those indicated are proposed for any phase of historic treatment work, add a written description of such materials and methods, including evidence of successful use on comparable projects, and demonstrations to show their effectiveness for this Project.

C. Mockups: Prepare mockups of historic treatment repair processes on existing surfaces to demonstrate aesthetic effects and to set quality standards for materials and execution and for fabrication and installation. Prepare mockups so they are inconspicuous.

1. Repairing Metal Component: Two cast-iron pinning and metal-stitching repairs on sample pieces of cast iron.
2. Replacing Metal Component: Two cast-iron finials replaced on newel posts.
3. Cast-Metal Components: Submit patterns, models, or plaster castings made from existing cast-iron item for each replacement casting required.
4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
5. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 FIELD CONDITIONS

A. Weather Limitations: Proceed with historic cast-iron repair only when existing and forecasted weather conditions are within the environmental limits set by each manufacturer's written instructions and specified requirements.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer to design railings, handrails, handrail brackets and anchors according to structural performance requirements.

B. Structural Performance: Railings, handrails, and handrail brackets, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Uniform load of 50 lbf/ft. applied in any direction.
2. Concentrated load of 200 lbf applied in any direction.
3. Uniform and concentrated loads need not be assumed to act concurrently.

2.2 METAL MATERIALS

A. Provide metal materials made of the alloys, forms, and types that match existing metals and that have the ability to receive finishes matching existing finishes unless otherwise indicated. Exposed-to-view surfaces exhibiting imperfections inconsistent with existing materials are unacceptable.

B. Source Limitation for Replacement Cast Materials: Obtain castings for cast-iron repair from single source from single manufacturer with resources to provide materials of consistent quality in appearance and physical properties.

C. Cast Iron:

1. Gray-Iron Castings: ASTM A 48/A 48M, Class 30.
2. Malleable-Iron Castings: ASTM A 47/A 47M, grade as recommended in writing by fabricator for type of use indicated.

D. Steel:

1. Tubing: Cold formed, ASTM A 500/A 500M.

2.3 PREPARATORY CLEANING MATERIALS

A. Water: Potable.

B. Hot Water: Water heated to a temperature of 140 to 160 deg F.

C. Detergent Solution, Job Mixed: Solution prepared by mixing 2 cups of trisodium phosphate (TSP), 1/2 cup of laundry detergent, and 20 quarts of hot water for every 5 gal. of solution required.

D. Abrasive Materials:

1. Abrasive Pads: Non-scratch, of the following type(s):

a. Abrasive Pad with Sponge: Combination plastic abrasive pad, consisting of a sponge enclosed with a woven urethane, polypropylene, or other plastic mesh or fabric, without other abrasive components that can scratch metal.
b. Abrasive Pad of Plant Fibers: Agave, loofa, or another tough plant fiber, without other abrasive components that can scratch metal.

2. Medium Abrasives for Ferrous Metals: Aluminum-oxide paper, emery paper, fine steel wool, steel scrapers, and steel-wire brushes of various sizes.
3. Blasting Abrasive: Pulverized walnut shells may be used in a mock-up, and may only be used if approved.

E. Wash Cloths: Lint-free, absorbent, durable cloth without abrasives that can scratch metal.

F. Rust Remover: Manufacturer's standard phosphoric acid-based gel formulation, also called "naval jelly," for removing corrosion from iron and steel.

2.4 PINNING MATERIALS

A. Pins: Threaded, stainless-steel rod, cut to length as required for each repair.

B. Pinning Adhesive: Epoxy adhesive recommended in writing by adhesive manufacturer for bonding to cast iron.

2.5 METAL STITCHING MATERIALS

A. Stitching Pins: Threaded steel screws sized for the thickness and condition of cast iron being repaired, with thread design that pulls the sides of a crack together, thereby both sealing the crack and adding strength to the repair.

B. Locks: Multiple-dumbbell-shaped ties cut from steel sheet for installation in multiple thicknesses to add strength and distribute stresses in the cast iron as required for the thickness and condition of cast iron being repaired.

2.6 FASTENERS

A. Fasteners: Fasteners of the same basic metal as fastened metal unless otherwise indicated. Use metals that are noncorrosive and compatible with each metal joined.

1. Match existing fasteners in material and in type of fastener unless otherwise indicated.
2. Use concealed fasteners for interconnecting cast-iron components and for attaching them to other work unless exposed fasteners are the existing fastening method.
3. For exposed fasteners, use tamperproof screws and to match the existing fastening method, as determined by Architect.
4. Finish heads of exposed fasteners to match finish of metal fastened unless otherwise indicated.

B. Post-Installed Structural Anchors: Fastener systems with bolts of same basic metal as fastened metal, if visible, with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction.

1. Uses: Securing railings, handrails, handrail brackets, capitals, knuckles and column bases to structure.

2. Type: Torque-controlled, expansion anchor.
3. Material for Exterior or Interior Locations and Where Stainless Steel Is Indicated: Group 2 (A4) stainless-steel bolts ASTM F 593, and nuts, ASTM F 594.

C. Post-Installed Nonstructural Anchors: Fastener systems with bolt heads of same basic metal as fastened metal, if visible, unless otherwise indicated; with an evaluation report acceptable to authorities having jurisdiction, based on the substrate.

1. Type: types matching existing or types indicated on Drawings.
2. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
3. Material for Exterior or Interior Locations and Where Stainless Steel Is Indicated: Alloy Group 2 (A4) stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

2.7 ACCESSORIES

A. Metal-Patching Compound: Two-part, epoxy- or polyester-resin, metal-patching compound; knife-grade formulation as recommended in writing by manufacturer for type of metal repair indicated, tooling time required for the detail of work, and site conditions. Compound shall be produced for filling cast iron that has deteriorated because of corrosion or deformation. Filler shall be capable of filling deep holes and spreading to feather edge.

B. Brazing Rods for Cast Iron: Type and alloy as recommended in writing by brazing-rod manufacturer and as required for strength and compatibility with cast-iron items.

C. Welding Electrodes and Filler Metal: Select according to AWS specifications for welding cast-iron; use compatible metal type and alloy as required for strength, and compatibility with cast-iron items.

D. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended in writing by manufacturer for interior and exterior applications.

E. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.

1. Water-Resistant Product: At exterior locations and where indicated, provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended in writing by manufacturer for exterior use.

F. Sealant Materials:

1. Provide manufacturer's standard, elastomeric non-staining, single-component, non-sag silicone sealant complying with applicable requirements in Section 07 92 00 "Joint Sealants."
2. Colors: Provide colors of exposed sealants to match colors of metals in which sealant is placed unless otherwise indicated.

G. Antirust Coating: Fast-curing, lead- and chromate-free, self-curing, universal modified-alkyd primer according to SSPC-Paint 20 or SSPC-Paint 29.

1. Surface Preparation: Use coating requiring no better than SSPC-SP 3, "Power Tool Cleaning," surface preparation according to manufacturer's literature or certified statement.
2. VOC Limit: Use coating with a VOC content of 400 g/L or less.

H. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

I. Liquid Strippable Masking Agent: Manufacturer's standard liquid, film-forming, strippable masking material for protecting glass, metal, glazed masonry, and polished stone surfaces from damaging effects of acidic and alkaline cleaners.

J. Masking Tape: Nonstaining, nonabsorbent material; compatible with chemical solutions being used and substrate surfaces, and that will easily come off entirely, including adhesive.

K. Other Products: Select materials and methods of use based on the following, subject to approval of a mockup:

1. Previous effectiveness in performing the work involved.
2. Little possibility of damaging exposed surfaces.
3. Consistency of each application.
4. Uniformity of the resulting overall appearance.
5. Do not use products or tools that could do the following:

a. Remove, alter, or in any way harm the present condition or future preservation of existing surfaces, including surrounding surfaces not in the Contract.
b. Leave an unintended residue on surfaces.

2.8 CAST-METAL FABRICATION

A. Sufficient quantities of cast iron and wrought iron historic elements have been identified to suffice for the design as illustrated in the drawings, and provide attic stock. Fabrication of new elements is only required to provide pieces to complete design, in the event that multiple elements have been destroyed during dismantling.

B. Custom fabricate repairs of cast-iron items and components in sizes and profiles to match existing cast iron unless otherwise indicated, with accurate curves, lines, and angles. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.

C. Provide uniform, neat seams with minimum exposure of welds, brazing, and sealant.

D. Provide rebates, lugs, and brackets necessary to assemble components and to attach to existing work. Drill and tap for fasteners. Use concealed fasteners where possible; use exposed fasteners to match existing work.

E. Comply with AWS for recommended practices in welding and brazing. Clean exposed welded and brazed joints of flux, and dress exposed and contact surfaces.

1. Use materials and methods that minimize distortion, and develop maximum strength and corrosion resistance.
2. Remove flux immediately.

3. At exposed connections, match contours of adjoining surfaces, and finish exposed surfaces smooth and blended so no roughness shows after finishing.

F. Castings: Fabricate castings free of warp, cracks, blowholes, or other defects that impair strength or appearance. Grind, wire brush, sandblast, and buff castings to remove seams, gate marks, casting flash, and other casting marks.

1. Finish castings to match existing cast-iron work.
2. Replacement Casting for Handrail Bracket: Duplicate existing handrail bracket on the cast-iron railing of first-floor stairs in the lobby. Make molds from this bracket to create new cast-iron brackets.

G. Date Identification: Emboss on a concealed, interior surface of the metal body of each new component, in easily read characters, "MADE 2022." Manufacturer's name may also be embossed. Add the identification to the mold pattern before casting.

2.9 FINISHES, GENERAL

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.10 FERROUS METAL FINISHES

A. Repair Primer: Manufacturer's standard, rust-inhibiting, fast-curing, lead- and chromate-free universal primer, compatible with firmly adhered existing paint and applied finish. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

B. Finish Primer: Manufacturer's standard, rust-inhibiting, fast-curing, lead- and chromate-free universal primer, compatible with firmly adhered existing paint and applied finish. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 PROTECTION

A. Comply with each manufacturer's written instructions for protecting building and other surfaces against damage from exposure to its products. Prevent chemical solutions from coming into contact with people, motor vehicles, landscaping, buildings, and other surfaces that could be harmed by such contact.

1. Cover adjacent surfaces with materials that are proved to resist chemical solutions being used unless products being used will not damage adjacent surfaces. Use protective materials that are waterproof and UV resistant. Apply masking agents to comply with manufacturer's written instructions. Do not apply liquid masking agent to painted or

porous surfaces. When no longer needed, promptly remove masking to prevent adhesive staining.
2. Do not apply chemical solutions during winds of enough force to spread them to unprotected surfaces.
3. Neutralize alkaline and acid wastes before disposal.
4. Dispose of runoff from operations by legal means and in a manner that prevents soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interiors.

3.2 HISTORIC CAST-IRON REPAIR, GENERAL

A. Repair Appearance Standard: Repaired surfaces are to have a uniform appearance as viewed from 5 feet away by Architect.

B. Execution of the Work: In repairing historic items, disturb remaining existing work as minimally as possible and as follows:

1. Stabilize cast iron to reestablish structural integrity and weather resistance while maintaining the existing form of each item.
2. Remove deteriorated coatings and corrosion.
3. Sequence work to minimize time before protective coatings are reapplied.
4. Disassemble, salvages and repair items as indicated on drawings.
5. Make historic treatment of materials reversible whenever possible.
6. Install temporary protective measures to stabilize cast iron that is indicated to be repaired later.

C. Mechanical Coating Removal: Use gentlest mechanical methods, such as scraping and wire brushing, that do not abrade metal substrate. Do not cleaning using mild steel brushes or steel wool; use stainless steel if using metal brushes or wool. Do not use abrasive methods, such as sanding, or power tools except as indicated as part of the historic treatment program and approved by Architect.

D. Repairing Cast-Iron Items: Match existing features, retaining as much original material as possible to complete the repair.

1. Unless otherwise indicated, repair cast iron by patching, filling, piecing-in, splicing, or otherwise reinforcing the existing cast iron with new material matching existing.
2. Where indicated, repair cast iron by limited replacement to the extent indicated, matching existing material.

E. Replacing Cast-Iron Components:

1. Replace heavily deteriorated or missing parts or features of cast iron with compatible materials, using surviving prototypes to create patterns or molds for duplicate replacements.
2. Do not use substitute materials unless otherwise indicated.

3.3 PREPARATORY CLEANING

A. Perform preparatory cleaning before performing repair work.

1. Brushes: If using wire brushes, use steel or stainless-steel brushes that are resistant to chemicals being used.

2. Spray Equipment: Use spray equipment that provides controlled application at volume and pressure indicated, measured at nozzle with a functioning pressure gauge. Adjust pressure and volume to ensure that spray methods do not damage surfaces.

    a. Equip units with functioning pressure gages.
    b. For water-spray application, use fan-shaped spray that disperses water at an angle of 25 to 50 degrees.
    c. For heated water-spray application, use equipment capable of maintaining temperature between 140 and 160 deg F at flow rates required.

3. Uniformity: Perform each cleaning method in a manner that results in uniform coverage of all surfaces, including corners, contours, and interstices, and that produces an even effect without streaks or damaging surfaces.
4. Protection: After cleaning is complete, remove protection no longer required. Remove tape and adhesive marks.

B. Water Cleaning: Clean with cold or hot water applied with sponges or wash cloths, low-pressure spray supplemented by occasional medium-pressure spray. Do not use high-pressure spray. Supplement with natural-fiber or plastic bristle brush and abrasive pads. Use small brushes made of natural, plastic or stainless steel to remove soil and loose paint from joints and crevices.

C. Detergent Cleaning:

1. Wet surface with cold or hot water applied with sponges or wash cloths or low-pressure spray.
2. Scrub surface with detergent solution and natural-fiber or plastic bristle brush and abrasive pads until soil is thoroughly dislodged and can be removed by rinsing. Use small brushes to remove soil from joints and crevices. Dip brush in solution often to ensure that adequate fresh detergent is used and that surface remains wet.
3. Rinse with cold or hot water applied with sponges or wash cloths or low-pressure spray supplemented by medium-pressure spray to remove detergent solution, soil, and loose paint. Do not use high pressure spray.

D. Cleaning by Abrasive Blasting: Clean surfaces to remove dirt and loose paint by dry blasting with specified blasting abrasive at pressure and distance from surface indicated below. Do not rinse cast iron with water; wipe with soft brushes and damp cloths to remove residue.

1. Pressure and Distance from Surface: Maximum pressure of 60 psi with specified blasting abrasive propelled from a distance of 12 to 18 inches from surface.
2. Final Pressure and Distance from Surface shall be established by approved mockup.

E. Chemical Rust Removal:

1. Remove loose rust scale with approved, medium abrasives for ferrous metals.
2. Apply rust remover with brushes or as recommended in writing by manufacturer.
3. Allow rust remover to remain on surface for period recommended in writing by manufacturer or as determined by testing. Do not allow extended dwell time.
4. Wipe off residue with mineral spirits and either steel wool or soft rags, or clean with method recommended in writing by manufacturer to remove residue.
5. Dry immediately with clean, soft cloths. Follow direction of grain in metal.
6. Prime immediately to prevent rust. Do not touch cleaned metal surface until primed.

F. Mechanical Rust Removal:

1. Remove rust with approved, medium abrasives for ferrous metals.
2. Wipe off residue with mineral spirits and either steel wool or soft rags.
3. Dry immediately with clean, soft cloths. Follow direction of grain in metal.
4. Prime immediately to prevent rust. Do not touch cleaned metal surface until primed.

3.4 DISMANTLING, REPAIR, AND INSTALLATION

A. Repair cast iron in place insofar as practicable unless otherwise indicated. Where necessary, dismantle components from their substrate and repair and reinstall according to approved historic treatment program.

B. Perform dismantling work as required in Section 02 42 96 "Historic Removal and Dismantling."

C. Installation:

1. Locate and place cast-iron items level and plumb and in alignment with adjacent construction.

    a. Do not cut or abrade finishes that cannot be completely restored in the field. Return items with such finishes to the shop for required alterations, followed by complete refinishing, or provide new units as required.

2. Use concealed anchorages where possible unless otherwise indicated.
3. Form tight joints with exposed connections accurately fitted together.
4. Install concealed joint fillers, sealants, and flashings, as the Work progresses, to make exterior items weatherproof.
5. Corrosion Protection: Apply bituminous paint or other permanent separation materials on concealed surfaces where metals would otherwise be in direct contact with substrate materials that are incompatible or could result in corrosion or deterioration of either material or finish.
6. Touch Up: At completion of installation, touch up and restore damaged or defaced finish surfaces and fastener heads.

D. Reinstalling Railing and Newel Posts: After posts have been inserted in sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions. Leave anchorage joint exposed, wipe off surplus anchoring material, and leave 1/8-inch buildup sloped away from post.

E. Anchoring Wood Rails: Secure wood rails to cast-iron subrail or brackets from bottom of rail as indicated on Drawings. Make fastener heads flush to metal surface of subrail or brackets.

F. Sealant: Clean and prepare joint surfaces and apply and cure sealant according to Section 07 90 00 "Joint Sealants."

1. Keep joint surfaces to receive sealant dry and free of debris.
2. Prime joint surfaces unless sealant manufacturer recommends against priming. Do not allow primer to spill or migrate onto adjoining surfaces.
3. Apply sealant on joint surfaces between abutting cast-iron components in a continuous application immediately before joining the components together. Remove excess after components are joined and tightened.
4. Fill sealant-type joints with specified joint sealant as recommended in writing by sealant manufacturer and the following:

a. Install sealant using only proved installation methods that ensure sealant is deposited in a uniform, continuous ribbon, without gaps or air pockets, and with complete wetting of the joint bond surfaces equally on both sides. Fill joint flush with surrounding metal.
b. Do not allow sealant to overflow or spill onto adjoining surfaces or to migrate into the voids of adjoining surfaces, particularly rough or sculptural textures. Promptly remove excess and spillage of sealant as the work progresses. Clean adjoining surfaces by means necessary to eliminate evidence of spillage, without damage to adjoining surfaces or finishes, as demonstrated in an approved mockup.

3.5 FILLING DEFECTS IN PAINTED SURFACES

A. Repair non-load-bearing defects in existing metal surfaces, including dents and gouges more than 1/16 inch deep or 1/2 inch across and all holes and tears by filling with metal-patching compound. Remove burrs. Prime iron and steel surfaces immediately after repair to prevent flash rusting.

1. Apply metal-patching compound to fill depressions, nicks, cuts, and other voids created by rusted, removed, or missing metal.
2. Mix only as much patching compound as can be applied according to manufacturer's written instructions.
3. Apply patching compound in layers of maximum 1/8-inch thickness and as recommended in writing by manufacturer until the void is completely filled.
4. Finish patch surface smooth and shaped flush with adjacent contours, without voids in patch material.
5. Clean spilled compound from adjacent materials immediately.

3.6 PINNING

A. Use failed cast-iron parts not intended for reuse for stitching material. Verify that repair piece is a correct match for remaining existing work and of a size that can be pinned.

B. Grind mating surfaces of base metal and repair piece along the repair seam to produce an accurate fit and alignment with the base assembly. Grind mating surfaces to produce joint size no larger than 1/32 inch.

C. Concealed Pinning: Before applying adhesive, prepare for concealed mechanical anchorage consisting of 1/8-inch- diameter, threaded stainless-steel pins set into aligned, 3/16-inch-diameter holes drilled into base metal and into, but not through, the repair piece. Insert pins at least 1 inch into base metal and 1 inch into repair piece.

D. Apply pinning adhesive according to adhesive manufacturer's written instructions. Fill holes and coat bonding surfaces of base metal and repair piece.

E. Apply repair piece while adhesive is fresh and hold securely in place until adhesive has cured. Use temporary shims, clamps, wedges, or other devices as necessary to keep repair piece and base metal aligned.

3.7 METAL STITCHING

A. Install metal stitching materials according to written instructions of metal-stitching-system manufacturer for the thickness and condition of cast iron being repaired.

B. Drill, tap, and install metal stitching pins along entire length of crack being repaired, overlapping the pins to ensure complete sealing and pulling together of sides of the crack.

C. Cut slots shaped and sized to hold locks. Do not cut slots deeper than 90 percent of the thickness of the cast iron.

D. Install locks with three large lobes and spaced as recommended in writing by metal-stitching-system manufacturer for each lock location. Install locks in two layers unless otherwise recommended in writing by metal-stitching-system manufacturer.

E. Grind off metal-stitching materials that project above surface of cast iron without damaging cast-iron surface.

3.8 PRIMING

A. Repair Primer: Apply immediately after completing a repair.

B. Finish Primer: Apply as soon after cleaning as possible.

3.9 PAINTING STEEL UNCOVERED DURING THE WORK

A. Notify Architect if steel is exposed during metal repair or removal. Where Architect determines that the steel is structural, or for other reasons cannot be totally removed, prepare and paint it as follows:

1. Surface Preparation: Remove paint, rust, and other contaminants according to SSPC-SP 3, "Power Tool Cleaning" as applicable to comply with paint manufacturer's recommended preparation.
2. Antirust Coating: Immediately paint exposed steel with two coats of antirust coating, following coating manufacturer's written instructions and without exceeding manufacturer's recommended rate of application (dry film thickness per coat).

B. If on inspection and after rust removal the thickness of a steel member is found to be reduced from rust by more than 1/16 inch, notify Architect before proceeding.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections. Allow inspectors use of lift devices and scaffolding, as needed, to perform inspections.

B. Notify testing agency in advance of times when lift devices and scaffolding will be relocated. Do not relocate lift devices and scaffolding until inspectors have had reasonable opportunity to inspect work areas at locations of lift devices or scaffolding.

3.11 HISTORIC CAST-IRON REPAIR SCHEDULE

A. Treatment of Wrought-Iron Railing WIR-1: Wrought-iron railing.

1. Perform work in the shop.
2. Paint Removal: As specified in Section 05 03 71 "Historic Decorative Metal Cleaning."

3. Repairs: Repair broken wrought iron railing elements by welding and/or forging as needed and replace missing components with custom wrought-iron components to exactly match the original.
4. Painted Finish: Manufacturer's standard, rust-inhibiting, fast-curing, lead- and chromate-free universal primer, compatible with firmly adhered existing paint and applied finish. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

B. Treatment of Cast-Iron Railing Newel and Base CIR-2: Cast-iron Newel and Base.

1. Perform work in the shop.
2. Paint Removal: As specified in Section 05 03 71 "Historic Decorative Metal Cleaning."
3. Rust Removal: Mechanical.
4. Repair: Patch with new material by filling, metal stitching, or replacing cast-iron components with new castings and fasteners.
5. Painted Finish: Manufacturer's standard, rust-inhibiting, fast-curing, lead- and chromate-free universal primer, compatible with firmly adhered existing paint and applied finish. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

C. Treatment of Cast-Iron column base, knuckle and capital CIC-1: Cast-iron column elements of Base, Knuckle and Capital.

1. Perform work in the shop.
2. Cleaning: As specified in Section 05 03 71 "Historic Decorative Metal Cleaning."
3. Repair: Patch cast iron with new material by filling, metal stitching, or replacing cast-iron components with new castings and fasteners.
4. Painted Finish: Manufacturer's standard, rust-inhibiting, fast-curing, lead- and chromate-free universal primer, compatible with firmly adhered existing paint and applied finish. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of HISTORIC CAST IRON REPAIR shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of HISTORIC CAST IRON REPAIR shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. ARCHITECTURAL WORK: 09000

END OF SECTION 05 03 83

SECTION 05 10 30
STRUCTURAL STEEL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this section.

1.02 SUMMARY

A. This Section specifies requirements for structural steel used in the project including columns, beams, canopy and roof framing, framing for new stair opening, framing for elevator shaft, framing for escalator opening and support, etc. This work includes furnishing all labor, materials, accessories, tools and equipment required to furnish and install all structural steel including, but not limited to, fabrication, galvanizing, field erection, field preparation for painting and any other work required for a complete project.

B. Unless noted otherwise, all new structural steel must be hot-dip galvanized. Existing structural steel must be field prepared and cleaned and also coated with protective and finish coats in the field.

C. Related Specifications:

1. Section 05 01 31, Architecturally Exposed Structural Steel Framing
2. Section 05 12 50, Architecturally Exposed Structural Steel
3. Section 05 31 00, Steel Deck
4. Section 05 50 00, Metal Fabrications
5. Section 05 50 10, Barriers High Barriers Gate
6. Section 05 50 20, Railing and Guardrails
7. Section 05 53 00, Metal Gratings
8. Section 05 71 00, Perforated Metal Panels for Glazing Protection
9. Section 09 90 00, Painting

1.03 REFERENCES

A. General

1. American Society for Testing and Materials (ASTM)

a. ASTM A6 “Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling”
b. ASTM A36 “Standard Specification for Carbon Structural Steel”
c. ASTM A572 “Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel”
d. ASTM A53 “Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless”
e. ASTM F3125 “Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi and 150 ksi Minimum Tensile Strength”
f. ASTM F1554 “Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength”
g. ASTM A123 “Standard Specification for Zinc (Hot-Dip Galvanized)

Coatings on Iron and Steel Products”

h. ASTM A153 “Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware”
i. ASTM A780 “Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings”
j. ASTM D6386 “Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting”
k. ASTM D7803 “Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Powder Coating”

2. “Recommended Details for Hot-dip Galvanized Structures”, American Galvanizers Association
3. “Inspection of Products Hot-dip Galvanized After Fabrication”, American Galvanizers Association
4. “The Design of Products to be Hot-dip Galvanized After Fabrication”, American Galvanizers Association

B. Building and Facility Structures

1. American Society for Testing and Materials (ASTM)

a. ASTM A500 “Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes”
b. ASTM A992 “Standard Specification for Structural Steel Shapes”
c. ASTM A1085 “Standard Specification for Cold-Formed Welded Carbon Steel Hollow Structural Sections (HSS)”

2. AISC 303 “Code of Standard Practice for Steel Buildings and Bridges”
3. AISC 360 “Specification for Structural Steel Buildings”
4. AWS D1.1 “Structural Welding Code”
5. Industrial Fasteners Institute (IFI): IFI “Fastener Standards".
6. “Specification for Structural Joints Using High-Strength Bolts” as approved by the Research Council on Structural Connections
7. “Handbook on Bolt, Nut, and Rivet Standards”, Industrial Fasteners Institute
8. AISC "Load and Resistance Factor Design Specification for Structural Steel Buildings", including the "Commentary" thereto.
9. ASIC Code of Standard Practice for Steel Buildings and Bridges", including the "Commentary" thereto.

C. Bridges Structures

1. American Society for Testing and Materials (ASTM)

a. ASTM A709 “Standard Specification for Structural Steel for Bridges”

2. Illinois Department of Transportation Standard Specification for Road and Bridge Construction, Section 505, and 1006 including the current Supplemental Specifications for these Sections and applicable Guide Bridge Special Provisions.
3. AWS D1.5 “Bridge Welding Code”

D. Track Structures

1. All references included in Section C.

2. American Railway Engineering and Maintenance of Way Association (AREMA) “Manual for Railway Engineering”, Chapter 15, “Steel Structures”, Parts 1, 3, 4 and 5.

1.04 SUBMITTALS

A. Shop Drawings: Submit to the Authority in accordance with the requirements of the Submittal Section of these specifications, the following:

1. Complete details and schedules for the fabrication of each member, and for shop assembly of members, including connections.
2. Complete details, schedules, procedures and diagrams showing the sequence of erection.
3. Complete shop drawings must indicate actual field-verified dimensions, elevations and details for all structural steel for this project. Shop drawings must identify the size, location and erection details of all structural steel, connections, and all other details.

B. Connection Designs Delegated to the Fabricator: Furnish structural calculations with connection detail drawings for all structural steel and connections for the actual loading and conditions. Calculations must be prepared by and sealed by an Illinois licensed Structural Engineer. Prior to submitting shop drawings of these connections for review, the Structural Engineer of Record for the connections must review the shop drawings for compliance with their design.

C. Manufacturer's Literature: Submit to the Authority, copies of manufacturer's specifications and installation instructions for the products being supplied as well as for the welding, galvanizing, and any shop applied coats of paint; including laboratory test reports and such other data as may be required to show compliance with these specifications and specified standards.

D. Surveys: When new steel is connected to or installed adjacent to another fixed object, submit to the Authority, copies of signed and sealed survey(s) by the Contractor's Illinois licensed Professional Land Surveyor, showing elevations and locations of all pertinent existing fixed object elements. The shop drawings for the new steel will not be approved for fabrication until the survey is submitted and it is confirmed that the survey information has been integrated into the shop drawings.

E. Mill Affidavits and Certifications: Prior to fabrication of Structural Steel, the Contractor must submit to the Authority the following certified reports for the steel for the permanent structure:

1. AISC Fabricator Certification: Furnish evidence that the structural steel fabrication plant has current AISC Quality Certification of the specified category with facilities and personnel qualified to conduct the required Source Quality Control program.
2. AISC Erector Certification: Furnish evidence that the structural steel erector has current AISC Quality Certification of the specified category.
3. Paint Test Report: Copies of manufacturer's report verifying that paint to be used under slip-critical friction type structural bolted connections meets specified slip coefficient in accordance RCSC test requirements.
4. Paint Manufacturer's Certification: Furnish certification signed by the primary manufacturer of the paint coating materials, stipulating which painting materials and systems are proposed for use in the Work, and stating that the coating applicator is approved as a qualified applicator of said coating systems.
5. AISC Paint Applicator Endorsement: Furnish evidence that the applicator for

coating of “Architecturally Exposed Structural Steel” has a current AISC Sophisticated Paint Endorsement of the specified category.

6. Mill heat analysis of chemical composition.
7. Tension, bend and notch toughness test reports.
8. Mill certification that all supplementary requirements have been complied with.
9. Certification that bolts meet all ASTM requirements for the grade specified.
10. Certification that welding rods will deposit weld composition and amounts of silicone as close as possible to base metal.

F. Submit weld procedures and welder qualifications for review and obtain approval prior to fabrication or erection for field welding.

G. Provide letter from the galvanizer indicating that the approved shop drawings and fabrication processes have been reviewed and that there is nothing found that will prevent the hot dip galvanizer from meeting the requirements in the project documents

H. Submit all proposed galvanizing repair work, including galvanizing repair material type and corresponding detailed repair procedure.

1. Repair procedures must be per annex section for corresponding material repair type in ASTM A780 – refer to “Products” Part of this specification. Manufacturer’s detailed application procedures for repair material type may be used provided they conform to ASTM A780.

I. Contractor must submit a letter confirming that the steel shop drawings have been coordinated with all other new and existing pertinent adjacent objects, including but not limited to new and existing CIP concrete, PC concrete and utilities.

J. Contractor must submit process plans for all steel erection phases. Process plans to include, but are not limited to the following:

1. Plans showing extent of work zone and equipment locations.
2. Analysis of material picks for lifting equipment capacities.
3. Special attention is to be paid to steel erected adjacent to active train traffic and traction power infrastructure. Coordination of these activities with CTA Safety and CTA Rail Operations is essential.
4. All other requirements for process plans as listed in Division 1.

K. Contractor must submit process plan for bolting and testing of slip critical connections and pretensioned bolts. The process plan must include a field demonstration by the erector and testing agency, witnessed by the Authority or the Authority’s designee prior to steel erection.

L. Exposed Painting System Description: Submit for Commissioner's information. Furnish a complete written description of the shop coating and touch-up painting of the “Architecturally Exposed Structural Steel" systems. Itemize the materials, methods, procedures and sequence to be followed for exposed painted steel components, and arrange the description to correspond with the fabrication and erection schedule. Include statement verifying that the selected painting materials and systems are proper and adequate for the application shown, including compatibility of each coating product within each painting system.

1.05 QUALITY ASSURANCE

A. The structural steel work required herein, including details, fabrication, inspection,

testing, and erection, except as otherwise shown, must comply with the provisions of the codes, specifications and standards listed in both Section 1.03 A for all types of structure and Sections 1.03 B, C, and D for the specific individual type of structure.

B. The Contractor is solely responsible for quality control of all the structural steel work. The Contractor must employ, at his own expense, a qualified Independent Testing Agency to conduct specified Source Quality Control and Field Quality Control and provide reports to the Authority. Information regarding the testing agency must be submitted to the Authority for approval prior to being hired by the Contractor.

C. Contractor must comply with all applicable governmental codes and regulations.

D. Galvanize Coating Applicator's Qualifications: Company specializing in hot dip galvanizing after fabrication and following the procedures of "Quality Assurance Manual" of the American Galvanizers Association.

E. Coating Applicator Qualification: The coating applicator for painting of "Architecturally Exposed Structural Steel" shall be trained and approved by the paint manufacturer in the use of the coating materials and equipment to be employed in the Work. The structural steel fabricator shall have an AISC Sophisticated Paint Endorsement for Category P3 - Outside.

F. Approved shop drawings must be submitted to the galvanizer for review and approval.

G. Fabricator's Qualifications: Engage a firm experienced in fabricating structural steel similar to that indicated for the Project and with a record of successful in-service performance. Unless otherwise approved in writing by Authority, fabricator must participate in the AISC quality certification program and be designated an AISC certified fabricator as follow:

1. Building and Facility Structures: Building QMS Certification (BU)
2. Bridge Structures: Comply with IDOT Standard Specification for Certification of Metal Fabricator.
3. Track Structures: Bridge QMS Certification, Advanced (ABR)

H. Erector Qualifications: Unless otherwise approved by Authority in writing, a qualified erector who participates in the AISC Quality Certification Program and is designated as an AISC-Certified Erector, Category CSE.

1.06 PRODUCT HANDLING

A. Do not deliver material to the project site until the proposed method and sequence of erection has been reviewed by the Authority. Method and sequence must be planned so as to avoid delay or damage to the work of other trades.

B. Storage of fabricated steel at the job site must be the responsibility of the Contractor. Material stored at the job site must not exceed design loads on existing or newly-constructed structures so that members will not be distorted or otherwise damaged; and must be protected against corrosion or deterioration.

PART 2 PRODUCTS

2.01 STRUCTURAL STEEL

A. Structural steel including beams, columns, angles, channels, plates, etc. must comply

with the provisions of the ASTM specifications for A992 material for building and facility structures, and A709 for bridge and track structures, unless noted otherwise on the Drawings.

B. For bridge and track structures, material designated as FCM (Fracture Critical Material) must comply with Charpy V-Notch Testing requirements for Zone 2. For track structures, material not designated as FCM or designated as NTR (Notch Toughness Requirement) must comply with Impact Test Requirements for Zone 2 in Table 15-1-2 of AREMA “Manual for Railway Engineering”, Chapter 15.

C. Structural steel tubes must comply with ASTM A 500 Grade C, unless noted otherwise on the Drawings.

D. Provide and install all miscellaneous structural steel members required for this project including lintels, leveling, plates, base plates, setting plates, etc.

2.02 WELDING ELECTRODES

A. For building and facility structures, welding electrodes must comply with the provisions of AWS specifications A 5.1, A 5.5, A 5.17, A 5.18, and A 5.20. Weld electrodes must be E70XX unless required otherwise. For bridge and track structures, welding electrodes must comply with the provisions of Article 505.04 (q) of the IDOT Standard Specifications.

1. To achieve a more uniform galvanized coating thickness and appearance, welding rod must deposit weld composition and amount of silicone matching that of the surrounding base metal and per steel mill reports.

2.03 BOLTS

A. All high strength bolts, nuts and washers must comply with the provision of ASTM F3125 Grade A325.

B. For pretensioned joint and slip critical joint, bolt/nut/washer must be supplied by one manufacturer as a complete assembly.

C. All anchor bolts, nuts and washers must conform to the requirements of ASTM F1554, GR 36 unless otherwise shown on the drawings.

2.04 GALVANIZING, SHOP PRIMING AND FINISHING

A. All new structural steel members and fabrications must be hot-dip galvanized conforming to ASTM A123 or ASTM A153. Where galvanized steel exposed to view after installation are finished with protective and finished coats as shown in the Drawings, see painting section of these specifications.

B. Existing structural steel members and fabrications must be prepared and field finished with protective and finish coats according to painting section of these specifications.

C. Repair/Renovation of damaged galvanized coating must conform to ASTM A780. Manufacturer's application procedures may be submitted for approval provided they conform with corresponding repair material type Annex. Thickness of repair must be verified as required by corresponding Annex. Acceptable repair material types and corresponding repair procedure must be as follow:

1. Zinc-Based Solders: Must be per ASTM A780, Annex A1. Thickness of repair must match surrounding undamaged galvanized coating and as required for the class of material in ASTM A123 or ASTM A153.
2. Paints Containing Zinc Dust: Must be per ASTM A780, Annex A2. Thickness of repair must be 50% greater than the thickness of the galvanized coating required for the class of material in ASTM A123 or ASTM A153. Exception to Annex A2.1.4: Spray application of paints is prohibited.
3. Spray Molten Zinc (Metallizing) - Not an acceptable repair material type for structural steel in this specification.

2.05 SHEAR STUD CONNECTORS

A. Headed stud type, in accordance with AWS D1.1 requirements. ASTM A108, Grade 1015 or 1020 cold-finished carbon steel.

2.06 FILLER FOR ARCHITECTURALLY EXPOSED STRUCTURAL STEEL

A. Solvent-resistant, 2-component metal and epoxy compound suitable for repair of steel l

2.07 MISCELLANEOUS MATERIAL

A. Miscellaneous material, accessories, grout, etc. not listed above must be provided as specified hereinafter under the various items of work and/or as indicated on the drawings or required for a complete structure according to specified standards.

B. Provide supplemental structural steel support framing for metal deck where normal deck bearing is precluded by other framing members and around openings.

2.08 SOURCE QUALITY CONTROL

A. All tests required in this Specification must be performed by the Testing Agency, or at the Contractor's option, by the manufacturer's Quality Control program, provided the Quality Control program and the testing reports are reviewed by the Testing Agency. The Testing Agency must furnish a letter and submit to the Authority confirming the manufacturer's Quality Control program complies with the requirements in this Specification, and the testing reports meet the approval criteria in the specific codes, specifications, and standards in Section 1.03. Additional testing required due to non-conforming work must be the responsibility of the Contractor. All reporting by the Testing Agency must be provided concurrently to both the Authority and the Contractor.

B. Bolted connections must be inspected by the Testing Agency in accordance with the following:

1. Building and Facility structures: AISC Specifications for Structural Joints Using High-Strength Bolts Section 9. For pre-tensioned and slip critical joints, pre-installation verification must be performed in accordance with Section 7 of the AISC Specifications for Structural Joints Using High-Strength Bolts. Blind bolts are to be inspected by the Testing Agency per the manufacturer's ICC-ES report.
2. Bridge and Track structures: IDOT Standard Specification Section 505. In addition to the after-installation inspection, field rotational-capacity test in accordance with Article 505.04(f)(3) g.1 and pre-installation verification test in accordance with Article 505.04(f)(2) in IDOT Standard Specification must be performed. Article 505.04(f)(3)(d) does not apply and field rotational- capacity test must be witnessed by the Testing Agency.

C. During fabrication, welding inspection and testing must comply with Section 1.05 A. Anytype of crack or zone of incomplete fusion or penetration will not be acceptable.

1. Building and Facility structures: Specification for Structural Steel Buildings Chapter N Section N5 with the following clarifications and modifications:

   a. Tables N5.4-1, 2, and 3 where “O” presents, a minimum of 15% of the welded joints must be observed on a random basis.
   b. Nondestructive testing of welded joints is required per Section 3.14 of this Specification.
   c. Section 5b, structures must be considered as in Risk Category III per ASCE 7, and user note, “NDT of CJP groove welds in materials less than 5/16 in. thick is not required” will not apply.
   d. Section 5e, reduction of rate of ultrasonic testing will not be permitted.

2. Bridge structures: AWS D1.5 Clause 6. In addition, Clause 12 for any structural components designated on the Drawings or in the special provisions as FCM (Fracture Critical Member) with the following clarifications and modifications:

   a. Section 6.1.3.1, the inspector must be an AWS Certified Welding Inspector (CWI) qualified and certified in conformance with the provisions of AWS QC1, Standard for AWS Certification of Welding Inspectors.
   b. Section 6.1.3.4 the individuals who perform NDT must be certified as NDT Level III and qualified per ASNT SNT-TC-1A as a Level II for NDT performed.
   c. Where code does not contain structural element welded joint inspection frequency requirements, Section 2.06 G will apply.

3. Track structures: Section 1.05 C 2 must apply and AREMA “Manual for Railway Engineering”, Chapter 15, “Steel Structures”, Part 3 Section 3.5.5 and Part 1 Section 1.14.4, with the following clarifications and modifications made to AREMA reference:

   a. Section 3.5.5 b, groove welds must be tested with ultrasonic nondestructive testing method.
   b. Section 3.5.5 c, 100% flange-to-web fillet welds must be inspected by the magnetic particle method.
   c. Where codes do not contain structural element welded joint inspection frequency requirements, Section 2.06 G will apply.

D. Access to locations where material for this contract is being fabricated or produced must be provided for the purpose of inspection and testing, including scaffolding.

E. The Authority may inspect structural steel at the plant before shipment; however, the Authority reserves the right to reject any material, at any time before final acceptance, which does not conform to all the requirements of the drawings and specifications.

F. The Testing Agency must perform visual and coating thickness inspections of hot-dip galvanized steel before the product leaves the galvanizer’s plant. The “Sampling” and “Test Methods” of ASTM A123 and ASTM A153 must be followed as appropriate.

G. Where codes do not contain structural element welded joint inspection frequency requirements as specified in Section 2.06 C, Non-Destructive Testing must include not less than the following items. All testing is done on the final pass:

1. Magnetic Particle Testing: 20% of continuity plate, end plate, and bracing gusset plate fillet welds, selected at random.
2. Magnetic Particle Testing: 100% of tension member fillet welds, e. g. hanger rod connections, bracing members to gusset plate and gusset plate welds for the main lateral resistance system, and other similar connections.
3. Ultrasonic Testing: 100% of full and partial penetration welds, e.g. built-up members and other similar members.
4. Magnetic Particle Testing: 100% of built-up member fillet welds in zones of moment connections.
5. Magnetic Particle Testing: 20% of other built-up member fillet welds, selected at random.
6. Magnetic Particle Testing: 10% of other miscellaneous fillet welds, selected at random.
7. All field welds on bridge and track structures, when approved by the Authority, must be tested 100% with Magnetic Particle Testing Method for fillet welds, and Ultrasonic Testing Method for groove welds.

PART 3 EXECUTION

3.01 GENERAL

A. Contractor must verify all dimensions and conditions in the field prior to fabricating and erecting structural steel. Notify the Authority of any major discrepancies.

B. Field modification of structural steel is prohibited without prior written approval of the Authority.

C. Structural steel for the bridge and track structures must be fabricated in accordance with Section 505, Steel Structures, of the IDOT Standard Specifications. In addition, track structures must be fabricated in accordance with AREMA “Manual for Railway Engineering”, Chapter 15, “Steel Structures”, Parts 3, Fabrication. Where difference occur in the provisions of the IDOT Standard Specification, AREMA “Manual for Railway Engineering”, and this Specifications, the more stringent requirements must be followed as determined by the Authority.

3.02 FABRICATION

A. Material must be properly marked and match-marked where field assembly is required. The sequence of shipments must be such as to expedite erection and minimize the field handling of material.

B. Rolled material, before and after being laid off or worked, must be straight within the tolerances allowed by ASTM A6. If straightening is necessary, it must be done by methods which will not adversely affect the behavior of the material. If straightening is not necessary, natural camber of rolled sections must be placed upward.

C. Fabricate and assemble structural steel in shop to greatest extent possible. Assemblies must conform to the dimensions shown on the approved shop drawings.

D. Beams must be cambered where indicated on the Drawings.

E. Beam connections must be as shown or noted on the Drawings. Unless noted otherwise, standard connections must be used.

F. Combination of bolts and welds must not be used for stress transmission in the same

face of any connection.

G. Holes: Provide holes required for securing other work to structural steel framing and for passage of other work through steel framing members, as shown on shop drawings.

1. For building structures, cut, drill, or punch holes perpendicular to metal surfaces. Do not flame-cut holes or enlarge holes by burning; ream holes that must be enlarged to admit bolts. Drill holes in bearing plates.
2. For bridge structures, fastener holes must be in accordance with IDOT Standard Specification Article 505.04 (d).
3. For track structures, fastener holes must be in accordance with AREMA "Manual for Railway Engineering", Chapter 15, "Steel Structures", Parts 3, Fabrication, with the following modifications:

a. Section 3.2.6 g will not be permitted.
b. Section 3.2.7 e will not be permitted.

H. For steel to be galvanized, fabricate in accordance with Class I or II guidelines as described in AGA's Recommended Details for Galvanized Structures.

3.03 WELDING

A. Welding processes other than shielded metal arc and submerged arc may be used provided procedure qualification tests in accordance with the American Welding Society are made for the intended application of any such process.

B. Built-up sections assembled by welding must be free of warpage and all axes must have true alignment.

C. Welds not specified must be continuous fillet welds, using not less than the minimum fillet as specified by AWS.

D. All welding sequences must be such as to reduce the residual stresses due to welding to a minimum value. If high residual stresses are present, stress relieving of joints may be required.

E. The toughness and notch sensitivity of the steel must be considered in the formation of all welding procedures to prevent brittle and premature fracture during fabrication and erection.

F. Welded connections must be detailed and designed to minimize the accumulation and concentration of thru-thickness strains due to weld shrinkage.

G. The maximum number of welded joint repairs is two unless otherwise approved by the Authority. Fabricator's welded joint repair procedure must be submitted to the Authority for approval, or the following pre-approved repair procedure may be used:

1. Notify the Testing Agency prior to starting the repair procedure. Inspector from Testing Agency must witness the welded joint repair work.
2. Remove the welded component by cutting to 1/8" above the welds.
3. Using air carbon arc, being extremely careful not to damage the base metal, remove the weld and remaining welded component to within 1/8" of the base metal.
4. Grind the remaining weld and welded component smooth and flush with the surrounding base metal. Grind parallel to the direction of longitudinal axis of the

weld.

5. Inspect all of the weld removal areas by magnetic particle test method either by the Testing Agency inspector or have the inspector witness the test.

    a. For track structures, time delay prior to magnetic particle test of weld repairs to groove welds for material over 2 inches in thickness, subject to tensile stress, as determined by the Authority on a case-by-case basis, must be 16 hours minimum.

6. Complete a corrective action report and provide a copy to the Authority confirming the base metal meets the material requirement in this Specification with no defect and is adequate for the welded joint rework.
7. Welded joint rework can start after the corrective action report is accepted by the Authority.

3.04 PREPARATION OF STEEL

A. Perform all inspections prior to galvanizing or field finishing. Galvanized faying surfaces for slip critical joints shall not be roughened by means of hand wire brushing or power wire brushing. Galvanized faying surfaces for slip critical joints shall be protected/masked and be free of all oil, grease, dust, dirt, primer, or paint before final connections can be made.

B. All non-galvanized existing structural steel surfaces must be prepared and cleaned as specified in the painting section of these specifications.

C. Paint application must be in accordance with paint manufacturer's printed instructions and recommendations. The fabricator must submit paint system to be used for approval by the Authority prior to purchasing. All paint products must be compatible products from the same manufacturer.

3.05 APPLICATION OF GALVANIZING

A. Galvanize steel members, fabrications, and assemblies to the greatest extent possible after fabrication by the hot dip process in accordance with ASTM A123 and ASTM A153. All structural steel must have all pieces attached by welding to the greatest extent possible as shown on drawings before galvanizing. All bolted pieces must be bolted together after galvanizing.

B. Prior to galvanizing, structural steel must be cleaned of all mill scale, rust, spatter, slag or flux deposit, oil, dirt and other foreign material.

C. Dip all structural steel members and metal fabrications assuring a sufficient coating of all surfaces, including corners, joints, holes, and other surfaces.

D. Long steel members and large fabrications too large for a single dip in the galvanizing vat, must be dipped in maximum two applications to assure all surfaces are thoroughly and fully coated.

E. Galvanize bolts, nuts and washers and iron and steel hardware components in accordance with ASTM A 153. Bolts, nuts, and washers must be a unit assembly when shipped to job site for slip critical and pretensioned joints.

F. Safeguard products against steel embrittlement in conformance with ASTM A 143.

G. Handle all articles to be galvanized in such a manner as to avoid any mechanical damage or any distortion.

H. Where contract documents indicate that galvanized steel is to receive additional coatings as part of duplex coating system, galvanized surfaces must be prepared in accordance to ASTM D6386 for paint coating or ASTM D7803 for powder coatings.

3.06 GALVANIZING COATING REQUIREMENTS

A. Coating Weight and Thickness must be per applicable ASTM:

1. Conform with paragraph 5.1 of ASTM A 123, Table 1 and 2

2. Conform with paragraph 4.3 of ASTM A 153, Table 1

B. Surface Finish: Continuous, adherent, as smooth and evenly distributed as possible and free from any defect detrimental to the stated end use of the coated article.

C. Adhesion: Withstand normal handling consistent with the nature and thickness of the coating and normal use of the article.

3.07 TESTS FOR GALVANIZING

A. Galvanizer must inspect the entire galvanized surface to ensure compliance with ASTM requirements.

B. Testing Agency to inspect and test hot dip galvanized coatings per the guidelines provided in the AGA publication “Inspection of Products Hot Dip Galvanized After Fabrication” and in conformance with ASTM A123 and ASTM A153.

C. Galvanizer to furnish a certificate indicating compliance with ASTM Standards and Specifications herein listed. The certificate must be signed by the galvanizer and contain a detailed description of the material processed as well as information as to the ASTM standard used for the coating.

3.08 PAINTING

A. See painting section of these specifications.

B. Perform all inspections and repair all galvanizing prior to finishing.

C. Galvanized steel must be prepared per ASTM D6386 for painting if required per the Drawing.

D. Metal fabrications may have protective and finish coats installed in the shop if approved by the Authority. Do not provide finish coats to shop or field contact surfaces or within 2" of field welds. See painting section for description of protective and finish coats for steel.

3.09 BENCHMARKS

A. The Contractor must employ the services of an Illinois registered professional surveyor who must establish permanent bench marks, field check all elevations of concrete on which structural steel is to be placed, locations of anchor bolts as well as location and elevation of any objects where the new steel is connected to or installed adjacent to.

The contractor's surveyor must provide a letter prior to erection that verifies existing field conditions have been checked and coordinated with the steel shop drawings. If the surveyor notes any discrepancies, the Contractor must propose mitigation measures.

3.10 ERECTION

A. The Contractor must be responsible for the accurate setting and leveling of all bearing plates or setting plates. Bearing plates or setting plates must be leveled on steel wedges or shims unless otherwise detailed.

B. Furnish templates, where shown, specified or called for on the drawings. Furnish shim plates or developed fills where required to obtain proper fit and alignment.

C. For bridge structures, structural steel must be assembled and erected in accordance with Section 505, Steel Structures, of the IDOT Standard Specifications and, also, in accordance with this Specification. For track structures, in addition to the requirements for bridge structures, structural steel must be assembled and erected in accordance with AREMA "Manual for Railway Engineering", Chapter 15, "Steel Structures", Parts 4, Erection. Where differences occur in the provisions of the IDOT Standard Specification, AREMA "Manual for Railway Engineering", and this Specification, the more stringent requirements must be followed, as determined by the Authority.

D. For bridge and track structures, the Contractor and the Contractor's erection engineer must be responsible to determine how cross frames and diaphragms should be fitted. The Contractor and Contractor's erection engineer must perform girder drop analysis per AASHTO/NSBA Steel Bridge Erection Guide to determine the erected position of the girders and the condition under which that position is to be theoretically achieved. Girder drop analysis must be submitted to the Authority for review. No Load Fit (NLF or Fully Cambered Fit) should be avoided for skewed bridges or track structure spans with skew greater than 20 degrees.

3.11 ERECTION TOLERANCE

A. General: Provide in accordance with AISC Specification and AISC Code. Accurately fit structural members for proper elevation and alignment of the finished structure. Make adjustments necessary in the steel frame due to discrepancies in elevations and alignment. Adjust and align in accurate location before permanently fastening. Design, provide and maintain temporary bracing, bridging, guy lines, crane supports, connections, and anchors as required to ensure proper alignment and stability during construction.

B. The Contractor alone must be responsible for the correct fitting of all structural members and for the elevation and alignment of the finished structure. Any adjustments necessary in the steel frame because of discrepancies in elevations and alignment must be the responsibility of the Contractor.

C. Unless otherwise noted, individual members of the structure must be leveled and plumbed to an accuracy of 1 to 500, but not to exceed 1/2" in columns for their full height, except exterior columns and columns adjacent to elevator beams must be accurate to 1 to 1,000 but not to exceed 1/2" for their full height or unless otherwise noted by the elevator manufacturer. All leveling and plumbing must be done based on the mean operating temperature of the structure. Allowances must be made for the difference in temperature at time of erection and the mean temperature at which the structure will be when completed and in service.

D. Where building and facility steel structures are supported by bridge or track structures, detailing of the building and facility steel structures must consider the dead load deflection of the bridge or track structures at the stage when building and facility structures are erected. The erection tolerances specified in this Section applies to all steel structures, regardless of staging.

3.12 CONNECTIONS

A. Connections between members and corners must be mitered unless approved otherwise.

B. Welding or final bolting must not be done until as much of the structure as will be stiffened by the welding or bolting has been properly aligned.

C. Drift pins must not be used to enlarge unfair holes in main material.

D. When high strength bolts are used in pre-tensioned or slip-critical connections, bolt tensioning must be performed using "turn-of-nut method".

E. For bridge and track structures, bolt heads must face out on the exterior of the web. For field splice, bolt nuts must be on top surface of the lower flange splice.

3.13 STUD WELDING

A. Provide in accordance with the stud manufacturer's recommendations, using only personnel and equipment authorized by the stud manufacturer. Clean the surfaces where the studs shall be attached to make free of rust, oil, grease, paint, and other deleterious matter. Remove mill scale by grinding or sandblasting as necessary to prevent difficulty in obtaining proper welds.

3.14 FIELD ALTERATIONS

A. Modifications required to structural steel fabrications to facilitate proper installation including cutting, drilling or welding must be submitted to the Authority for written approval. Provide shop drawings of the proposed modifications certified by a licensed structural engineer in the State of Illinois.

B. Protective coatings must be restored per appropriate, approved material type and procedure conforming to ASTM A780.

3.15 FIELD QUALITY CONTROL

A. Connection Inspection: Perform 100% visual inspection of bolted connection installed as bearing type. Examine the surfaces, size, quality and placement of each connection to verify installation in accordance with Contract documents and approved shop drawings.

B. Testing of High-Strength Bolted Connections installed as pretensioned and slip critical condition: inspect and test 100% bolts installed in snug-tight condition with match-marks are made, but prior to tightening to slip critical condition. After tightening by the turn-of-the nut method, bolted connection will be accepted on the basis of a visual inspection of the match-marks on the bolts.

C. Field welding must be inspected and tested by the Testing Agency during the erection of the structural steel.

1. For building and facility structures, Specification for Structural Steel Buildings Chapter N Section N5 will apply, with the modification that all marking “O” will be replaced by “P” for field welding.
2. All other requirements specified in Section 2.06 C and G of this Specification will apply with the exception that testing frequency is 100%.
3. For bridge and track structures, field welding is prohibited.

3.16 FIELD CLEANING, GALVANIZING TOUCH UP AND PAINTING

A. Field cleaning and painting must conform to the requirements of the painting section of these specifications, including preparation of existing surfaces, and application of prime and finish coats at field welds, bolted connections, abraded areas and other areas of the exposed steel.

B. Repair of damaged or uncoated areas of galvanized steel must be per approved repair material and approved detailed procedure conforming to ASTM A780. Damaged or uncoated areas must be previously galvanized steel surfaces that do not have the minimum required coating thicknesses as defined in the governing ASTM, ASTM A123 or ASTM A153.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 05 10 30, Structural Steel shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 05 10 30, Structural Steel shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Structural Work: 030000

END OF SECTION

SECTION 05 10 30.S
STRUCTURAL STEEL

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this section.

1.02 SUMMARY

A. This Section specifies requirements for structural steel used in the project including columns, beams, canopy and roof framing, framing for new stair opening, framing for elevator shaft, framing for escalator opening and support, etc. This work includes furnishing all labor, materials, accessories, tools and equipment required to furnish and install all structural steel including, but not limited to, fabrication, galvanizing, field erection, field preparation for painting and any other work required for a complete project.

B. Unless noted otherwise, all new structural steel must be hot-dip galvanized. Existing structural steel must be field prepared and cleaned and also coated with protective and finish coats in the field.

C. Related Specifications

1. Section 05 12 50 – Architecturally Exposed Structural Steel
2. Section 05 31 00 – Steel Deck
3. Section 05 50 00 – Metal Fabrications
4. Section 05 50 10 – Barriers, High Barriers, Gates
5. Section 05 50 20 – Railing and Guardrails
6. Section 05 51 10 – Metal Stairs with Stainless Steel Treads
7. Section 05 53 00 – Metal Gratings
8. Section 05 71 00 – Perforated Metal Panels
9. Section 05 80 10 – Elastomeric Expansion Assemblies, Slide Bearing Assemblies, Bearing Pads and Isolation Pads
10. Section 09 90 00 – Painting
11. Section 09 90 10 – Cleaning and Painting of Existing Surfaces

1.03 REFERENCES

A. General

1. American Society for Testing and Materials (ASTM)

a. ASTM A6 “Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling”
b. ASTM A36 “Standard Specification for Carbon Structural Steel”
c. ASTM A572 “Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel”
d. ASTM A53 “Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless”

e. ASTM F3125 “Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi and 150 ksi Minimum Tensile Strength”
f. ASTM F1554 “Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength”
g. ASTM A123 “Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products”
h. ASTM A153 “Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware”
i. ASTM A780 “Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings”
j. ASTM D6386 “Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting”
k. ASTM D7803 “Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Powder Coating”

2. “Recommended Details for Hot-dip Galvanized Structures”, American Galvanizers Association
3. “Inspection of Products Hot-dip Galvanized After Fabrication”, American Galvanizers Association
4. “The Design of Products to be Hot-dip Galvanized After Fabrication”, American Galvanizers
Association

B. Building and Facility Structures

1. American Society for Testing and Materials (ASTM)

a. ASTM A500 “Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes”
b. ASTM A992 “Standard Specification for Structural Steel Shapes”
c. ASTM A1085 “Standard Specification for Cold-Formed Welded Carbon Steel Hollow Structural Sections (HSS)”

2. AISC 303 “Code of Standard Practice for Steel Buildings and Bridges”
3. AISC 360 “Specification for Structural Steel Buildings”
4. AWS D1.1 “Structural Welding Code”
5. “Specification for Structural Joints Using High-Strength Bolts” as approved by the Research Council on Structural Connections
6. “Handbook on Bolt, Nut, and Rivet Standards”, Industrial Fasteners Institute
7. AISC Design Guides

C. Bridges Structures

1. American Society for Testing and Materials (ASTM)
(a) ASTM A709 “Standard Specification for Structural Steel for Bridges”
2. Illinois Department of Transportation Standard Specification for Road and Bridge Construction, Section 505, and 1006 including the current Supplemental Specifications for these Sections and applicable Guide Bridge Special Provisions.
3. AWS D1.5 “Bridge Welding Code”

D. Track Structures

1. All references included in Section C.

2. American Railway Engineering and Maintenance of Way Association (AREMA) “Manual for Railway Engineering”, Chapter 15, “Steel Structures”, Parts 1, 3, 4 and 5.

1.04 SUBMITTALS

A. Shop Drawings: Submit to the Authority in accordance with the requirements of the Submittal Section of these specifications, the following:

1. Complete details and schedules for the fabrication of each member, and for shop assembly of members, including connections.
2. Complete details, schedules, procedures and diagrams showing the sequence of erection.
3. Complete shop drawings must indicate actual field-verified dimensions, elevations and details for all structural steel for this project. Shop drawings must identify the size, location and erection details of all structural steel, connections, and all other details.

B. Connection Designs Delegated to the Fabricator: Furnish structural calculations with connection detail drawings for all structural steel and connections for the actual loading and conditions. Calculations must be prepared by and sealed by an Illinois licensed Structural Engineer. Prior to submitting shop drawings of these connections for review, the Structural Engineer of Record for the connections must review the shop drawings for compliance with their design.

C. Manufacturer's Literature: Submit to the Authority, copies of manufacturer's specifications and installation instructions for the products being supplied as well as for the welding, galvanizing, and any shop applied coats of paint; including laboratory test reports and such other data as may be required to show compliance with these specifications and specified standards.

D. Surveys: When new steel is connected to or installed adjacent to another fixed object, submit to the Authority, copies of signed and sealed survey(s) by the Contractor's Illinois licensed Professional Land Surveyor, showing elevations and locations of all pertinent existing fixed object elements. The shop drawings for the new steel will not be approved for fabrication until the survey is submitted and it is confirmed that the survey information has been integrated into the shop drawings.

E. Mill Affidavits and Certifications: Prior to fabrication of Structural Steel, the Contractor must submit to the Authority the following certified reports for the steel for the permanent structure:

1. Mill heat analysis of chemical composition.
2. Tension, bend and notch toughness test reports.
3. Mill certification that all supplementary requirements have been complied with.
4. Certification that bolts meet all ASTM requirements for the grade specified.
5. Certification that welding rods will deposit weld composition and amounts of silicone as close as possible to base metal.

F. Submit weld procedures and welder qualifications for review and obtain approval prior to fabrication or erection for field welding.

G. Provide letter from the galvanizer indicating that the approved shop drawings and fabrication processes have been reviewed and that there is nothing found that will prevent the hot dip galvanizer from meeting the requirements in the project documents

H. Submit all proposed galvanizing repair work, including galvanizing repair material type and corresponding detailed repair procedure.

1. Repair procedures must be per annex section for corresponding material repair type in ASTM A780 – refer to “Products” Part of this specification. Manufacturer’s detailed application procedures for repair material type may be used provided they conform to ASTM A780.

I. Contractor must submit a letter confirming that the steel shop drawings have been coordinated with all other new and existing pertinent adjacent objects, including but not limited to new and existing CIP concrete, PC concrete and utilities.

J. Contractor must submit process plans for all steel erection phases. Process plans to include, but are not limited to the following:

1. Plans showing extent of work zone and equipment locations.
2. Analysis of material picks for lifting equipment capacities.
3. Special attention is to be paid to steel erected adjacent to active train traffic and traction power infrastructure. Coordination of these activities with CTA Safety and CTA Rail Operations is essential.
4. All other requirements for process plans as listed in Division 1.

K. Contractor must submit process plan for bolting and testing of slip critical connections and pretensioned bolts. The process plan must include a field demonstration by the erector and testing agency, witnessed by the Authority or the Authority’s designee prior to steel erection.

1.05 QUALITY ASSURANCE

A. The structural steel work required herein, including details, fabrication, inspection, testing, and erection, except as otherwise shown, must comply with the provisions of the codes, specifications and standards listed in both Section 1.03 A for all types of structure and Sections 1.03 B, C, and D for the specific individual type of structure.

B. The Contractor is solely responsible for quality control of all the structural steel work. The Contractor must employ, at his own expense, a qualified Independent Testing Agency to conduct specified Source Quality Control and Field Quality Control and provide reports to the Authority. Information regarding the testing agency must be submitted to the Authority for approval prior to being hired by the Contractor.

C. Contractor must comply with all applicable governmental codes and regulations.

D. Galvanize Coating Applicator’s Qualifications: Company specializing in hot dip galvanizing after fabrication and following the procedures of “Quality Assurance Manual” of the American Galvanizers Association.

E. Approved shop drawings must be submitted to the galvanizer for review and approval.

F. Fabricator’s Qualifications: Engage a firm experienced in fabricating structural steel similar to that indicated for the Project and with a record of successful in-service performance. Unless otherwise approved in writing by Authority, fabricator must participate in the AISC quality certification program and be designated an AISC certified fabricator as follow:

1. Building and Facility Structures: Building QMS Certification (BU)
2. Bridge Structures: Comply with IDOT Standard Specification for Certification of Metal Fabricator.

3. Track Structures: Bridge QMS Certification, Advanced (ABR)

G. Erector Qualifications: Unless otherwise approved by Authority in writing, a qualified erector who participates in the AISC Quality Certification Program and is designated as an AISC-Certified Erector, Category CSE.

1.06 PRODUCT HANDLING

A. Do not deliver material to the project site until the proposed method and sequence of erection has been reviewed by the Authority. Method and sequence must be planned so as to avoid delay or damage to the work of other trades.

B. Storage of fabricated steel at the job site must be the responsibility of the Contractor. Material stored at the job site must not exceed design loads on existing or newly-constructed structures so that members will not be distorted or otherwise damaged; and must be protected against corrosion or deterioration.

PART 2 – PRODUCTS

2.01 STRUCTURAL STEEL

A. Structural steel including beams, columns, angles, channels, plates, etc. must comply with the provisions of the ASTM specifications for A992 material for building and facility structures, and A709 for bridge and track structures, unless noted otherwise on the Drawings.

B. For bridge and track structures, material designated as FCM (Fracture Critical Material) must comply with Charpy V-Notch Testing requirements for Zone 2. For track structures, material not designated as FCM or designated as NTR (Notch Toughness Requirement) must comply with Impact Test Requirements for Zone 2 in Table 15-1-2 of AREMA “Manual for Railway Engineering”, Chapter 15.

C. Structural steel tubes must comply with ASTM A 500 Grade B, unless noted otherwise on the Drawings.

D. Provide and install all miscellaneous structural steel members required for this project including lintels, leveling, plates, base plates, setting plates, etc.

2.02 WELDING ELECTRODES

A. For building and facility structures, welding electrodes must comply with the provisions of AWS specifications A 5.1, A 5.5, A 5.17, A 5.18, and A 5.20. Weld electrodes must be E70XX unless required otherwise. For bridge and track structures, welding electrodes must comply with the provisions of Article 505.04 (q) of the IDOT Standard Specifications.

1. To achieve a more uniform galvanized coating thickness and appearance, welding rod must deposit weld composition and amount of silicone matching that of the surrounding base metal and per steel mill reports.

2.03 BOLTS

A. All high strength bolts, nuts and washers must comply with the provision of ASTM F3125 Grade A325.

B. For pretensioned joint and slip critical joint, bolt/nut/washer must be supplied by one manufacturer as a complete assembly.

C. All anchor rods, nuts and washers must conform to the requirements of ASTM F1554, GR 36 unless otherwise shown on the drawings.

2.04 GALVANIZING, SHOP PRIMING AND FINISHING

A. Unless noted otherwise, new structural steel members and fabrications must be hot-dip galvanized conforming to ASTM A123 or ASTM A153. Where galvanized steel exposed to view after installation are finished with protective and finished coats as shown in the Drawings, see painting section of these specifications.

B. Existing structural steel members and fabrications must be prepared and field finished with protective and finish coats according to painting section of these specifications.

C. Repair/Renovation of damaged galvanized coating must conform to ASTM A780. Manufacturer's application procedures may be submitted for approval provided they conform with corresponding repair material type Annex. Thickness of repair must be verified as required by corresponding Annex. Acceptable repair material types and corresponding repair procedure must be as follow:

1. Zinc-Based Solders: Must be per ASTM A780, Annex A1. Thickness of repair must match surrounding undamaged galvanized coating and as required for the class of material in ASTM A123 or ASTM A153.
2. Paints Containing Zinc Dust: Must be per ASTM A780, Annex A2. Thickness of repair must be 50% greater than the thickness of the galvanized coating required for the class of material in ASTM A123 or ASTM A153. Exception to Annex A2.1.4: Spray application of paints is prohibited.
3. Spray Molten Zinc (Metallizing) – Not an acceptable repair material type for structural steel in this specification.

2.05 MISCELLANEOUS MATERIAL

A. Miscellaneous material, accessories, grout, etc. not listed above must be provided as specified hereinafter under the various items of work and/or as indicated on the drawings, or required for a complete structure according to specified standards.

B. Provide supplemental structural steel support framing for metal deck where normal deck bearing is precluded by other framing members and around openings.

C. Structural grout: Non-shrink, high strength, non-metallic grout with a compressive strength of 6000 psi minimum. Provide grout under base plates as indicated.

2.06 SOURCE QUALITY CONTROL

A. All tests required in this Specification must be performed by the Testing Agency, or at the Contractor’s option, by the manufacturer’s Quality Control program, provided the Quality Control program and the testing reports are reviewed by the Testing Agency. The Testing Agency must furnish a letter and submit to the Authority confirming the manufacturer’s Quality Control program complies with the requirements in this Specification, and the testing reports meet the approval criteria in the specific codes, specifications, and standards in Section 1.03. Additional testing

required due to non-conforming work must be the responsibility of the Contractor. All reporting by the Testing Agency must be provided concurrently to both the Authority and the Contractor.

B. Bolted connections must be inspected by the Testing Agency in accordance with the following:

1. Building and Facility structures: AISC Specifications for Structural Joints Using High-Strength Bolts Section 9. For pre-tensioned and slip critical joints, pre-installation verification must be performed in accordance with Section 7 of the AISC Specifications for Structural Joints Using High-Strength Bolts. Blind bolts are to be inspected by the Testing Agency per the manufacturer's ICC-ES report.
2. Bridge and Track structures: IDOT Standard Specification Section 505. In addition to the after installation inspection, field rotational-capacity test in accordance with Article 505.04(f)(3) g.1 and pre-installation verification test in accordance with Article 505.04(f)(2) in IDOT Standard Specification must be performed. Article 505.04(f)(3)(d) does not apply and field rotational capacity test must be witnessed by the Testing Agency.

C. During fabrication, welding inspection and testing must comply with Section 1.05 A. Any type of crack or zone of incomplete fusion or penetration will not be acceptable.

1. Building and Facility structures: Specification for Structural Steel Buildings Chapter N Section N5 with the following clarifications and modifications:

    a. Tables N5.4-1, 2, and 3 where "O" presents, a minimum of 15% of the welded joints must be observed on a random basis.
    b. Nondestructive testing of welded joints is required per Section 3.14 of this Specification.
    c. Section 5b, structures must be considered as in Risk Category III per ASCE 7, and user note, "NDT of CJP groove welds in materials less than 5/16 in. thick is not required" will not apply.
    d. Section 5e, reduction of rate of ultrasonic testing will not be permitted.

2. Bridge structures: AWS D1.5 Clause 6. In addition, Clause 12 for any structural components designated on the Drawings or in the special provisions as FCM (Fracture Critical Member) with the following clarifications and modifications:

    a. Section 6.1.3.1, the inspector must be an AWS Certified Welding Inspector (CWI) qualified and certified in conformance with the provisions of AWS QC1, *Standard for AWS Certification of Welding Inspectors*.
    b. Section 6.1.3.4 the individuals who perform NDT must be certified as NDT Level III and qualified per ASNT SNT-TC-1A as a Level II for NDT performed.
    c. Where code does not contain structural element welded joint inspection frequency requirements, Section 2.06 G will apply.

3. Track structures: Section 1.05 C 2 must apply and AREMA "Manual for Railway Engineering", Chapter 15, "Steel Structures", Part 3 Section 3.5.5 and Part 1 Section 1.14.4, with the following clarifications and modifications made to AREMA reference:

    a. Section 3.5.5 b, groove welds must be tested with ultrasonic nondestructive testing method.
    b. Section 3.5.5 c, 100% flange-to-web fillet welds must be inspected by the magnetic particle method.

c. Where codes do not contain structural element welded joint inspection frequency requirements, Section 2.06 G will apply.

D. Access to locations where material for this contract is being fabricated or produced must be provided for the purpose of inspection and testing, including scaffolding.

E. The Authority may inspect structural steel at the plant before shipment; however, the Authority reserves the right to reject any material, at any time before final acceptance, which does not conform to all of the requirements of the drawings and specifications.

F. The Testing Agency must perform visual and coating thickness inspections of hot-dip galvanized steel before the product leaves the galvanizer's plant. The "Sampling" and "Test Methods" of ASTM A123 and ASTM A153 must be followed as appropriate.

G. Where codes do not contain structural element welded joint inspection frequency requirements as specified in Section 2.06 C, Non Destructive Testing must include not less than the following items. All testing is done on the final pass:

1. Magnetic Particle Testing: 20% of continuity plate, end plate, and bracing gusset plate fillet welds, selected at random.
2. Magnetic Particle Testing: 100% of tension member fillet welds, e. g. hanger rod connections, bracing members to gusset plate and gusset plate welds for the main lateral resistance system, and other similar connections.
3. Ultrasonic Testing: 100% of full and partial penetration welds, e.g. built-up members and other similar members.
4. Magnetic Particle Testing: 100% of built-up member fillet welds in zones of moment connections.
5. Magnetic Particle Testing: 20% of other built-up member fillet welds, selected at random.
6. Magnetic Particle Testing: 10% of other miscellaneous fillet welds, selected at random.
7. All field welds on bridge and track structures, when approved by the Authority, must be tested 100% with Magnetic Particle Testing Method for fillet welds, and Ultrasonic Testing Method for groove welds.

PART 3 – EXECUTION

3.01 GENERAL

A. Contractor must verify all dimensions and conditions in the field prior to fabricating and erecting structural steel. Notify the Authority of any major discrepancies.

B. Field modification of structural steel is prohibited without prior written approval of the Authority.

C. Structural steel for the bridge and track structures must be fabricated in accordance with Section 505, Steel Structures, of the IDOT Standard Specifications. In addition, track structures must be fabricated in accordance with AREMA "Manual for Railway Engineering", Chapter 15, "Steel Structures", Parts 3, Fabrication. Where difference occur in the provisions of the IDOT Standard Specification, AREMA "Manual for Railway Engineering", and this Specifications, the more stringent requirements must be followed as determined by the Authority.

3.02 FABRICATION

A. Material must be properly marked and match-marked where field assembly is required. The sequence of shipments must be such as to expedite erection and minimize the field handling of material.

B. Rolled material, before and after being laid off or worked, must be straight within the tolerances allowed by ASTM A6. If straightening is necessary, it must be done by methods which will not adversely affect the behavior of the material. If straightening is not necessary, natural camber of rolled sections must be placed upward.

C. Fabricate and assemble structural steel in shop to greatest extent possible. Assemblies must conform to the dimensions shown on the approved shop drawings.

D. Beams must be cambered where indicated on the Drawings.

E. Beam connections must be as shown or noted on the Drawings. Unless noted otherwise, standard connections must be used.

F. Combination of bolts and welds must not be used for stress transmission in the same face of any connection.

G. Holes: Provide holes required for securing other work to structural steel framing and for passage of other work through steel framing members, as shown on shop drawings.

1. For building structures, cut, drill, or punch holes perpendicular to metal surfaces. Do not flame-cut holes or enlarge holes by burning; ream holes that must be enlarged to admit bolts. Drill holes in bearing plates.
2. For bridge structures, fastener holes must be in accordance with IDOT Standard Specification Article 505.04 (d).
3. For track structures, fastener holes must be in accordance with AREMA “Manual for Railway Engineering”, Chapter 15, “Steel Structures”, Parts 3, Fabrication, with the following modifications:

    a. Section 3.2.6 g will not be permitted.
    b. Section 3.2.7 e will not be permitted.

H. For steel to be galvanized, fabricate in accordance with Class I or II guidelines as described in AGA’s Recommended Details for Galvanized Structures.

3.03 WELDING

A. Welding processes other than shielded metal arc and submerged arc may be used provided procedure qualification tests in accordance with the American Welding Society are made for the intended application of any such process.

B. Built-up sections assembled by welding must be free of warpage and all axes must have true alignment.

C. Welds not specified must be continuous fillet welds, using not less than the minimum fillet as specified by AWS.

D. All welding sequences must be such as to reduce the residual stresses due to welding to a minimum value. If high residual stresses are present, stress relieving of joints may be required.

E. The toughness and notch sensitivity of the steel must be considered in the formation of all welding procedures to prevent brittle and premature fracture during fabrication and erection.

F. Welded connections must be detailed and designed to minimize the accumulation and concentration of thru-thickness strains due to weld shrinkage.

G. The maximum number of welded joint repairs is two unless otherwise approved by the Authority. Fabricator's welded joint repair procedure must be submitted to the Authority for approval, or the following pre-approved repair procedure may be used:

1. Notify the Testing Agency prior to starting the repair procedure. Inspector from Testing Agency must witness the welded joint repair work.
2. Remove the welded component by cutting to 1/8" above the welds.
3. Using air carbon arc, being extremely careful not to damage the base metal, remove the weld and remaining welded component to within 1/8" of the base metal.
4. Grind the remaining weld and welded component smooth and flush with the surrounding base metal. Grind parallel to the direction of longitudinal axis of the weld.
5. Inspect all of the weld removal areas by magnetic particle test method either by the Testing Agency inspector or have the inspector witness the test.

    a. For track structures, time delay prior to magnetic particle test of weld repairs to groove welds for material over 2 inches in thickness, subject to tensile stress, as determined by the Authority on a case-by-case basis, must be 16 hours minimum.

6. Complete a corrective action report and provide a copy to the Authority confirming the base metal meets the material requirement in this Specification with no defect and is adequate for the welded joint rework.
7. Welded joint rework can start after the corrective action report is accepted by the Authority.

3.04 PREPARATION OF STEEL

A. Perform all inspections prior to galvanizing or field finishing. Galvanized faying surfaces for slip critical joints shall not be roughened by means of hand wire brushing or power wire brushing. Galvanized faying surfaces for slip critical joints shall be protected/masked and be free of all oil, grease, dust, dirt, primer, or paint before final connections can be made.

B. All non-galvanized existing structural steel surfaces must be prepared and cleaned as specified in the painting section of these specifications.

C. Paint application must be in accordance with paint manufacturer's printed instructions and recommendations. The fabricator must submit paint system to be used for approval by the Authority prior to purchasing. All paint products must be compatible products from the same manufacturer.

3.05 APPLICATION OF GALVANIZING

A. Galvanize steel members, fabrications, and assemblies to the greatest extent possible after fabrication by the hot dip process in accordance with ASTM A123 and ASTM A153. All structural steel must have all pieces attached by welding to the greatest extent possible as shown on drawings before galvanizing. All bolted pieces must be bolted together after galvanizing.

B. Prior to galvanizing, structural steel must be cleaned of all mill scale, rust, spatter, slag or flux deposit, oil, dirt and other foreign material.

C. Dip all structural steel members and metal fabrications assuring a sufficient coating of all surfaces, including corners, joints, holes, and other surfaces.

D. Long steel members and large fabrications too large for a single dip in the galvanizing vat, must be dipped in maximum two applications to assure all surfaces are thoroughly and fully coated.

E. Galvanize bolts, nuts and washers and iron and steel hardware components in accordance with ASTM A 153. Bolts, nuts, and washers must be a unit assembly when shipped to job site for slip critical and pretensioned joints.

F. Safeguard products against steel embrittlement in conformance with ASTM A 143.

G. Handle all articles to be galvanized in such a manner as to avoid any mechanical damage or any distortion.

H. Where contract documents indicate that galvanized steel is to receive additional coatings as part of duplex coating system, galvanized surfaces must be prepared in accordance to ASTM D6386 for paint coating or ASTM D7803 for powder coatings.

3.06 GALVANIZING COATING REQUIREMENTS

A. Coating Weight and Thickness must be per applicable ASTM:

1. Conform with paragraph 5.1 of ASTM A 123, Table 1 and 2
2. Conform with paragraph 4.3 of ASTM A 153, Table 1

B. Surface Finish: Continuous, adherent, as smooth and evenly distributed as possible and free from any defect detrimental to the stated end use of the coated article.

C. Adhesion: Withstand normal handling consistent with the nature and thickness of the coating and normal use of the article.

3.07 TESTS FOR GALVANIZING

A. Galvanizer must inspect the entire galvanized surface to ensure compliance with ASTM requirements.

B. Testing Agency to inspect and test hot dip galvanized coatings per the guidelines provided in the AGA publication “Inspection of Products Hot Dip Galvanized After Fabrication” and in conformance with ASTM A123 and ASTM A153.

C. Galvanizer to furnish a certificate indicating compliance with ASTM Standards and Specifications herein listed. The certificate must be signed by the galvanizer and contain a detailed description of the material processed as well as information as to the ASTM standard used for the coating.

3.08 PAINTING

A. See painting section of these specifications.

B. Perform all inspections and repair all galvanizing prior to finishing.

C. Galvanized steel must be prepared per ASTM D6386 for painting if required per the Drawing.

D. Metal fabrications may have protective and finish coats installed in the shop if approved by the Authority. Do not provide finish coats to shop or field contact surfaces or within 2" of field welds. See painting section for description of protective and finish coats for steel.

3.09 BENCH MARKS

A. The Contractor must employ the services of an Illinois registered professional surveyor who must establish permanent bench marks, field check all elevations of concrete on which structural steel is to be placed, locations of anchor bolts as well as location and elevation of any objects where the new steel is connected to or installed adjacent to. The contractor's surveyor must provide a letter prior to erection that verifies existing field conditions have been checked and coordinated with the steel shop drawings. If the surveyor notes any discrepancies, the Contractor must propose mitigation measures.

3.10 ERECTION

A. The Contractor must be responsible for the accurate setting and leveling of all bearing plates or setting plates. Bearing plates or setting plates must be leveled on steel wedges or shims unless otherwise detailed.

B. Furnish templates, where shown, specified or called for on the drawings. Furnish shim plates or developed fills where required to obtain proper fit and alignment.

C. For bridge structures, structural steel must be assembled and erected in accordance with Section 505, Steel Structures, of the IDOT Standard Specifications and, also, in accordance with this Specification. For track structures, in addition to the requirements for bridge structures, structural steel must be assembled and erected in accordance with AREMA "Manual for Railway Engineering", Chapter 15, "Steel Structures", Parts 4, Erection. Where differences occur in the provisions of the IDOT Standard Specification, AREMA "Manual for Railway Engineering", and this Specification, the more stringent requirements must be followed, as determined by the Authority.

D. For bridge and track structures, the Contractor and the Contractor's erection engineer must be responsible to determine how crossframes and diaphragms should be fitted. The Contractor and Contractor's erection engineer must perform girder drop analysis per AASHTO/NSBA Steel Bridge Erection Guide to determine the erected position of the girders and the condition under which that position is to be theoretically achieved. Girder drop analysis must be submitted to the Authority for review. No Load Fit (NLF or Fully Cambered Fit) should be avoided for skewed bridges or track structure spans with skew greater than 20 degrees.

E. Prior to commencement of steel erection, contractor must provide the steel erector written notification that the concrete in the foundations, piers and walls shall have either 75 percent of the intended minimum compressive strength or sufficient strength to support the loads imposed during steel erection.

3.11 ERECTION TOLERANCE

A. The Contractor alone must be responsible for the correct fitting of all structural members and for the elevation and alignment of the finished structure. Any adjustments necessary in the steel frame because of discrepancies in elevations and alignment must be the responsibility of the Contractor.

B. Unless otherwise noted, individual members of the structure must be leveled and plumbed to an accuracy of 1 to 500, but not to exceed 1/2" in columns for their full height, except exterior columns and columns adjacent to elevator beams must be accurate to 1 to 1,000 but not to exceed 1/2" for their full height or unless otherwise noted by the elevator manufacturer. All leveling and plumbing must be done based on the mean operating temperature of the structure. Allowances must be made for the difference in temperature at time of erection and the mean temperature at which the structure will be when completed and in service.

C. Where building and facility steel structures are supported by bridge or track structures, detailing of the building and facility steel structures must consider the dead load deflection of the bridge or track structures at the stage when building and facility structures are erected. The erection tolerances specified in this Section applies to all steel structures, regardless of staging.

3.12 CONNECTIONS

A. Connections between members and corners must be mitered unless approved otherwise.

B. Welding or final bolting must not be done until as much of the structure as will be stiffened by the welding or bolting has been properly aligned.

C. Drift pins must not be used to enlarge unfair holes in main material.

D. When high strength bolts are used in pre-tensioned or slip-critical connections, bolt tensioning must be performed using "turn-of-nut method".

E. For bridge and track structures, bolt heads must face out on the exterior of the web. For field splice, bolt nuts must be on top surface of the lower flange splice.

3.13 FIELD ALTERATIONS

A. Modifications required to structural steel fabrications to facilitate proper installation including cutting, drilling or welding must be submitted to the Authority for written approval. Provide shop drawings of the proposed modifications certified by a licensed structural engineer in the State of Illinois.

B. Protective coatings must be restored per appropriate, approved material type and procedure conforming to ASTM A780.

3.14 FIELD QUALITY CONTROL

A. Connection Inspection: Perform 100% visual inspection of bolted connection installed as bearing type. Examine the surfaces, size, quality and placement of each connection to verify installation in accordance with Contract documents and approved shop drawings.

B. Testing of High-Strength Bolted Connections installed as pretensioned and slip critical condition: inspect and test 100% bolts installed in snug-tight condition with match-marks are made, but prior to tightening to slip critical condition. After tightening by the turn-of-the nut method, bolted connection will be accepted on the basis of a visual inspection of the match-marks on the bolts.

C. Field welding must be inspected and tested by the Testing Agency during the erection of the structural steel.

1. For building and facility structures, Specification for Structural Steel Buildings Chapter N Section N5 will apply, with the modification that all marking “O” will be replaced by “P” for field welding.
2. All other requirements specified in Section 2.06 C and G of this Specification will apply with the exception that testing frequency is 100%.
3. For bridge and track structures, field welding is prohibited.

3.15 FIELD CLEANING, GALVANIZING TOUCH UP AND PAINTING

A. Field cleaning and painting must conform to the requirements of the painting section of these specifications, including preparation of existing surfaces, and application of prime and finish coats at field welds, bolted connections, abraded areas and other areas of the exposed steel.

B. Repair of damaged or uncoated areas of galvanized steel must be per approved repair material and approved detailed procedure conforming to ASTM A780. Damaged or uncoated areas must be previously galvanized steel surfaces that do not have the minimum required coating thicknesses as defined in the governing ASTM, ASTM A123 or ASTM A153.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of STRUCTURAL STEEL shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of STRUCTURAL STEEL shall be included in the contract lump sum price as shown in the Schedule of Prices for STRUCTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Structural Work: 030000

END OF SECTION

SECTION 05 12 50
ARCHITECTURALLY EXPOSED STRUCTURAL STEEL (AESS)

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions and Division 1 Specification sections, apply to this section.

1.01 SUMMARY

A. General: Provide Architecturally Exposed Structural Steel in accordance with requirements of the Contract Documents.

B. Section Includes the Following:

1. AESS 1, 2, 3: Steelwork as indicated on the Drawings.

C. Related Work Specified Elsewhere.

1. Refer to Section 05 10 30, Structural Steel Framing for all other requirements regarding structural steel work not included in this Section.

1.02 REFERENCES

A. American Institute of Steel Construction (AISC): ANSI/AISC 303, “Code of Standard Practice for Steel Buildings and Bridges, Chapter 10”.

B. International Building Code (IBC): IBC Chapter 17, Structural Tests and Special Inspections.

C. The Society for Protective Coatings (SSPC): “Steel Structures Painting Manual, Volume 2, Systems and Specifications".

1.03 DEFINITIONS

A. Architecturally Exposed Structural Steel (AESS): Structural Steel elements and connections conforming to one of the categories of Architecturally Exposed Structural Steel (AESS). Refer to ANSI/AISC 303 “Code of Standard Practice for Steel Buildings and Bridges”.

B. AESS 1: Structural Steel designated as “AESS 1 in the contract documents and conforming to ANSI/AISC 303, Chapter 10 definition of AESS1. These are basic elements with workmanship requirements exceeding those in non AESS construction.

C. AESS 2: Structural Steel designated as “AESS 2 in the contract documents and conforming to ANSI/AISC 303, Chapter 10 definition of AESS2. These are feature elements viewed at a distance greater than 20 feet. The art of metalworking is intended to be visible to the viewer.

D. AESS 3: Structural Steel designated as “AESS 3 in the contract documents and conforming to ANSI/AISC 303, Chapter 10 definition of AESS3. These are feature elements viewed at a distance less than 20 feet. The art of metalworking is intended to be visible to the viewer.

1.04 SUBMITTALS

A. Product Data: Submit for Commissioner's action. Furnish manufacturer's technical literature and installation instructions describing the general properties of each material and accessory to be used in the Work. Submit product information for field-applied paints and coatings specified in Section 09 90 00, Painting in conjunction with this submittal.

B. Shop Drawings: Submit for Commissioner's action. Submit shop drawings in conjunction with Section 05 10 30, Structural Steel Framing and as follows.

1. Submit erection drawings clearly indicating which members are considered AESS members and AESS category of each part.
2. Include details that clearly identify all of the requirements listed in Articles “Fabrication” and “Erection” of this specification for each part. Provide connections for exposed AESS consistent with concepts shown on the architectural or structural Drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Identify grinding, finish and profile of welds as defined herein.
4. Indicate orientation of HSS seams and mill marks (where applicable).
5. Indicate type, size, finish, and length of bolts, distinguishing between shop and field bolts. Identify high-strength bolted slip-critical, direct-tensioned shear/bearing connections. Indicate to which direction bolt heads should be oriented.
6. Clearly indicate which surfaces or edges are exposed and what class of surface preparation is being used.
7. Indicate special tolerances and erection requirements as noted on the Drawings or defined herein.
8. Indicate vent or drainage holes for HSS members.

C. Samples: Submit for Commissioner's action. Label samples to indicate product, characteristics, and locations in the Work. Samples will be reviewed for color and appearance only. Compliance with all other requirements is the exclusive responsibility of the Contractor.

1. Shop-Applied Finish: Furnish samples of the specified shop-applied finish system on 12 inch square metal, showing the successive coats of paint and field-applied overcoat to match color and sheen selected by Commissioner.

D. Quality Control Submittals: Submit for Commissioner's information.

1. Certifications: Furnish certified test reports for the following:

a. Welding: Furnish welding certificates and details of welding procedures, including tack and sealing welds. Procedures and sequences shall minimize the effect of weld shrinkage and residual stresses.
b. Certificate of Compliance: At the completion of fabrication, furnish a certificate of compliance to the Commissioner and building official that the work was performed in accordance with the approved plans and specifications.

2. Quality Assurance Programs: Furnish details of the fabricator's and the erector's quality assurance programs. Include inspector qualifications, method of reporting, frequency of reporting and distribution of reports. Identify individuals(s) responsible for the program.
3. Inspection and Test Reports: Furnish reports for the specified Quality Control inspections and tests.
4. Fabricator's Qualifications: Evidence of successful completion of work of similar scope to that shown and specified for this Project.
5. Erector's Qualifications: Evidence of successful completion of work of similar scope to that shown and specified for this Project.
6. Paint Test Report: Copies of manufacturer's report verifying that paint to be used under slip-critical friction type structural bolted connections meets specified slip coefficient in accordance RCSC test requirements.

E. Exposed Painting System Description: Submit for Commissioner's information. Furnish a complete written description of the shop coating, touch-up painting, and field coating of the “Architecturally Exposed Structural Steel" systems. Itemize the materials, methods, procedures and sequence to be followed for exposed painted steel components, and arrange the description to correspond with the fabrication and erection schedule. Include statement verifying that the selected painting materials and systems are proper and adequate for the application shown, including compatibility of each coating product within each painting system.

F. Paint Manufacturer's Certification: Furnish certification signed by the primary manufacturer of the paint coating materials, stipulating which painting materials and systems are proposed for use in the Work, and stating that the coating applicator is approved as a qualified applicator of said coating systems.

1. AISC Paint Applicator Endorsement: Furnish evidence that the applicator for coating of “Architecturally Exposed Structural Steel” has a current AISC Sophisticated Paint Endorsement of the specified category. The structural steel fabricator shall have an AISC Sophisticated Paint Endorsement for Category P2 - Covered, P3 - Outside.

1.05 QUALITY ASSURANCE

A. Contractor's Quality Control Responsibilities: Contractor is solely responsible for quality control of the Work.

B. Fabricator Qualifications: In addition to those qualifications listed in Section 05 10 30, Structural Steel Framing, engage an ASIC Certified Fabricator experienced in fabricating AESS similar to that indicated for this Project with a record of successful in-service performance as well as sufficient production capacity to fabricate AESS without delaying the Work.

C. Erector Qualifications: In addition to those qualifications listed in Section 05 10 30, Structural Steel Framing”, engage an experienced erector who has completed AESS similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

D. Coating Applicator Qualification: The coating applicator for painting of “AESS” shall be trained and approved by the paint manufacturer in the use of the coating materials and equipment to be employed in the Work.

E. Mock-Ups: Provide mock-ups of the nature and extent indicated on the Drawings.

1. At least four weeks prior to fabricating AESS, construct mock-ups to demonstrate visual effects, qualities of materials, and execution.
2. Locate mock-ups on site or in the fabricator's shop as directed by Commissioner. Mock-ups shall be full-size pieces unless the Commissioner approves smaller models.
3. Notify the Commissioner one week in advance of dates and times when mock-ups will be available for review.
4. Demonstrate all applicable AESS characteristics for the specified category of AESS on the elements and joints in the mock-up. Demonstrate the proposed range of aesthetic effects regarding each element.
5. Build mock-ups using member sizes and materials indicated for final Work.
6. mock-up shall demonstrate weld quality and contouring of the welds at the aligned walls of the members.
7. Mock-up shall demonstrate the specified surface preparation and finish coating.
8. HSS members shall extend at least 6 inches from the joint in the mock-up.
9. Obtain Commissioner's approval of mock-ups before starting fabrication of final units.
10. Retain and maintain mock-ups during construction in an undisturbed condition as a standard for judging the completed Work.

F. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals from all such authorities.

G. Pre-Construction Conferences: Prior to the start of the Work, meet at the Project site to review methods and sequence of AESS erection. Coordinate requirements for shipping, special handling, storage, attachment of safety cables and temporary erection bracing, field coating, touch-up painting, special details and conditions, standard of workmanship, testing and quality control requirements, job organization and other pertinent topics related to the Work. At a minimum, the meeting shall include the Contractor, Fabricator, Erector, finish painting subcontractor, and Commissioner.

1.06 DELIVERY, STORAGE AND HANDLING

A. Provide in accordance with fabricator's recommendations and by methods or sequence as required to prevent overload, damage or delay. Store materials to permit easy access for inspection and identification. Keep steel members off ground by using pallets, platforms, or other supports. Protect against corrosion or deterioration. Use special care in handling to prevent twisting or warping of AESS members.

B. Erect pre-painted finish pieces using nylon type slings, or chains with softeners, or wire ropes with softeners such that they are not damaged. Provide softeners or padding to protect while rigging and aligning members. Weld tabs for temporary bracing and safety cabling only at points concealed from view in the completed structure or where approved by Commissioner during the Pre-Installation Meeting. Conform to ANSI/AISC 303 Sections 10.4, 10.5, and 10.6.

1.07 PROJECT CONDITIONS

A. Field Measurements: Where AESS is indicated to fit against walls and other construction, verify dimensions by field measurements prior to fabrication and indicated measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.08 COORDINATION

A. Coordination: Coordinate installation of anchors for AESS members that connect to the work of other trades. Furnish setting drawings, templates, and directions for installing anchors, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to the project site in time for installation. Anchorage concepts shall be as indicated on drawings and approved on final Fabrication Documents.

1.09 WARRANTY

A. Shop Applied Finish Warranty: Submit for Owner's documentation. Furnish 10 year written warranty, signed by the applicator and the manufacturer of the coating materials, warranting that shop applied coating systems will not crack, peel, pit, exhibit evidence of corrosion, or otherwise fail as a result of defects in materials or workmanship. Upon notification of such defects, within the warranty period, make necessary repairs or replacement at the convenience of the Owner.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General: Comply with requirements of Section 05 10 30, Structural Steel Framing, as amended below.

B. Material Quality: Smooth, clean, sound, free from surface defects, handling marks, die or roller marks, pits, mill scale, rust, pitting left by rust removal, cracks, laminations, and slag inclusions. Use only members which have been manufactured not longer than 6 months prior to fabrication.

C. High Strength Bolts, Nuts, and Washers: As specified under Section 051200, Structural Steel Framing, heavy hex heads and nuts. Provide Heavy Hex bolt heads with standard bolts. Provide mechanically galvanized finish.

D. Filler: Solvent-resistant, 2-component metal and epoxy compound suitable for repair of steel.

1. 3M Company “Scotch-Weld Adhesive 1751”
2. Devcon Corp. “Plastic Steel”

2.02 SHOP PRIMING MATERIALS

A. Compatibility: Contractor shall submit all components and procedures of the complete paint system for AESS as a single coordinated submittal. At a minimum, identify required surface preparation, primer, intermediate coat (if applicable) and finish coat. All items shall be coordinated with finish coats specified in Section 09 90 00, Painting.

B. Inorganic Zinc-Rich Metal Primer: 2-component, solvent based, inorganic ethyl silicate zinc coating; minimum 82% zinc content in dried film. Provide zinc rich coating certified by manufacturer to have slip coefficient greater than 0.33 in accordance with RCSC test and to be suitable for use at faying surfaces of slip-critical friction type structural bolted connections.

1. Carboline “Carbozinc 11 HS”
2. International Protective Coatings “Interzinc 22HS Inorganic Zinc-Rich Silicate”
3. PPG / Pittsburgh Paints “Dimetcote 9 Inorganic-Zinc Silicate Primer”

4. Sherwin-Williams “Zinc Clad II Plus Inorganic B69VZ1/B69VZ1/B69D11”

C. Zinc-Rich Metal Primer: For application in the field touch-up only. Zinc rich primer in a cross linked epoxy or organic resin, meeting class B surface requirements for slip-critical connections.

1. Carboline "Carbozinc 859" (Carboline Co.)
2. International Protective Coatings “Interzinc 315B”
3. Tnemec Company, Inc. "90-97 Tneme-Zinc"
4. Sherwin-Williams “Zinc Clad IV B69A8/B69V8”

D. Polysiloxane Shop Coat Finish: 2-component, catalyzed polysiloxane. Color and sheen to match Commissioner's selection.

1. Carboline “Carboxane 2000”
2. International Protective Coatings “Interfine 979 Polysiloxane”
3. PPG / Pittsburgh Paints “Ameron PSX 700”
4. Sherwin-Williams “Sher-Loxane 800 Polysiloxane”

2.03 FABRICATION REQUIREMENTS FOR AESS 1

A. General: Use special care in handling and shipping of AESS both before and after shop painting minimize damage to any shop finish. Fabricate and assemble AESS in the shop to the greatest extent possible. Locate field joints in AESS assemblies at concealed locations or as approved by the Commissioner. Detail AESS assemblies to minimize field handling and expedite erection.

B. Tolerances: Permissible tolerances for member depth, width, out of square, and camber and sweep shall comply with ASTM A6/A6M Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling, ASTM A500/A500M Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes, and ASTM A1085/A1085M Standard Specification for Cold-Formed Welded Carbon Steel Structural Sections (HSS).

C. Minimize Distortion of Rolled Members: Member specified to be rolled to a final curved shape shall be fully shaped in the shop and tied during shipping to prevent stress relieving. Distortion of the web or stem, and of outstanding flanges or legs of angles shall be visibly acceptable to the Commissioner from a distance of 20 feet under any lighting condition determined by the Commissioner. Tolerances for the vertical and horizontal walls of rectangular HSS members after rolling shall be the specified dimension +/- 1/2 inch.

D. Bolted Connections: Make in accordance with Section 05 10 30. Provide bolt type and finish as noted herein. Install all bolts on the same side of the connection. Oriented uniformly in the direction indicated consistent from one connection to another.

E. Weld Connections: Comply with AWS D1.1 and Section 05 10 30. Appearance and quality of welds shall be consistent. Assemble and weld built-up sections by methods that will maintain alignment of members without warp exceeding the tolerance of this section.

F. Remove blemishes or unsightly surfaces resulting from temporary braces or fixtures. Remove all backing and run out tabs. Remove all weld spatter, slivers and similar surface discontinuities.

G. Grind all sharp edges smooth, including all sheared, punched or flame cut edges. Grind off projections larger than 1/16 inch at butt and plug welds.

H. Continuous Weld Appearance: Provide a continuous appearance to all welded joints including tack welds. Provide joint filler at intermittent welds. Where continuous welding is noted on the drawings, provide welds of a uniform size and profile

I. Seal Welds: Seal weld open ends of round and rectangular hollow structural section with 3/8 inch closure plates. Provide venting as required for galvanized members.

2.04 FABRICATION REQUIREMENTS FOR AESS 2

A. General: Fabricate to the requirements for AESS 1 and as follows.

B. As-fabricated straightness tolerance shall be one-half of that specified in ASTM A6/A6M, ASTM A500/A500M, or ASTM A1085/A1085M.

C. For curved structural members, whether composed of a single standard structural shape or built-up, the as-fabricated variation from the theoretical curvature shall be equal to or less than the standard camber and sweep tolerances permitted for straight members in the applicable ASTM standard.

D. Tolerance on overall profile dimensions of welded built-up members shall be one-half of that specified in AWS D1.1/D1.1M, Structural Welding Code – Steel.

E. Fabricate with hidden part marks or piece marks that may be fully removed after erection.

F. Welds shall be made uniform and smooth as specified in AISC Code of Standard Practice For AESS.

2.05 FABRICATION REQUIREMENTS FOR AESS 3

A. General: Fabricate to the requirements for AESS 2 and as follows.

B. Fabricate AESS with exposed surfaces smooth, square and of surface quality consistent with the approved mock-up. Grind projections at butt and plug welds to be smooth with the adjacent surface.

C. Orientation of HSS seams for reduced visibility.

D. Copes, miters, and cuts in surfaces exposed to view shall have a maximum gap of 1/8 inch in an open joint. If the gap is shown to be in contact, the contact shall be uniform within 1/16 inch.

E. Mill marks shall not be exposed to view. If it is not possible to hide mill marks, then the mill marks are to be removed by appropriate length cutting of mill material. If this is not possible, the fabricator shall remove the mill mark, grind, and fill the surface to be consistent with the approved mock-up.

F. Matching of abutting cross sections is required.

2.06 SHOP QUALITY CONTROL

A. General: As specified under Section 05 10 30, Structural Steel Framing.

2.07 SHOP CLEANING AND COATING OF AESS

A. Extent: Clean the surfaces of steel at the shop to remove grease, mill scale, rust, dirt, dust, and other foreign matter. Prevent contamination of the cleaned surfaces before coating. Shop coat the prepared surfaces with primer, unless otherwise noted.

1. Exterior Architecturally Exposed Structural Steel Framing: Provide near-white blast cleaning, fill, and shop coat in accordance with this Section.

B. Blast-Cleaning Methods: Provide dry blast-cleaning of the surfaces with commercial type of non-staining fine abrasive grit. The blast cleaning system shall include suitable dust removal equipment. Abrasives shall be new, clean and not re-used. Do not perform blast cleaning when relative humidity exceeds 85% nor when steel surface temperature is less than 5 deg F above the dew point. Remove every trace of blast residue, dust, and prevent contamination of surfaces.

1. Near-White Blast Cleaning, SSPC SP-10: Use dry blast-cleaning as necessary to obtain very thorough near-white cleaning and surface condition SP-10 described in SSPC Vis-1.

C. Shop Priming of Steel: Immediately after cleaning the steel surfaces, apply primer in not less than the required dry film thickness and not more than the maximum recommended thickness according to the manufacturer's instructions. Spread coatings evenly and smoothly without runs, sags or other defects. Stripe paint corners, crevices, bolts, welds, and sharp edges. Apply two coats of shop primer to surfaces inaccessible after assembly or erection. Allow sufficient time between coats to ensure proper drying and comply with manufacturer's minimum over-coating times.

2.08 SOURCE QUALITY CONTROL

A. Paint Manufacturer's Shop Service: At the start of the shop painting, periodically as the Work progresses, and after completion, furnish the services of the paint manufacturer's technical representative at the paint applicator's shop as necessary to advise on every phase of the Work. As a minimum, furnish full-time attendance during the first 2 work days, at least once every week thereafter, and furnish technical assistance to the Installer as may be required. The representative shall examine the substrates before coating as well as examine the completed application.

B. Shop Coating Inspection and Testing: Perform not less than the following inspections and tests.

1. Review proposed systems for compliance with required materials, methods and procedures for surface preparation and shop coating application.
2. Perform visual inspection of all surface preparation and shop coating application.
3. Test at least 10% of the members, at random, for the specified surface condition and dry film coating thickness.
4. Record types and locations of defects found in the Work, record measures performed to correct such defects and record any non-compliance with required coating application procedures.
5. Perform visual inspection of all shop touch-up and repair of damaged coating surfaces.

C. Shop Coating Inspection and Testing: Perform not less than the following inspections and tests.

1. AESS 1 and 2:

a. Structural Requirements:

1) Conform to Quality Control requirements per ANSI/AISC 360 “Specification for Structural Steel Buildings” Chapter N and ANSI/AISC 303,” Code of Standard Practice for Steel Buildings and Bridges”, Section 10. Refer to Section 05 10 30 “Structural Steel Framing” for additional requirements.

2) Owner will engage a Quality Assurance agency complying with the requirements of ANSI/AISC 360 “Specification for Structural Steel Buildings” Chapter N and ANSI/AISC 303,” Code of Standard Practice for Steel Buildings and Bridges”, Section 10.

b. AESS Acceptance: Commissioner shall observe the AESS steel in the shop at a viewing distance consistent with the final installation and determine acceptability based on the qualification data and submittals. Quality Assurance Agency shall have no responsibility for enforcing the requirements of this section.

2. AESS 3: Conform to the requirements of AESS 1 and 2. and as follows.

a. AESS Acceptance: Commissioner shall observe the AESS steel in the shop at a viewing distance consistent with the final installation and determine acceptability based on the approved mock-up. Quality Assurance Agency shall have no responsibility for enforcing the requirements of this section.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Before starting work, examine adjoining work on which execution is in any way dependent for workmanship and fit. Give written notification of any existing deficiencies detrimental to proper and timely installation of work under this Section. Do not proceed until conditions are satisfactory.

B. Erector shall check all AESS members upon delivery for twist, kinks, gouges, or other imperfections which might result in rejection of the appearance of a member. Coordinate remedial action with fabricator prior to erecting steel.

3.02 PREPARATION

A. Protection: Provide connections for temporary shoring, bracing and supports only where noted on the approved shop drawings. Temporary connections not shown shall be made at locations not exposed to view in the final structure or as approved by the Commissioner. Handle, lift, and align pieces using padded slings and/or other protection required to maintain the appearance of the AESS through the process of erection.

3.03 ERECTION AESS 1

A. Employ special care to handle and erect AESS. Erect finish pieces using nylon straps or chains with softeners such that they are not damaged.

B. Place weld tabs for temporary bracing and safety cabling at points concealed from view in the completed structure or where approved by the Commissioner during the

pre-installation meeting. Methods of removing temporary erection devices and finishing the AESS members shall be approved by the Commissioner prior to erection.

C. AESS Erection tolerances: Erection tolerances shall meet the requirements of standard frame tolerances for structural steel per Chapter 7 of ANSI/AISC 303.

D. Set AESS accurately in locations and to elevations indicated and according to AISC specifications referenced in this Section.

E. Remove blemishes or unsightly surfaces resulting from temporary braces or fixtures. Remove all backing and run out tabs.

F. When temporary braces or fixtures are required to facilitate erection, care shall be taken to avoid any blemishes, holes or unsightly surfaces resulting from the use or removal of such temporary elements.

G. Bolted Connections: Align bolt heads on the same side of the connection as indicated on the approved fabrication or erection documents.

H. Weld Connections: Comply with AWS D1.1 and Section 05 10 30. Appearance and quality of welds shall be consistent. Employ methods that will maintain alignment of members without warp exceeding the tolerance of this section.

I. Remove all weld spatter exposed to view.

J. Grind off projections larger than 1/16 inch at field butt and plug welds.

K. Continuous Welds: Where continuous welding is noted on the drawings, provide continuous welds of a uniform size and profile.

L. Do not enlarge holes in members by burning or by using drift pins. Ream holes that must be enlarged to admit bolts. Replace connection plates that are misaligned where holes cannot be aligned with acceptable final appearance.

M. Splice members only where indicated.

N. Obtain permission for any torch cutting or field fabrication from the Commissioner. Finish sections thermally cut during erection to a surface appearance consistent with the mock- up.

3.04 ERECTION AESS 2

A. Erect to the requirements of AESS 1 and as follows.

B. AESS Erection Tolerances: Erect to standard frame tolerances for structural steel complying with Chapter 7 of ANSI/AISC 303.

3.05 ERECTION AESS 3

A. Minimize Weld Show Through: At locations where welding on the far side of an exposed connection creates distortion, grind distortion and marking of the steel to a smooth profile with adjacent material.

B. Filling of weld access holes: Where holes must be cut in the web at the intersection with flanges on W shapes and structural tees to permit field welding of the flanges, they shall be filled with joint filler.

C. AESS Erection Tolerance: Erection tolerance shall meet the requirements of standard frame tolerances for structural steel, in addition to the erection tolerances indicated on the drawings for AESS 3 structural steel.

3.06 REQUIREMENTS FOR PAINTED AESS

A. Touch-Up Painting of Architecturally Exposed Structural Steel: As soon as practicable after erection and completion of final connections, touch-up the shop coated surfaces, including the surfaces of fasteners and welds, the bare areas around field connections, and areas where the shop coat has been abraded or otherwise damaged. Properly prepare and touch-up scratches, abrasions or other blemishes and remove foreign matter before proceeding with following coats. Thoroughly clean the surfaces and apply the paints in same coats as used for shop coating in accordance with the shop cleaning and painting requirements and the paint manufacturer's instructions. Feather the spot-coating and overlap at least 2 inch onto adjacent prepared areas to obtain proper adhesion and produce a smooth blended surface. Leave surfaces ready for application of field applied finish painting system.

B. Field Coating of Shop-Applied Finish: After touch-up painting, clean surfaces to remove dirt, dust, and any other foreign matter detrimental to the finish coating performance or appearance. Overcoat all areas of the shop-applied finish with a field application of the same coating, Polysiloxane Finish, minimum 4.0 mil dry film thickness.

3.07 FIELD QUALITY CONTROL AND QUALITY ASSURANCE

A. AESS 1 and 2:

1. Structural Requirements:

a. Conform to Quality Control requirements per ANSI/AISC 360 “Specification for Structural Steel Buildings” Chapter N and ANSI/AISC 303,” Code of Standard Practice for Steel Buildings and Bridges”, Section 10. Refer to Section 05 10 30 “Structural Steel Framing” for additional requirements.

b. Owner will engage a Quality Assurance agency complying with the requirements of ANSI/AISC 360 “Specification for Structural Steel Buildings” Chapter N and ANSI/AISC 303,” Code of Standard Practice for Steel Buildings and Bridges”, Section 10.

2. AESS Acceptance: Commissioner shall observe the AESS steel in the shop at a viewing distance consistent with the final installation and determine acceptability based on the qualification data and submittals. Quality Assurance Agency shall have no responsibility for enforcing the requirements of this section.

B. AESS 3: Conform to the requirements of AESS 1 and 2. and as follows.

1. AESS Acceptance: Commissioner shall observe the AESS steel in the shop at a viewing distance consistent with the final installation and determine acceptability based on the approved mock-up Quality Assurance Agency shall have no responsibility for enforcing the requirements of this section.

C. Paint Manufacturer's Field Service: At the start of the field painting, periodically as the Work progresses, and after completion, furnish the services of the paint

manufacturer's technical representative at the job site as necessary to advise on every phase of the Work. As a minimum, furnish full-time attendance during the first 2 work days, at least once every week thereafter, and furnish technical assistance to the Installer as may be required. The representative shall examine the substrates before coating as well as examine the completed application.

D. Field Coating Inspection and Testing: Perform not less than the following inspections and tests.

1. Review proposed systems for compliance with required materials, methods and procedures for surface preparation and field coating application.
2. Perform visual inspection of all surface preparation and field coating application.
3. Test at least 10% of the members, at random, for the specified surface condition and dry film coating thickness.
4. Record types and locations of defects found in the Work, record measures performed to correct such defects and record any non-compliance with required coating application procedures.
5. Perform visual inspection of all field touch-up and repair of damaged coating surfaces.

3.08 ADJUSTING AND CLEANING

A. Touch-Up Painting: Cleaning and touch-up painting of field welds, bolted connections, and abraded areas of shop paint shall be completed to blend with the adjacent surfaces of AESS. Such touch up work shall be done in accordance with manufacturer's instructions and as specified in Section 09 90 00, Painting.

3.09 PROTECTION

A. General: Protect the Work during the construction period so that it will be without any indication of use or damage at the time of acceptance.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 05 12 50, Architecturally Exposed Structural Steel shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 05 12 50, Architecturally Exposed Structural Steel shall be included in the contract lump sum price as shown in the Schedule of Prices for Structural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Structural Work: 030000

END OF SECTION

SECTION 05 31 00
STEEL DECK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions and Division 1 Specification sections, apply to this section.

1.02 SUMMARY

A. Furnish and install all galvanized steel deck for roof, fasteners and related items as shown on the drawings and specified herein.

1.03 RELATED WORK

A. Division 05 Section, Structural Steel.

B. Division 07 Section, Roofing System.

1.04 REFERENCES

A. AISI S100 – North American Specification for the Design of Cold Formed Steel Structural Members.

B. AISI SG-671 - Specification & Commentary for the Design of Cold-Formed Steel Structural Members.

C. SDI Engineering Manual – Roof Deck Design, 1st Edition.

D. SDI Diaphragm Design Manual, 3rd Edition.

E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot- Dip Process, Structural (Physical Quality).

F. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

G. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.

H. ASTM A611 - Standard Specification for Steel, Cold-Rolled Sheet, Carbon, Structural.

I. AWS D1.1 - Structural Welding Code - Steel.

J. AWS D1.3 -Structural Welding Code - Sheet Steel.

K. SDI-27 - Design Manual for Composite Decks, Form Decks, Roof Decks, and Cellular Metal Floor
Deck with Electrical Distribution.

L. SSPC SP-6 - Commercial Blast Cleaning.

M. SSPC Paint 20 - Zinc-Rich Primers (Type I, Inorganic, and Type II, Organic).

N. Factory Mutual Approval Guide, latest edition.

1.05 SUBMITTALS

A. Submit manufacturer's certifications, as required, to show compliance with these specifications.

B. Where welding has been required by drawings, provide certification that each welder has been qualified in accordance with AWS D1.1 and AWS D1.3 within the previous 12 months.

C. Submit manufacturer's product data and certification letter assuring conformance to galvanizing, finish coating when shop painted units are to be used

D. Submit detailed shop drawings showing large-scale cross-sectional details of the decking, connections, layout of deck units, placement directions, bearing on structural supports, anchorage details, attachment of accessories, and every condition requiring closure panels, supplementary framing, special jointing, and other accessories. Details and layout to show, quantity and marking of decking units, size and location of holes to be cut, and the location, type, and sequence of connections. Shop drawings shall show the structural properties of the decking units.

1. Shop drawings to indicate installation details, quantity and marking of deck units, size and location of holes to be cut and erection procedures including schedules, procedures and diagrams showing sequence of erection.

E. When finish coating is specified, submit product data and letter of certification assuring compatibility with galvanizing.

F. Submit third party testing agency inspection reports, as listed in Section 3.03, Quality Control.

1.06 QUALITY ASSURANCE

A. The latest editions of AISI SG-671, AWS D1.1, AWS D1.3 and SDI-27 form a part of this specification to the extent indicated by the references thereto.

B. Use qualified welding processes and operators in accordance with "Welder Qualification" AWS procedures.

1. Qualification for Field Welding: Qualify the welding operators and welding procedures for welding of shear studs, steel deck and deck accessories to structural supports in accordance with AWS D 1.1 and D 1.3 requirements, using the same type of equipment and welds to be used in the Work. Perform qualifications prior to start of the Work, and on a periodic basis during the Work as deemed necessary by the Authority.

C. Provide metal deck units which have been evaluated by Factory Mutual System and are listed in "Factory Mutual Approval Guide" for "Class I", where fire rated construction is specified.

1.07 DELIVERY, STORAGE AND HANDLING

A. Handle material safely and in a manner that will prevent distortion or damage to coating.

B. Store materials in a clean, properly drained location. Keep material off the ground under a weather- tight covering permitting good air circulation.

C. Damaged galvanized coating to be repaired per approved repair procedure and with approved material.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Metal Roof Deck Units:

1. Consolidated Systems, Inc.
2. Epic Metals Corp.
3. United Steel Deck, Inc.
4. VersaDeck Industries.
5. Vulcraft/Div. Nucor Corp.
6. Wheeling Corrugating Co.
7. Or approved equal.

2.02 MATERIALS, GENERAL

A. Unless otherwise indicated, all metal deck shall be galvanized steel sheet conforming to ASTM A653, Grade to comply with SDI specifications. Decking shall be shop prime painted over galvanized metal after fabrication.

B. Flexible rubber closure strips shall be manufacturer's standard made of vulcanized, closed-cell, synthetic rubber.

C. Galvanizing shall conform to ASTM A924, G60 (0.60 ounce per square foot).

D. Galvanizing repair paint shall conform to SSPC Paint 20.

E. Tek screws, galvanized, size as specified on drawings.

2.03 FABRICATION

A. Deck units shall be in lengths to span three or more supports with flush, telescoped, or nested 2- inch end laps and nesting side laps, unless otherwise indicated. Deck configurations shall comply with SDI and as specified herein.

B. Fabricate metal closure strips of not less than 18 gauge galvanized sheet steel of the same quality as the deck units. Form to the configuration required to provide tight fitting closures at open ends and sides of decking.

C. Metal decking shall be of the type shown and shall have the depth, gauge, and structural properties as indicated on the drawings. Unless shown otherwise, use Wide Rib Decking, 18 gauge, 1 1/2 inch deep.

PART 3 - EXECUTION

3.01 FIELD INSTALLATION

A. Install deck units and accessories in accordance with the manufacturer's and SDI's recommendations, approved shop drawings and as specified herein.

B. Locate decking bundles to prevent overloading of structural members.

C. Place deck units on supporting steel framework with edges up and flutes at right angles to supports. Adjust to final position with ends bearing on supporting members not less than 3 inches and accurately aligned end to end before permanently fastening. Double span or more when possible. Lap ends not less than 2 inches for welded construction on all decks. Side laps shall be one half corrugation. Do not stretch or contract the side lap interlocks. Place deck units flat and square, secured to adjacent framing without warp or excessive deflections, and with close alignment between cells at ends of abutting deck units.

D. Fasten steel deck as shown on approved shop drawings.

E. Mechanically fasten deck at side laps of adjacent steel deck as shown on approved shop drawings.

F. Cut and fit deck units and accessories around other work projecting through or adjacent to the decking, as shown on the drawings. Provide neat, square, trim cuts.

G. Provide metal closure strips at all open uncovered ends and edges of roof decking, and in the voids between decking and other construction. Weld into position to provide a complete decking installation.

H. Hanger slots or clips are not permitted.

I. Provide additional metal reinforcement and closure pieces as shown on the approved shop drawings. Reinforce roof decking around openings less than 12 inches in any dimension by means of a flat steel sheet placed over the opening and fusion welded to the top surface of the deck. Provide steel sheet of the same quality as the deck units, not less than 18 gauge, and at least 12 inches wider and longer than the opening. Provide welds at each corner and spaced not more than every 12 inches along each side. Openings larger than 12 inches shall be supported by a steel sub- framing supported from main structural members as shown on the drawings.

3.02 TOUCH-UP PAINT

A. After decking installation, repair all visible damage to coatings per approved repair procedure and with approved materials.

3.03 QUALITY CONTROL

A. Visual Inspection of Field Connections: Perform 100 percent visual inspection of the steel deck installation, including deck accessories and shear studs. Examine the surfaces, size, quality and placement of connections to verify installation in accordance with Contract Documents and shop drawings.

B. Testing of Shear Connectors: Conduct standard in-place shear stud bend test of 5 percent of the studs, and a minimum of 2 connectors per beam, in accordance with AWS D 1.1 requirements.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 05 31 00, Steel Deck shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 05 31 00, Steel Deck shall be included in the contract lump sum price as shown in the Schedule of Prices for Structural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Structural Work: 030000

END OF SECTION

SECTION 05 42 00.S
COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of contract, including General and Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes providing and installing light gauge metal framing systems including the following:

1. Wall framing.
2. Roof rafter framing.
3. Ceiling joist framing.
4. Miscellaneous framing and furring for wall trims, column surrounds, etc.

1.03 REFERENCES

A. Refer to the following standards for reference.

1. American Iron and Steel Institute (AISC): "Specification for the Design of Cold-Formed Steel Structural Members".
2. ASTM C 754: Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum; 1988.

1.04 RELATED SECTIONS

A. The following sections contain requirements that relate to this section:

1. Division 09 secton: “Gypsum Board Assemblies”.
2. Division 09 section: “Portland Cement Plaster”.

1.05 SUBMITTALS

A. General: Submit the following according to Division 01 Specification Section, Submittals:

B. Product data for each type of product specified, including installation instructions and data sufficient to show compliance with requirements.

1. Metal framing components.
2. Fastening devices.

C. Shop drawings for cold-formed steel framing indicating layout, spacings, sizes thicknesses and types of cold-formed framing; fabrication; fastening and anchorage; reinforcing; and accessories.

D. Shop drawings for special assemblies designated on the drawings, including details sufficient to show compliance with design intent and performance requirements.

E. For cold-formed metal framing indicated to comply with design loads, include structural analysis and detailed shop drawings signed and sealed by a professional structural

engineer licensed in the state of Illinois.

F. Reflected ceiling plan showing locations for light fixtures, access panels, vents and openings. Indicate reinforcing or additional framing for supporting fixtures, access panels and openings.

G. Certification and details for fire rated assemblies. Certification and details for STC-rated assemblies.

1.06 QUALITY ASSURANCE

A. Installer Qualifications, Metal Framing: Provide installation by a company specializing in work similar to that required on this project and with not less than 5 years of documented experience.

B. Installer Qualifications, Gypsum Board: Provide installation by a company specializing in work similar to that required on this project and with not less than 5 years of documented experience.

C. Single-Source Responsibility for Panel Products: Obtain each type of gypsum board, accessories and other panel products from a single manufacturer. Obtain finishing materials from either the same manufacturer that supplies gypsum board and other panel products or from a manufacturer acceptable to gypsum board manufacturer.

D. Fire-Resistive Rating: Where indicated for fire-resistance ratings, provide materials and installations identical with applicable assemblies, which have been tested per ASTM E 119 and listed by a testing laboratory recognized by authorities having jurisdiction.

E. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.

B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, construction traffic, corrosion, and other causes. Neatly stack and support gypsum panels flat and level to prevent sagging.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Steel Framing and Furring:

a. Clark Steel Framing Systems.
b. Consolidated Systems, Inc.
c. Dale Industries, Inc. - Dale/Incor.

d. Dietrich Industries, Inc.
e. MarinoWare; Division of Ware Ind.
f. National Gypsum Company.
g. Scafco Corporation.
h. Unimast, Inc.
i. Western Metal Lath & Steel Framing Systems.

2.02 PERFORMANCE REQUIREMENTS

A. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:

1. Exterior Wall Framing: Horizontal deflection of 1/360 of the wall height.
2. Interior Wall Framing: Horizontal deflection of 1/360 of the wall height.
3. Floor Joist Framing: Vertical deflection of 1/360 of the span.
4. Roof Rafter Framing: Vertical deflection of 1/360 of the span.
5. Ceiling Joist Framing: Vertical deflection of 1/360 of the span.

B. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure,connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 degrees F.

C. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:

1. Upward and downward movement of ½ inch.

D. Cold-Formed Steel Framing Design Standards:

1. Floor and Roof Systems: AISI S210.
2. Wall Studs: AISI S211.
3. Headers: AISI S212.
4. Lateral Design: AISI S213.

E. AISI Specifications and Standards: Unless more stringent requirements are indicated, comply with AISI S100 and AISI S200.

F. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

G. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.03 STEEL FRAMING MATERIALS

A. General: Select size and gage of framing members and establish spacing to comply with requirements of ASTM C 754 and actual design loads for maximum span and spacing, unless otherwise specifically indicated.

1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal, unless otherwise indicated.
2. Protective Coating: ASTM A 653, G60 hot-dip galvanized zinc coating.

B. Minimum Base-Metal Thickness of framing members: 14 gauge or 0.0677 inch.

C. Size of runners and vertical members as shown on the drawings, unless noted otherwise or otherwise required structurally for actual conditions, loads or unsupported length.

D. Steel framing materials to be secured to substrates and to each other with stainless steel or galvanized screws and anchors of type, size and length required for the actual application and conditions.

E Steel Studs and Runners: ASTM C 645, with flange edges of studs bent back 90 degrees and doubled over to form 3/16-inch wide minimum lip (return), and complying with the following requirements for minimum thickness of base (uncoated) metal, width and limiting heights. Limiting heights are based on using 16" o.c. stud spacing with 1/2" thick Gypsum board panels and 5 psf load perpendicular to partition or furring with an allowable detection of L/360.

1. Thickness, Width and Limiting Height:

Stud Width & Thickness	Limiting Height with One Layer of Gyp. Bd. Each Side
2 1/2"	9'-10"
3 5/8"	12'-4"
4"	13'-4"
6"	17'-11"

2. Protective Coating: Manufacturer's standard corrosion-resistant coating for exterior soffits and ceiling suspension members.
3. Runners: Match studs; type recommended by stud manufacturer for floor and ceiling support of studs, and for vertical abutment of drywall work at other work.
4. Stiffeners: 3/4" cold-rolled steel channels at 0.3 lb. per ft., rust-inhibitive paint finish.
5. Stud System Accessories: Provide stud manufacturer's standard clips, shoes, ties, reinforcements, fasteners and other accessories as needed for a complete stud system.
   a. Steel Channel Bridging: Cold-rolled steel, 0.0677-inch minimum thickness of base (uncoated) metal and 7/16-inch wide flanges, 1-1/2 inches deep, 475 lb/1000 feet, unless otherwise indicated.
   b. Steel Flat Strap and Backing Plate: Steel sheet for blocking and bracing complying with ASTM A 653 or ASTM A 568, length and width as indicated, and with a minimum base metal (uncoated) thickness as follows:
6. Thickness: 0.0677 inch where indicated.

F. Steel Joists, Rafters and Framing: C – Channel sections, hot dip galvanized. Size, gauge or thickness, spacing as indicated on the drawings for the specific loading and spans without exceeding a deflection of 1/360 of the span.

1. Minimum Gauge: 14.
2. Stiffeners, bridging and accessories as shown, required or recommendedby the manufacturer.

2.04 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

1. Supplementary framing.
2. Bracing, bridging, and solid blocking.
3. Web stiffeners.
4. Anchor clips.
5. End clips.
6. Foundation clips.
7. Gusset plates.
8. Stud kickers and knee braces.
9. Joist hangers and end closures.
10. Hole reinforcing plates.
11. Backer plates.

2.05 ANCHORS, CLIPS, AND FASTENERS

A. Fasteners for Metal Framing: Provide fasteners of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel framing and furring members securely to substrates involved; complying with the recommendations of gypsum board manufacturers for applications indicated.

B. Anchor Bolts: ASTM F 1554, threaded carbon-steel and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153, Class C.

C. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E 488 conducted by a qualified testing agency.

D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.

E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.

1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

2.06 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: SSPC-Paint 20 or MIL-P-21035B, ASTM A 780.

B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

C. Nonmetallic, Non-shrink Grout: Premixed, nonmetallic, noncorrosive, non-staining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107, with fluid

consistency and 30-minute working time.

D. Shims: Load bearing, high-density multimonomer plastic, and non-leaching; or of cold-formed steel of same grade and coating as framing members supported by shims.

E. Sealer Gaskets: Closed-cell neoprene foam, ¼ inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

PART 3 EXECUTION

3.01 EXAMINATION

A. Inspection: Verify that project conditions and substrates are appropriate to begin installation of work of this section.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Furnish inserts and other devises indicated to other trades for installation in advance of time needed for coordination and construction.

3.03 INSTALLATION OF STEEL FRAMING, GENERAL

A. Installation Standards: ASTM C 754, ASTM C 840 and AISC S200 have requirements that apply to framing installation.

B. Install bracing at terminations in gypsum board assemblies. Install supplementary framing, blocking, and bracing to support fixtures, equipment services, heavy trim, or similar construction. Comply with details indicated and with gypsum board manufacturer's written recommendations or, if none available, with United States Gypsum's "Gypsum Construction Handbook."

C. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

D. Installation Tolerances: Install steel framing components for walls so members for panel attachment are level to within 1/8 inch in 12 feet (3 mm) in 3.6 m measured lengthwise on each member and transversely between parallel members.

E. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.

F. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.

1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.

G. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.

1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
3. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
4. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.

H. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

I. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure.

J. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet.

K. Provide and install a perimeter track for support and securing the ceiling framing. Secure to masonry wall with ¼ inch diameter galvanized screw anchors at 8 inches o.c. staggered – 2 anchors between joists. Provide and install ceiling joists at 16 inches o.c. and secure to perimeter track.

L. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

M. Provide and install miscellaneous framing, bracing, diagonal bracing, supports, headers, stiffeners, bridging, intermediate runners, closure pieces, clip angles, continuous angles, hold-down angles, anchors and fasteners as shown or as required to provide a complete and stable installation.

3.05 INSTALLATION OF WALL/PARTITION SUPPORT SYSTEM

A. Where studs are installed directly against exterior walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

1. Where indicated, secure furring members to wall with screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

B. Install studs so flanges within framing system point in same direction.

C. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install joints at tops of framing systems that prevent axial loading of finished assemblies.
2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.

a. Install two studs at each jamb, unless otherwise indicated.
b. Install cripple studs at head adjacent to each jamb stud, with a minimum ½ inch clearance from jamb stud to allow for installation of control joint in finished assembly.
c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

3. Other Framed Openings: Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.

D. Install supplementary framing, solid blocking and bracing to support fixtures, equipment, services, heavy trim, furnishings, woodwork, accessories and similar work.

E. Isolate stud system from transfer of structural loading to system, both horizontally and vertically. Provide slip or cushioned type joints to attain lateral support and avoid axial loading. Cut studs 1/2” short of full height.

F. Space studs 16" o.c., except as otherwise indicated closer.

G. Fasten studs only at ends of floor and ceiling runner tracks by installing a screw into both flanges at each end.

H. Install horizontal stiffeners in stud system faced on one side only; space 4'-0" o.c. vertically; wire-tie at each intersection.

I. Install horizontal stiffeners 6" above and 6" below each opening more than 3'-0" wide, and extend 2 regular stud spaces beyond each jamb.

3.06 JOIST/RAFTER INSTALLATION

A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings.

B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.

1. Install joists over supporting frame with a minimum end bearing of 1-1/2 inches.
2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections as indicated on Shop Drawings.

C. Space joists not more than 2 inches from abutting walls, and as follows:

1. Joist Spacing: As indicated on drawings and/or approved shop drawings.

D. Frame openings with built-up joist headers consisting of joist and joist track, or another combination of connected joists if indicated.

E. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement, or as indicated on drawings and/or approved shop drawings.

1. Install web stiffeners to transfer axial loads of walls above.

F. Install bridging at intervals indicated on drawings and/or approved shop drawings. Fasten bridging at each joist intersection as follows:

1. Bridging: Joist-track solid blocking of width and thickness indicated, secured to joist webs.
2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and joist-track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists and secure solid blocking to joist webs.

G. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.

3.07 FIELD QUALITY CONTROL

A. Remove and replace work where it does not comply with specified requirements.

3.08 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure that cold-formed steel framing is without damage or deterioration at time of Final Acceptance.

PART 4 MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of COLD-FORMED METAL FRAMING shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of COLD-FORMED METAL FRAMING shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 05 50 00
METAL FABRICATIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions and Division 01 Specification sections, apply to this section.

1.02 SUMMARY

A. This section includes, all labor and materials for the complete installation of all metal fabrications including, but not limited to, those specified herein:

1. Rough Hardware.
2. Miscellaneous Framing and Supports.
3. Miscellaneous Metal Trim.
4. Strut Channels.
5. Metal Framed Stairs.
6. Metal Plate Closures, Covers, Frames and Panels.
7. Metal Ladders.
8. Ladder Safety Cages.
9. Public Art Installation.
10. Miscellaneous framing and supports for applications where framing and supports are not specified in other sections.

B. Related Sections: The following sections contain requirements that relate to this section:

1. Section 05 10 30, Structural Steel.
2. Section 05 12 50, Architecturally Exposed Structural Steel.
3. Section 05 50 10, Barriers, High Barriers, Gates.
4. Section 05 50 20, Railings and Guardrails.
5. Section 05 51 10, Metal Stairs with Stainless Steel Treads.
6. Section 05 53 00, Metal Gratings.
7. Section 08 71 00, Door Hardware
8. Section 09 90 00, Painting.

1.03 REFERENCES

A. Standard provided by the following professional organizations are referred to in this section for technical requirements:

1. ADA: American with Disabilities Act
2. ANSI: American National Standards Institute
3. ASTM: American Society for Testing and Materials
4. AWS: American Welding Society
5. OSHA: Occupational Safety and Health Administration
6. Standard Specifications: Standard Specifications for Road and Bridge Construction, Illinois Department of Transportation (IDOT).

1.04 DEFINITIONS

A. Definitions in ASTM E 985 for railing-related terms apply to this section.

1.05 SUBMITTALS

A. General: Submit each item in this Article according to the General and Special Conditions and Division 01 Specification Sections.

B. Product data for products used in miscellaneous metal fabrications, including finishes, paint products and grout.

C. Shop drawings showing sizes and detailing fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, profiles, and details of metal fabrications and their connections. Indicate heights, sizes and spacings of components. Show anchorage, joinery and accessory items. Where applicable, indicate field verified dimensions on shop drawings.

1. Include setting drawings, templates, and directions for installation of anchor bolts and other anchorages to be installed.
2. Indicate field verified dimensions on shop drawings.
3. Indicate on shop drawings location of all components and all details and dimensions. Provide cuts for all accessories, fasteners and hardware.

D. Provide structural calculations for metal fabrications subject to or designed to sustain structural loadings and stresses. Calculations to be signed, sealed and submitted by a structural engineer licensed in the State of Illinois.

E. Samples representative of materials and finished products as may be requested by Authority; in specified finish.

F. Welder certificates signed by Contractor certifying that welders comply with requirements specified under "Quality Assurance" article.

G. Qualification data for firms and persons specified in "Quality Assurance" article to demonstrate their capabilities and experience. Include list of completed projects with project name, addresses, names of Architects and Owners, and other information specified.

H. Provide samples of specified finishes.

I. For galvanized coating applications, submit notarized Certificate of Compliance with ASTM Standards and Specifications listed, signed by galvanizing applicator.

J. Strut Channel Submittals:

1. Submit the sizes and types of strut channel proposed or required for the project.
2. Submit manufacturer’s product data, specifications, finish and installation recommendations for each type of strut channel.
3. Submit structural calculations for approval by the project engineer. Calculations may include, but are not limited to:

    a. Description of design criteria.
    b. Stress and deflection analysis.
    c. Selection of strut channel framing members, fittings, and accessories.

4. Submit all shop/assembly drawings necessary to completely install the Strut System in compliance with the Contract Drawings.

5. Submit all pertinent manufacturers published data.

1.06 QUALITY ASSURANCE

A. Fabricator Qualifications: Firm experienced in successfully producing metal fabrications similar to that indicated for this Project, including coordination and integration of electrical items, with sufficient production capacity to produce required units without causing delay in the Work.

B. Installer Qualifications: Arrange for installation of metal fabrications specified in this section by same firm that fabricated them.

C. Regulatory Requirements: Comply with applicable requirements of all governing codes, ordinances and regulations.

D. Qualify welding processes and welding operators in accordance with AWS D1.1 "Structural Welding Code - Steel," D1.3 "Structural Welding Code - Sheet Steel", and D1.2 "Structural Welding Code - Aluminum." Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

E. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel" and AWS D1.3 "Structural Welding Code--Sheet Steel", or when applicable, comparable AWS standards for 316 stainless steel.

1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

F. Pre-Installation Conference: Conduct conference at Project site to comply with requirements of Division 01 Section "Project Meetings".

G. Galvanize Coating Applicator’s Qualifications: Company specializing in hot dip galvanizing after fabrication and following the procedures of “Quality Assurance Manual” of the American Galvanizers Association.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store fabricated components and materials in clean, dry locations, away from uncured concrete and masonry. Cover with waterproof paper, tarpaulin or polyethylene sheeting in a manner that permits air circulation within covering.

B. Handle metalwork on site to a minimum; exercise care to avoid damaging metal finishes.

1.08 PROJECT CONDITIONS

A. Field Measurements: Check actual locations of structure, walls and other construction to which metal fabrications shall fit, by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of Work. Verify all conditions for installation of the work.

B. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabrication of products without field measurements.

Coordinate construction to ensure that actual opening dimensions correspond to guaranteed dimensions. Allow for adjustments, trimming and fitting.

1.09 COORDINATION

A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings,

templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to project site in time for installation.

B. Coordinate installation of steel weld plates and angles for casting into concrete that are specified in this section but required for work of another section. Deliver such items to project site in time for installation.

1.10 WARRANTY

A. General Warranty: Submit a one (1) year written warranty, beginning from date of substantial completion, and executed by the Contractor, manufacturer and the installer agreeing to repair or replace metal fabrication components that develop defects in materials or workmanship within the specified warranty period. Defects include, structural failures, deterioration of metals, metal finishes, improper installation, and other conditions beyond normal weathering and use.

PART 2 - PRODUCTS

2.01 FERROUS METALS

A. Metal Surfaces, General: For metal fabrications exposed to view upon completion of the Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials whose exposed surfaces exhibit pitting, seam marks, roller marks, rolled trade names, roughness, stains, discolorations, and, for steel sheet, "oil canning" and variations in flatness exceeding those permitted by reference standards for stretcher-leveled sheet.

B. Steel Plates, Shapes, and Bars: ASTM A 36.

C. Steel Tubing: Product type (manufacturing method) and as follows:

1. Cold-Formed Steel Tubing: ASTM A 500, Grade A, unless otherwise indicated or required for design loading.
2. Hot-Formed Steel Tubing: ASTM A 501.

a. For exterior installations and where indicated, provide tubing with hot-dip galvanized coating per ASTM A53.

D. Uncoated Steel Sheet: Commercial quality, product type (method of manufacture) as follows:

1. Cold-Rolled Steel Sheet: ASTM A 366.
2. Hot-Rolled Steel Sheet: ASTM A569

E. Galvanized Steel Sheet: Quality as follows:

1. Commercial Quality: ASTM A653, G90 coating designation unless otherwise indicated.

F. Steel Pipe: ASTM A 53; finish, type, and weight class as follows:

1. Provide galvanized finish for exterior installations and where indicated.

G. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.

H. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A 47, or cast steel, ASTM A 27. Provide bolts, washers, shims as required, hot-dip galvanized per ASTM A 153.

I. Elastomeric Pads: Comply with Section 783 of the Standard Specifications.

J. Gray-Iron Castings: ASTM A 48, Class 30.

K. Malleable-Iron Castings: ASTM A 47, Grade 32510.

L. Rolled Steel Floor Plate:
ASTM A786.

M. Steel Bars for Gratings: ASTM A 569.

N. Wire Rod for Grating Cross Bars: ASTM A 510.

O. Abrasive-Surface Floor Plate: Steel plate with abrasive granules rolled into surface or with abrasive material metallically bonded to steel by a proprietary process.

1. Products:

a. IKG Industries, a Harsco company; Mebac.
b. W.S. Molnar Company; SlipNOT.

P. Slotted Channel Framing: Cold-formed metal channels with continuous slot complying with MFMA-3.

1. Size of Channels: As indicated on drawings.
2. Material: Galvanized steel complying with ASTM A 653, with G90 coating; 0.108-inch nominal thickness.

2.02 STAINLESS STEEL

A. Stainless Steel: Provide austenitic stainless steel in form and 316 grade complying with the following requirements:

1. Sheet, Strip, Plate, and Flat Bars: ASTM A666 Type 316L, as indicated on the Drawings.
2. Bars and Shapes: ASTM A 276, Type 316L.
3. Rolled Floor Plate: ASTM A793.
4. Bar Stock: ASTM A276.
5. Castings: ASTM A 743, Grade CF 8 or CF 20.
6. Rolled-Stainless-Steel Floor Plate: ASTM A 793.
7. Stainless Steel Pipes: ASTM A312 TP316.

2.03 NONFERROUS METALS

A. Aluminum Plate and Sheet: ASTM B 209, Alloy 6061-T6.

B. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6.

C. Aluminum-Alloy Rolled Tread Plate: ASTM B 632, Alloy 6061-T6.

D. Aluminum Castings ASTM B 26, Alloy 443.0-F.

2.04 FASTENERS

A. General: Provide Type 316 stainless steel fasteners unless otherwise indicated. If not stainless steel, provide fasteners of same basic metal and alloy as fastened metal. Do not use metals which are corrosive or otherwise incompatible with metals joined. Always provide Type 316 stainless steel fasteners for all exterior use or where built into exterior walls. Select fasteners for the type, grade, and class required and for type of loading and installation condition shown or as specified by the manufacturer.

1. Provide concealed fasteners for interconnection of ornamental metalwork components and for their attachment to other work except where exposed fasteners are unavoidable or are the standard fastening method.
2. Provide Phillips flat-head machine screws for exposed fasteners, unless otherwise indicated.
3. Where subject to vandalism or as otherwise specified, provide vandal proof type fasteners.

B. Bolts and Nuts: Regular hexagon head type, ASTM A 307, Grade A (ASTM F 568, Property Class 4.6), with hex nuts, ASTM A 563 and, where indicated, flat washers. Stainless steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, nuts and where indicated, flat washers; ASTM F 593 for bolts and ASTM F 594 for nuts, Alloy Group 1.

C. Lag Bolts: ANSI B18.2.1.

D. Machine Screws: ANSI B 18.6.3.

E. Plain Washers: Round, carbon steel, ANSI B 18.22.1.

F. Lock Washers: Helical, spring type, carbon steel, ANSI B 18.21.1.

G. Expansion Anchors: Anchor bolt and sleeve assemblies of type as required for installation condition shown; and of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

1. Material: Group 1 alloy 316 stainless-steel bolts and nuts complying with ASTM F 593 and ASTM F 594.
2. Drilled-In Expansion Anchors: Expansion anchors complying with FS FF-325, Group VIII (anchors, expansion), Type I (internally threaded tubular expansion anchor); and machine bolts complying with FS FF-575, Grade 5.

H. Cast-In-Place Anchors in Concrete: Anchors capable of sustaining, without failure, a load equal to four times the load imposed, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47 malleable iron or ASTM A 27 cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153.

I. Toggle Bolts: Tumble-wing type, FS FF-B-588, type, class, and style as required.

2.05 GROUT

A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically specified by manufacturer for interior and exterior applications.

B. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

1. Nonshrink, Nonmetallic Grouts:

a. B-6 Construction Grout; W. R. Bonsal Co.
b. Diamond-Crete Grout; Concrete Service Materials Co.
c. Supreme; Cormix Construction Chemicals.
d. Sure-grip High Performance Grout; Dayton Superior Corp.
e. Euco N-S Grout; Euclid Chemical Co.
f. Five Star Grout; Five Star Products.
g. Vibropruf #11; Lambert Corp.
h. Crystex; L&M Construction Chemicals, Inc.
i. Masterflow 928 and 713; Master Builders Technologies, Inc.
j. Sealtight 588 Grout; W. R. Meadows, Inc.
k. Sonogrout 14; Sonneborn Building Products--ChemRex, Inc.
l. Kemset; The Spray-Cure Company.

C. Do not grout aluminum items.

2.06 FABRICATION, GENERAL

A. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.

B. Form exposed work true to line and level with accurate angles, curves and surfaces and straight sharp edges. Form to required shapes and sizes. Finish exposed surfaces to smooth, sharp, well-defined lines and arises.

C. Allow for thermal movement in the design, fabrication, and installation of installed metal assemblies to prevent buckling, opening up of joints, and overstressing of welds and fasteners.

D. Cut, drill, shear and punch metals cleanly and accurately. Remove burrs.

E. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

F. Remove sharp or rough areas on exposed surfaces.

G. Weld corners and seams continuously to comply with AWS specifications and the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding fluximmediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent. Grind exposed welds flush and smooth to match and blend with adjoining surfaces.

H. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous. Cope or miter corner joints.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.

1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1 1/2 inches, with a minimum 6 inch embedment and 2 inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

J. Provide necessary rebates, lugs and brackets for assembly of units. Use concealed fasteners wherever possible.

K. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

L. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware, screws, and similaritems.

M. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water mayaccumulate.

2.07 WELDING

A. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for the metal alloy to be welded. Provide type and alloy of filler metal and electrodes as specified by producer of metal to be welded, complying with applicable AWS specifications, and as required for color match, strength and compatibility in the fabricated items.

B. All structural welds to be 3/16 inch fillet all around continuous welds unless noted or required otherwise. Ground smooth and flush all welds exposed to view unless noted otherwise.

2.08 GALVANIZING AND PAINT

A. Hot-dip galvanize items as indicated to comply with ASTM A 123, for galvanizing both fabricated and unfabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strips 0.0299 inch thick and heavier. Comply with ASTM A 153 for galvanizing steel and iron hardware.

B. Galvanizing Repair Paint: High zinc dust content paint for regalvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, complying with DOD-P-21035 or SSPC-Paint-20.

C. Shop Primer for Ferrous Metal: Primer to be recommended for application over galvanizing and be manufacturer's or fabricator's standard, fast-curing, lead-free, universal modified alkyd primer selected for good resistance to normal atmospheric corrosion, for compatibility with finish paint systems indicated, and for capability to provide a sound foundation for field or shop-applied topcoats despite prolonged exposure complying with performance requirements of FS TT-P-645.

D. Bituminous Paint: Cold-applied asphalt mastic complying with ASTM D 1187 and containing no asbestos fibers.

E. Zinc Chromate Primer: FS TT-P-645.

F. Baked-Enamel Finish: Apply baked enamel complying with paint manufacturer’s written instructions for cleaning, conversion coating and finish application.

1. Organic Coating: Thermosetting, modified-acrylic or polyester enamel primer/topcoat system complying with AAMA 2603, minimum dry film thickness of 1.5 mils, medium gloss.
2. Color: As selected by Architect from manufacturer’s full range.

2.09 ROUGH HARDWARE

A. Rough hardware to include brackets, straps, hangers, etc. as shown and required. Unless

indicated otherwise, rough hardware to be hot dipped galvanized. Fasteners and accessories to be stainless steel or galvanized.

B. Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Division 06 sections.

C. Fabricate items to sizes, shapes, and dimensions required. Furnish malleable-iron washers for heads and nuts which bear on wood structural connections; elsewhere, furnish steel washers.

2.10 MISCELLANEOUS FRAMING AND SUPPORTS

A. Provide steel framing and supports for applications indicated or which are not a part of structural steel framework, as required to complete work.

B. Provide shop drawings showing applicable field verified sizes, details. Coordinate with supplier of equipment or product framing is supporting, if applicable.

C. Fabricate units to sizes, shapes, and profiles indicated and required to receive adjacent other construction retained by framing and supports. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitered joints for field connection. Cut, drill, and tap units to receive hardware, hangers, and similar items. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed. Type, size and spacing of anchors as shown on the Drawings or as required for structural and code requirements. Secure miscellaneous framing securely to structure by welding or anchoring as approved. Install to withstand all applicable loadings and stresses.

D. Galvanize miscellaneous framing and supports after fabrication, touch up galvanizing in field, and also prime and paint any exposed surfaces.

2.11 MISCELLANEOUS METAL TRIM

A. Provide shapes and sizes indicated for profiles shown. Unless otherwise indicated, fabricate units from structural steel shapes, plates, and steel bars, with continuously welded joints and smooth exposed edges. Use concealed field splices wherever possible. Provide cutouts, fittings, and anchorages as required for coordination of assembly and installation with other work. Anchorages to be concealed unless approved otherwise.

B. Galvanize miscellaneous steel trim, framing and supports after fabrication. Also, prime and provide top coats for any exposed steel trim.

2.12 STRUT CHANNEL

A. Provide all strut metal framing material, fittings and related accessories (Strut System) as indicated on the Contract Drawings or as required.

B. All channel members shall be fabricated from structural grade steel conforming to one of the following ASTM specifications: A 1011 SS GR 33, A 653 GR 33.

C. Steel conforming to one of the following ASTM specifications: A 575, A 576, A 36 or A 635.

D. Finish: Hot-Dipped Galvanized. Zinc coated after all manufacturing operations are complete. Coating shall conform to ASTM A 123 or A 153.

2.13 METAL FRAMED STAIRS

A. General: Construct stairs to conform to sizes, thicknesses, shapes, details and arrangements indicated. Follow approved shop drawings. Verify dimensions and conditions in field. Verify code requirements, performance requirements, and method of support. Join pieces together by welding, unless otherwise indicated. Provide complete stair assemblies, including metal framing, hangers, columns, railings,

newels, balusters, wire mesh panels, struts, clips, brackets, bearing plates, and other components necessary for the support of stairs and platforms, and as required to anchor and contain the stairs on the supporting structure.

1. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM "Metal Stair Manual" for Architectural Class of stair except where more stringent requirements are indicated.
2. Fabricate treads and platforms of exterior stairs to accommodate slopes to drain in finished traffic surfaces.
3. Provide stiffener plates, bracing and additional framing to resist torsion, and properly secure stairs to the structural elements.

B. Stair Framing: Fabricate stringers of structural steel channels, or plates, or a combination thereof, as indicated. Provide closures for exposed ends of stringers. Construct platforms of structural steel channel headers and miscellaneous framing members as indicated. Bolt or weld headers to stringers, newels, and framing members to strings and headers; fabricate and join so that bolts, if used, do not appear on finish surfaces.

C. Treads, and Landings: Fabricate treads and landings as shown on the Drawings and specified herein and assemble as shown Drawings. Attach treads and platforms to stringers with brackets made of steel angles or bars. Weld brackets to stringers and attach treads to brackets by bolting, as indicated.

D. Stair Railings and Handrails: Comply with applicable requirements specified in Section 05 50 20, Railings and Guardrails for metal railings and handrails. Connect railing posts to stair framing by direct welding, unless otherwise indicated.

E. Hot dip galvanize ferrous metal stair assemblies and rail assemblies after fabrication. Then apply primer and top coats in the shop. Platforms of ferrous metal to be galvanized separately prior to installation of non-skid abrasive wearing surface.

F. Stair Specification Sections: See also Division 05 Specification Sections for metal stair systems.

2.14 METAL PLATE CLOSURES, COVERS, FRAMES AND PANELS

A. Provide the required sizes, shapes and profiles. Except as otherwise shown, fabricate from structural steel plate of all welded construction using mitered corners, welded brackets and splice plates, and a minimum number of joints for field connection. Cut, drill and tap units to receive hardware and similar items to be anchored to the work. Neatly dress exposed arises, edges, corners and welds so as to be flush, straight, and square for best appearance.

B. Flatness Tolerance: Deviations for faces of flat panels shall not exceed 1/16 inch in 4 feet-0 inch at any location, and 1/8 inch total for the entire face when tested in accordance with ASTM C 314.

C. Provide all fasteners, mounting plates, angles and framing necessary to securely fasten fabricated panels to structure.

D. Hot dip-galvanize ferrous metal fabrications unless indicated otherwise. Also provide primer and top coats for exposed steel.

2.15 METAL LADDERS

A. General:

1. Comply with ANSI A14.3**,** except for elevator pit ladders.
2. For elevator pit ladders, comply with ASME A17.1/CSA B44.
3. Comply with OSHA requirements and applicable regulations.
4. Ladders to be capable of sustaining loads of 250 lbs. per rung minimum.

B. Ferrous Metal Ladders:

1. Space siderails 16 or 18 inches as selected by the Authority, unless otherwise indicated.
2. Siderails: Continuous, 1/2 inch x 2-1/2 inch steel flat bars, with eased edges, or as shown on drawings.
3. Where other handholds are not indicated:

    a. Where there is no adjacent structure above the top of ladder, make rails extend at least 42 inches above top rung, turned back and down to walking surface.

4. Prefabricated Rungs: 1-inch o.d. or square steel bars, or size and shape as shown on the Drawing. Space rungs 10 to 14 inches apart as shown on the Drawings or as otherwise required by code.

5. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.

6. Provide nonslip surfaces on top of each rung as required by OSHA; either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive; by using a type of manufactured rung filled with aluminum-oxide grout; or by providing a knurled, dimpled or corrugated top surface. Verify that abrasive granules, aluminum oxide and adhesives are compatible with the galvanizing.

    a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work include, but are not limited to the following

        1) Harsco Industrial IKG, a division of Harsco Corporation.
        2) SlipNOT Metal Safety Flooring: W.S. Molnar Company.
        3) Approved equal.

7. Where shown or required, provide platforms as indicated fabricated from welded or pressure-locked steel bar grating, supported by steel angles. Limit openings in gratings to no more than 3/4 inch in least dimension.
8. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted steel brackets
9. Hot dip-galvanize ladders, including brackets.
10. Prime ladders, include brackets and fasteners, with zinc-rich primer if required on the Drawings or paint schedules.
11. Where shown or required, provide minimum 72-inch high, hinged security door with padlock hasp at foot of ladder to prevent unauthorized ladder use.
12. Where shown or required, provide retractable hand holder and cage of matching material and construction where shown on the drawings or required by code.
13. Smooth sharp edges and remove burrs from side rails.

C. Aluminum Ladders:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but not limited to the following:

   a. ACL Industries. Inc.
   b. Alco-Lite Industrial Products.
   c. Halliday Products
   d. O'Keeffe's Inc.
   e. Precision Ladders, LLC
   f. Royalite Manufacturing, Inc.
   g. Thompson Fabricating, LLC.
   h. Approved equal.

2. Space siderails 16 or 18 inches as selected by the Authority unless otherwise indicated.
3. Siderails: Continuous extruded-aluminum channels or tubes, not less than 2-1/2 inches deep, 3/4 inch wide, and 1/8 inch thick.
4. Rungs: Extruded-aluminum tubes, not less than 3/4 inch deep and not less than 1/8 inch thick, with ribbed tread surfaces.
5. Fit rungs in centerline of siderails; fasten by welding or with stainless-steel fasteners or brackets and aluminum rivets.
6. Where shown or required, provide platforms as indicated fabricated from pressure- locked aluminum bar grating or extruded-aluminum plank grating, supported by extruded-aluminum framing. Limit openings in gratings to no more than 1/2 inch in least dimension.
7. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted aluminum brackets.
8. Where shown or required, provide minimum 72-inch high, hinged security door with padlock hasp at foot of ladder to prevent unauthorized ladder use.
9. Where shown or required, provide retractable hand holder and cage of matching material and construction where shown on the Drawings or required by code.

2.16 LADDER SAFETY CAGES

A. General:

1. Fabricate ladder safety cages to comply with ANSI A14.3 and OSHA requirements. Size, spacings, clearances, etc. as shown on the Drawings and to meet code and OSHA requirements.
2. Assemble ladder safety cages by welding or with stainless-steel or hot dip galvanized fasteners.
3. Provide primary hoops at tops and bottoms of cages and spaced not more than 20 feet o.c. Provide secondary intermediate hoops spaced not more than 48 inches o.c. between primary hoops.
4. Fasten assembled safety cage to ladder rails and adjacent construction by welding or with stainless-steel fasteners unless otherwise indicated.
5. Provide minimum 72 inch high, hinged security door with padlock hasp at foot of ladder to prevent unauthorized ladder use.

B. Steel Ladder Safety Cages:

1. Primary Hoops: 1/4-by-4-inch flat bar hoops.
2. Secondary Intermediate Hoops: 1/4-by-2-inch flat bar hoops.

3. Vertical Bars: 3/16-by-1-1/2-inch flat bars secured to each hoop.
4. Galvanize and prime, if required, ladder safety cages, including brackets and fasteners.
5. Prime ladder safety cages, including brackets and fasteners, with zinc-rich primer as specified in painting section of these specifications

C. Aluminum Ladder SafetyCages:

1. Primary Hoops: 1/4-by-4-inch flat bar hoops.
2. Secondary Intermediate Hoops: 1/4-by-2-inch flat bar hoops.
3. Vertical Bars: 1/4-by-2-inch flat bars secured to each hoop.

2.17 PUBLIC ART INSTALLATION

A. Delegated Design: The Public Art Installation is to be designed by the selected artist.

1. Each art piece shall have an installed weight limit not to exceed 1,000 lbs.
2. The art installation shall comply with all local, state and federal code and accessibility requirements.
3. Sharp edges and protruding elements are to be avoided for safety purposes.

B. Acceptable Materials: Materials shall be selected based on longevity, durability, and ease of maintenance. Materials should be chosen to minimize staining of the adjacent floor surfaces and other station elements. Examples of acceptable materials include the following:

1. Painted Steel.
2. Stainless Steel.
3. Bronze (requires a clear coat).

C. Bird Mitigation: Bird roosting is to be avoided by integrating bird mitigation strategies into the design in lieu of additive measures such as spikes and wires. This includes avoidance of flat or low sloped surfaces or rough sloped surfaces. Ledges and small inset areas invite bird roosting and should be minimized or eliminated.

D. Delegated Design: The platform has been designed to accommodate sculptures with an installed weight of 1,000 lbs. Design of the structural connection to the platform or other station structure is the responsibility of the artist or art contractor's engineer. Drawings and calculations are to be submitted, and shall be prepared and sealed/signed by an engineer licensed in the State of Illinois.

1. All anchors shall be located a minimum distance of 6 inches from edge of precast planks or concrete slabs.
2. All anchors shall be grade 316 stainless steel thru rods in pre-drilled penetrations.
3. The engineer shall be responsible for determining loading requirements, sizing and spacing for all anchorage devices.
4. Connections shall be designed for overturning forces due to gravity, wind, seismic or other lateral loading conditions.
5. Samples: Provide 12 inch x 12 inch samples of all materials to be included in the art installation which are representative of the final finish for review and approval prior to production of mockup.

E. Mockup: Artist/ Art Contractor shall produce a full-scale mockup to verify full assembly process and final appearance of a representative piece. If accepted by the Commissioner, the piece may be incorporated into the final permanent installation.

2.18 FINISHES, GENERAL

A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.

B. Finish metal fabrications after assembly.

C. Protect mechanical finishes on exposed surfaces from damage by application of strippable temporary protective covering prior to shipment.

2.19 STEEL AND IRON FINISHES

A. Galvanizing: Galvanize all items fabricated from ferrous metal. Apply zinc-coating by the hot-dip process after fabrication of assemblies. Galvanize in compliance with the following requirements:

1. ASTM A 153 for galvanizing iron and steel hardware.
2. ASTM A 123 for galvanizing both fabricated and unfabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299 inch thick and heavier.

B. Preparation for Galvanizing: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:

1. SSPC Zone 1B: SSPC-SP6 "Commercial Blast Cleaning."

C. Where steel is to also be finished with primer and top coats, apply shop primer to galvanized surfaces of metal fabrications, except portions to be embedded in concrete or masonry. Comply with requirements of SSPC-PA1 "Paint Application Specification No. 1" for shop painting. Stripe paint all edges, corners, crevices, bolts, welds, and sharp edges.

2.20 STAINLESS STEEL FINISHES

A. Finish designations prefixed by AISI conform with the system established by the American Iron and Steel Institute for designating finishes for stainless steel sheet.

B. Satin Finish: Type 316, non-directional satin finish to match approved sample.

PART 3 - EXECUTION

3.01 PREPARATION

A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

B. Set sleeves in concrete with tops flush with finish surface elevations; protect sleeves from water and concrete entry.

C. Field verify all dimensions and conditions for the installation of all metal fabrications. Coordinate with approved shop drawings.

3.02 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required. Secure to meet all design loading and stresses.

1. Except where otherwise shown or specified, fasten metal fabrications to solid concrete or masonry with expansion bolts.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installation of miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels. Provide temporary bracing or anchors in formwork for items which are to be built into concrete, masonry or similar construction.

C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete masonry or similar construction.

D. Fit exposed connections accurately together to form hairline joints or, where indicated, with uniform reveals and spaces for sealants and joint fillers. Where cutting, welding and grinding are required for proper shop fitting and jointing of metal items, restore finishes to eliminate any evidence of such corrective work.

E. Weld connections that are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units which have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections. Grind exposed welded joints smooth and restore finish to match finish of adjacent surfaces.

F. Field Welding (only when approved by the Authority): Comply with applicable AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, methods used in correcting welding work, and the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Weld connections which cannot be shop welded because of shipping size limitations.
5. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.

G. Do not cut or abrade finishes which cannot be completely restored in the field. Return items with such finishes to the shop for required alterations, followed by complete refinishing or provide new units as required.

H. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint or zinc chromate primer.

1. Paint the contact surfaces of dissimilar materials and metal in contact with masonry or concrete with a heavy coat of epoxy paint.

3.03 INSTALLATION OF STRUT CHANNEL

A. Installation of strut channel to be accomplished by an installer experienced in installations of the type required and experience working with the strut material.

B. Set Strut System components into final position true to line, level and plumb, in accordance with approved shop drawings.

C. Anchor material firmly in place. Tighten all connections to their recommended torques.

3.04 INSTALLATION OF METAL STAIRS

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing steel stairs to in place construction. Include threaded fasteners for concrete inserts, through-bolts, lag bolts, and other connectors as required; weld stair framing to steel structure.

B. Set steel stair base plates on wedges, shims, or leveling nuts. After stairs have been positioned and aligned, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge or bearing plate.

C. If stair is to be set into concrete, pack voids solid with nonmetallic, nonshrink grout after installation.

D. Install stair units accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack.

E. Coordinate metal supporting structure with selected stair tread types. Provide isolation membrane to separate dissimilar metals where required.

3.05 ADJUSTING AND CLEANING

A. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 requirements for touch-up of field painted surfaces. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. For galvanized surfaces clean welds, bolted connections and abraded areas and apply galvanizing repair paint to comply with ASTM A 780.

C. Clean stainless steel with soap and water; rinse with clear water.

3.06 FINISHES

A. Unless fabricated of prefinished material or stainless steel, all metal fabrications to be hot dip galvanized in the factory after fabrication per referenced standards.

B. For fabrications exposed to view, finish galvanized fabrications in the shop, if possible, by cleaning galvanized surfaces, priming and application of finish coats. Follow paint manufacturer’s recommendations. See Section 09 90 00, Painting, for the

recommended paint system to be used. Touch up any welded or otherwise damaged galvanized surfaces with galvanizing repair paint prior to prime and finish coats.

C. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting. Apply by brush or spray to provide a minimum 3.0 mil dry film thickness.

3.07 PROTECTION

A. Protect finishes of metalwork from damage during construction period by use of temporary protective coverings approved by fabricators. Remove protective covering at time of substantial completion.

B. For pre-finished surfaces or stainless steel, restore protective coverings which have been damaged during shipment or installation of the work. Remove protective coverings only when there is no possibility of damage from other work yet to be performed at the same location. Retain protective coverings intact and remove simultaneously from similarly finished items to preclude non-uniform oxidation and discoloration.

C. Restore finishes damaged during installation and construction period so that no evidence remains of corrective work. Return items which cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units as required.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 05 50 00, Metal Fabrications shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 05 50 00, Metal Fabrications shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 05 50 10
BARRIERS, HIGH BARRIERS, GATES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions and Division 01 Specification sections, apply to this section.

1.02 SUMMARY

A. This section includes, but is not limited to, providing all labor, materials and equipment for the installation of barrier, high barrier and gate assemblies where shown on the drawings or required, including:

1. Stainless Steel Barriers, High Barriers, Gates.

B. Related Sections:

1. Division 05 Section, Structural Steel, for structural steel framing system components.
2. Division 05 Section, Metal Fabrications.
3. Division 05 Section, Railings and Guardrails".
4. Division 08 Section, Door Hardware.
5. Division 09 Section, Painting.

1.03 SUBMITTALS

A. Submit product data, catalog cuts, specifications, installation instructions and maintenance instructions for stainless steel barriers, high barriers and gates including data and specifications for the finish.

B. Submit shop drawings showing sizes and detailing fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, profiles, and details of metal fabrications, their connections, and their installation. Indicate heights, sizes and spacings of components. Show anchorage, joinery and accessory items. Show hardware for gates.

1. Include setting drawings, templates, and directions for installation of anchor bolts, inserts, or fabrications to be installed. Indicate core drilling details.
2. Indicate field verified dimensions and conditions on shop drawings.
3. For exit gates equipped with panic hardware, indicate provisions in design for deterring ability to activate the panic hardware from the unpaid areas.

C. Submit samples representative of materials and finished products as may be requested by the Authority; in specified finish.

D. Submit welder certificates signed by Contractor certifying that welders comply with requirements specified under "Quality Assurance" article.

1.04 QUALITY ASSURANCE

A. Fabricator Qualifications: Firm experienced in successfully producing metal fabrications similar to that indicated for this Project, with sufficient production capacity to produce required units without causing delay in the Work.

B. Installer Qualifications: Arrange for installation of metal fabrications specified in this section by same firm that fabricated them.

C. Regulatory Requirements: Comply with applicable requirements of all governing codes, ordinances and regulations. Fabricate and install barriers, high barriers and gates in accordance with the ADA Guidelines.

D. Qualify welding processes and welding operators in accordance with AWS D1.1 "Structural Welding Code - Steel". Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

E. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel" and comparable AWS standards for 304 stainless steel.

1.05 SYSTEM REQUIREMENTS

A. Fabricate and install the barriers, high barriers and gates as designed and detailed on the structural drawings:

1. Capable of withstanding a uniform load of 100 lb per sq. ft. or a concentrated load of 200 lb on a area of 4 sq. inches applied in any direction anywhere on the system, whichever produces a greater stress.

B. In general, all connections are to be made with shop welds unless shown and approved otherwise.

1.06 COORDINATION

A. Coordinate installation of anchorages, inserts, or core drilling holes for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, core drilled holes, and items with integral anchors, that are to be installed integral with substrates. Deliver anchorages or inserts to project site in time for installation.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store fabricated components and materials in clean, dry locations, away from uncured concrete and masonry. Cover with waterproof paper, tarpaulin or polyethylene sheeting in a manner that permits air circulation within covering.

B. Handle metalwork on site to a minimum; exercise care to avoid damaging metal finishes.

1.08 WARRANTY

A. General Warranty: Submit a one (1) year written warranty, beginning from date of substantial completion, and executed by the Contractor, manufacturer and the installer agreeing to repair or replace metal fabrication components that develop defects in materials or workmanship within the specified warranty period. Defects include,

structural failures, deterioration of metals, metal finishes, improper installation, and other conditions beyond normal weathering and use.

PART 2 - PRODUCTS

2.01 FERROUS METALS

A. Metal Surfaces, General: For metal fabrications exposed to view upon completion of the Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials whose exposed surfaces exhibit pitting, seam marks, roller marks, rolled trade names, roughness, stains, or discolorations.

B. Steel Plates, Shapes, and Bars: ASTM A 36.

1. All steel shapes to be hot dip galvanized per ASTM A 123.

C. Steel Tubing: Product type (manufacturing method) and as follows:

1. Cold-Formed Steel Tubing: ASTM A 500, Grade A, unless otherwise indicated or required for design loading.
2. Hot-Formed Steel Tubing: ASTM A 501.

a. Provide tubing with hot-dip galvanized coating per ASTM A 53.

D. Steel Pipe: ASTM A 53; finish, type, and weight class as approved:

2.02 STAINLESS STEEL

A. Stainless Steel: Provide austenitic stainless steel in form and grade indicated complying with the following requirements:

1. Tubing: ASTM A 554, Grades MT 301, MT 302, or MT 304, as standard with manufacturer.
2. Pipe: ASTM A 312/A 312M, Grade TP 304.
3. Plate and Sheet: ASTM A 167, Type 301, 302 or 304.
4. Sheet, Strip, Plate, and Flat Bars: ASTM A666 Type 304 .
5. Bars and Shapes: ASTM A 276, Type 304.
6. Bar Stock: ASTM A 276.

2.03 FASTENERS

A. General: Provide fasteners of same basic metal and alloy as fastened metal, or as otherwise indicated. Do not use metals which are corrosive or otherwise incompatible with metals joined. Provide Type 300 series stainless steel fasteners unless approved otherwise. Select fasteners for the type, grade, and class required and for type of loading and installation condition shown or as specified by the manufacturer.

1. Provide concealed fasteners for interconnection of components and for their attachment to other work except where exposed fasteners are unavoidable or are the standard fastening method.
2. Provide Phillips flat-head machine screws for exposed fasteners, unless otherwise indicated.
3. Where subject to vandalism or as otherwise specified, provide vandal proof type fasteners.

B. Bolts and Nuts: Regular hexagon head type, ASTM A 325, Grade A (ASTM F 568, Property Class 4.6), with hex nuts, ASTM A 563 and, where indicated, flat washers.

Stainless steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, nuts and where indicated, flat washers; ASTM F 593 for bolts and ASTM F 594 for nuts, Alloy Group 1.

C. Lag Bolts: ANSI B18.2.1 (ANSI B18.2.3.8 M).

D. Machine Screws: ANSI B 18.6.3 (ANSI B 18.6.7 M).

E. Plain Washers: Round, carbon steel, ANSI B 18.22.1 (ANSI B 18.22 M).

F. Lock Washers: Helical, spring type, carbon steel, ANSI B 18.21.1.

G. Expansion Anchors: Anchor bolt and sleeve assemblies of type as required for installation condition shown; and of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

1. Material: Group 1 alloy 304 or 316 stainless-steel bolts and nuts complying with ASTM F 593 (ASTM F 738 M) and ASTM F 594 (ASTM F 836 M).
2. Drilled-In Expansion Anchors: Expansion anchors complying with FS FF-325, Group VIII (anchors, expansion), Type I (internally threaded tubular expansion anchor); and machine bolts complying with FS FF-575, Grade 5.

H. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated; galvanized or stainless.

I. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A 47, or cast steel, ASTM A 27. Provide bolts, washers, shims as required, hot-dip galvanized per ASTM A153.

2.04 GROUT

A. Non-shrink, Nonmetallic Grout: Factory-packaged, non-staining, non-corrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically specified by manufacturer for interior and exterior applications.

B. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

1. Non-shrink, NonmetallicGrouts:

a. B-6 Construction Grout; W. R. Bonsal Co.
b. Diamond-Crete Grout; Concrete Service Materials Co.
c. Supreme; Cormix Construction Chemicals.
d. Sure-grip High Performance Grout; Dayton Superior Corp.
e. Euco N-S Grout; Euclid Chemical Co.
f. Five Star Grout; Five Star Products.
g. Vibropruf #11; LambertCorp.
h. Crystex; L&M Construction Chemicals, Inc.
i. Masterflow 928 and 713; Master Builders Technologies, Inc.
j. Sealtight 588 Grout; W. R. Meadows, Inc.
k. Sonogrout 14; Sonneborn Building Products--ChemRex, Inc.
l. Kemset; The Spray-CureCompany.

2.05 WELDING

A. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for the metal alloy to be welded. Provide type and alloy of filler metal and electrodes as specified by producer of metal to be welded, complying with applicable AWS specifications, and as required for color match, strength and compatibility in the fabricated items.

B. All structural welds to be 3/16” fillet all around continuous welds unless noted or required otherwise. Ground smooth and flush all welds exposed to view unless noted otherwise.

2.06 GALVANIZING AND PAINT

A. Hot-dip galvanize items as indicated to comply with ASTM A 123, for galvanizing both fabricated and un-fabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strips 0.0299 inch thick and heavier. Comply with ASTM A 153 for galvanizing steel and iron hardware.

B. Galvanizing Repair Paint: High zinc dust content paint for re-galvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, complying with DOD-P-21035 or SSPC-Paint-20.

C. Shop Primer for Ferrous Metal: Primer to be recommended for application over galvanizing and be manufacturer's or fabricator's standard, fast-curing, lead-free, universal modified alkyd primer selected for good resistance to normal atmospheric corrosion, for compatibility with finish paint systems indicated, and for capability to provide a sound foundation for field or shop-applied topcoats despite prolonged exposure complying with performance requirements of FS TT-P-645.

D. Bituminous Paint: Cold-applied asphalt mastic complying with ASTM D 1187 and containing no asbestos fibers.

E. Zinc Chromate Primer: FS TT-P-645.

2.07 FABRICATION, GENERAL

A. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.

B. Form exposed work true to line and level with accurate angles, curves and surfaces and straight sharp edges. Form to required shapes and sizes. Finish exposed surfaces to smooth, sharp, well-defined lines and arrises.

C. Allow for thermal movement in the design, fabrication, and installation of installed metal assemblies to prevent buckling, opening up of joints, and overstressing of welds and fasteners.

D. Cut and drill metals cleanly and accurately. Remove burrs.

E. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

F. Remove sharp or rough areas on exposed surfaces.

G. Assemble by welding unless approved otherwise. Weld corners, joints and seams continuously to comply with AWS specifications and the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding fluximmediately.
4. At exposed welds, finish welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent. Grind exposed welds flush and smooth to match and blend with adjoining surfaces, forming smooth transitions and maintaining sharp lines.

H. Mechanically fastened connections, where approved, to have exposed connections with hairline joints, flush and smooth. Use concealed fasteners wherever possible and where exposed fasteners are permitted, use type indicated or, if not indicated, Phillips flat-head (countersunk) screws. Locate joints where least conspicuous. Cope or miter corner joints. Fabricate joints in a manner to exclude water.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.

J. Provide necessary rebates, lugs and brackets for assembly of units.

K. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

2.08 BARRIERS, HIGH BARRIERS, GATES

A. General: Fabricate barriers, high barriers, and gates to comply with requirements indicated for their design, dimensions, heights, details, finish, and member sizes, including thickness, profiles, post spacings, and applied loads. Form to required shapes and sizes, with true curves, lines and angles. Assemble components at right angles, straight, flush and with equal spacing. Fabrication to follow approved shop drawings. Also, verify that installations will meet all applicable building codes and ADA requirements, including maximum clearance between vertical members.

B. Fabricate barriers, high barriers, and gates from solid stainless steel bar members or stainless steel tubing of 1/8 inch thickness as indicated and shown, unless approved otherwise; using fully welded construction. Provide closure plates or caps at ends, welded for a continuous, smooth appearance.

C. See approved shop drawings and drawings for sizes, spacings, design, sizes of members, anchorage, location, operation, and size of gates. Verify all dimensions and conditions in the field. If not indicated or required otherwise; barriers, high barriers, and gates to be fabricated of 1” square stainless steel tubes evenly spaced with 1”X2” and 2”X2” intermediate members and framing, respectively.

D. Interconnect barrier, high barrier, and gate members with full butt welds unless otherwise indicated. Corners to be mitered and welded. At tee and cross

intersections, notch ends of intersecting members to fit contour to which end is joined and weld all around. All joints to be tight and smooth. Members to be parallel and perpendicular to each other. Miter and weld joints and connections to form solid joints. Grind and smooth all welds.

E. Miter corners and joints to a tight, hairline fit. Changes in direction of members to be formed by mitering and welding; or, if indicated, members to be bent at corners, rail returns, and wall returns.

F. Where indicated, provide toe boards at barriers and high barriers around openings and at the edge of open-sided floors and platforms. Fabricate to dimensions and details indicated, or, if not indicated, use 4 inches high x 1/8 inch steel plate welded to, and centered between, each railing post.

G. Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors as required for interconnections of members and attachment of rails to other work. Furnish inserts and other anchorage devices for connecting barriers, high barriers, and gates to substrate; secure fabrications securely to substrate (floor, walls, ceiling, columns, beams).

1. For barrier, guardrail, and gate posts set in grout, provide preset sleeves of Schedule 80 steel pipe or drill holes, not less than 6 inches long and with inside dimensions not less than 2 inch greater than outside dimensions of post.

H. Fasteners: For stainless steel fabrications, provide fasteners fabricated from type 304 or type 316 stainless steel. For ferrous metal fabrications, use galvanized metal fasteners. Do not use metals that are corrosive or incompatible with materials joined. Provide concealed fasteners except where welded or where exposed fasteners are unavoidable or are the standard method of fastening. Provide Phillips flat-head machine screws for exposed fasteners, unless otherwise indicated.

I. Gates: Provide pivots and mounting plates to securely anchor gates to structure. Cut, drill and tap gates to receive hardware plate box and similar items. Ease edges of locking plates. Provide minimum 3 heavy duty stainless steel hinges, closer, bumper, mortise lock, and electric strike. Cut, drill and tap gates to receive hardware plate box and similar items. See approved submittals, drawings and hardware schedule for required hardware to be provided and installed.

J. Material for sleeves, flanges, wall returns, wall brackets, end closures, toe boards, miscellaneous fittings and anchors: Provide of same material as barriers, high barriers, and gates.

K. For ferrous metal, hot dip galvanize all items and entire assemblies after their fabrication. Use galvanized anchors and accessories. Install primer and top coats of paint to the assemblies in the shop.

L. Allow for thermal movement resulting from the following maximum change (range) in ambient temperature, in the design, fabrication, and installation of installed metal assemblies to prevent buckling, opening up of joints and over-stressing of welds and fasteners. Base design calculations on actual surface temperatures of metals due to both solar heat gain and night time sky heat loss. Temperature Change (Range); 100 deg F.

M. Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

N. Provide necessary rebates, lugs and brackets for assembly of units. Use concealed fasteners when possible.

O. Comply with AWS for specified practices in shop welding. Provide welds behind finished surfaces without distortion or discoloration of exposed side. Clean exposed welded joints of all welding flux, and dress on all exposed and contact surfaces. Grind exposed welds flush and smooth to match and blend with adjoining surfaces. Weld continuously along entire line of contact unless spot welding is indicated.

P. Finish exposed surfaces to smooth, sharp, well-defined lines and arises.

Q. Preassemble items in shop to greatest extent possible to minimize splicing and assembly of units at project site. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

R. For exit gates equipped with panic hardware, design to include provisions for deterring the ability to activate the panic hardware from the unpaid areas; including, but not limited to, screening, solid panels or closely spaced bars at the areas adjacent to the hardware at both the door and side panels or other design and as approved by CTA to prevent unauthorized entry.

2.09 FINISHES, GENERAL

A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.

B. Finish metal fabrications after assembly.

C. Protect mechanical finishes on exposed surfaces from damage by application of strippable temporary protective covering prior to shipment.

2.10 STAINLESS STEEL FINISHES

A. Finish designations prefixed by AISI conform with the system established by the American Iron and Steel Institute for designating finishes for stainless steel sheet.

B. Satin Finish: AISI No.4 polished, directional texture to match approved sample. Direction of texture shall be parallel to the long dimension of the member or surface.

2.11 STEEL AND IRON FINISHES

A. Galvanizing: Galvanize all items fabricated from ferrous metal. Apply zinc-coating by the hot-dip process after fabrication of assemblies. Galvanize in compliance with the following requirements:

1. ASTM A 153 for galvanizing iron and steel hardware.
2. ASTM A 123 for galvanizing both fabricated and unfabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299 inch thick and heavier.

B. Preparation for Galvanizing: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:

1. SSPC Zone 1B: SSPC-SP6 "Commercial Blast Cleaning."

C. Steel is to also be finished with primer and top coat, except portions to be embedded in concrete or masonry do not require a top coat. Comply with requirements of SSPC-PA1 "Paint Application Specification No. 1" for shop painting. Stripe paint all edges, corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.01 PREPARATION

A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, including concrete inserts, sleeves, anchor bolts, core drilling and miscellaneous items having integral anchors that are to be integral with the substrate. Coordinate delivery of such items to project site.

B. Set sleeves in concrete with tops flush with finish surface elevations; protect sleeves from water and concrete entry.

C. Field verify all dimensions and conditions for the installation of all metal fabrications. Coordinate with approved shop drawings.

3.02 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required. Secure to meet all design loading and stresses.

1. Except where grouted into substrate, fasten metal fabrications to substrates with expansion bolts.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installation of miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

C. Fit exposed connections accurately together to form hairline joints or, where indicated, with uniform reveals and spaces for sealants and joint fillers. Where cutting, welding and grinding are required for proper shop fitting and jointing of metal items, restore finishes to eliminate any evidence of such corrective work.

D. Weld connections that are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of units which have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections. Grind exposed welded joints smooth and restore finish to match finish of adjacent surfaces.

E. Field Welding (only when approved by the Authority): Comply with applicable AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, methods used in correcting welding work, and the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Weld connections which cannot be shop welded because of shipping size limitations.

5. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.

F. Do not cut or abrade finishes which cannot be completely restored in the field. Return items with such finishes to the shop for required alterations, followed by complete refinishing or provide new units as required.

G. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint or zinc chromate primer.

1. Paint the contact surfaces of dissimilar materials and metal in contact with masonry or concrete work, with a heavy coating of epoxy paint.

3.03 INSTALLATION OF BARRIERS, HIGH BARRIERS, GATES

A. Adjust barriers, high barriers, and gates prior to securing to ensure matching alignment at abutting joints. Space posts at spacing indicated, or if not indicated, as required by design loadings. Plumb posts in each direction. Secure posts and rail ends to substrates as follows:

1. Anchor posts in concrete by core drilling holes not less than 5 inches deep and 3/4 inch greater than outside diameter of post. Clean holes of all loose material, insert posts and fill annular space between post and concrete with non-shrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's directions.
2. Anchor posts to steel with steel oval flanges, angle type or floor type as required by conditions, welded to posts and bolted to steel supporting members.
3. Anchor barrier, high barrier and gate ends into substrates with stainless steel flanges, angles and anchors welded to barrier or gate frame ends and anchored into wall construction with lead expansion shields and bolts.
4. Anchor barrier or gate frame ends to steel with steel flanges welded to rail ends and bolted to structural steel members, unless otherwise indicated.

B. Secure barriers, high barriers, and gates to wall and/or floor with base plates, wall brackets and end fittings.

1. Use type of plate or bracket with flange or plate tapped for concealed anchorage to threaded hanger bolt.
2. Use type of plate or bracket with pre-drilled hole for exposed bolt anchorage.
3. For concrete and solid masonry anchorage, use drilled-in expansion shield and either concealed hanger bolt or exposed lag bolt, as applicable.
4. For hollow masonry anchorage, use toggle bolts having square heads.

C. Align barriers, high barriers, and gates so that variations from level for horizontal members do not exceed 1/4 inch in 12 feet. Align at abutting joints.

D. Welded Connections: Use fully welded joints; cope or butt components to provide full contact. At exposed welded connections, finish exposed welds and surfaces smooth

and blended so that no roughness is evident (by sight or touch) after finishing, and welded surface matches contours of adjoining surfaces.

E. Expansion Joints: Provide expansion joints at locations indicated, or if not indicated, at intervals not to exceed 40 feet. Provide slip joint with internal sleeve extending 2 inches beyond joint on either side; fasten internal sleeve securely to one side; locate joint within 6 inches of posts.

F. Installation to be rigid, straight, level, and secure. Installation to meet all applicable codes. Anchorage, fastening and setting of posts to be firm, secure, and be able to withstand design loadings as specified above. Follow approved shop drawings.

G. Securely anchor barriers, high barriers and gate assemblies to structure as indicated on the drawings and to withstand all structural stresses and loading. Use stainless steel angles and anchors.

H. Install gate hardware according to hardware manufacturer's directions for proper operation. Install using recommended tamper proof type fasteners.

I. For exit gates equipped with panic hardware, installation to include provisions for deterring the ability to activate the panic hardware from the unpaid areas and gain unauthorized entry.

3.04 ADJUSTING AND CLEANING

A. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 requirements for touch-up of field painted surfaces. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. For galvanized surfaces clean welds, bolted connections and abraded areas and apply galvanizing repair paint to comply with ASTM A 780.

C. Clean stainless steel with soap and water; rinse with clear water.

D. Adjust hardware as required for proper operation.

3.05 FINISHES

A. Unless fabricated of pre-finished material or stainless steel, all metal fabrications to be hot dip galvanized in the factory after fabrication per referenced standards.

B. For fabrications exposed to view, finish galvanized fabrications in the shop, if possible, by cleaning galvanized surfaces, priming and application of finish coats. Follow paint manufacturer's recommendations. See Painting Section of specifications for painting system. Touch up any welded or otherwise damaged galvanized surfaces with galvanizing repair paint prior to prime and finish coats.

C. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting. Apply by brush or spray to provide a minimum 3.0 mil dry film thickness.

3.06 PROTECTION

A. Protect finishes of metalwork from damage during construction period by use of temporary protective coverings approved by fabricators. Remove protective covering at time of substantial completion.

B. For pre-finished surfaces or stainless steel, restore protective coverings which have been damaged during shipment or installation of the work. Remove protective coverings only when there is no possibility of damage from other work yet to be performed at the same location. Retain protective coverings intact and remove simultaneously from similarly finished items to preclude non-uniform oxidation and discoloration.

C. Restore finishes damaged during installation and construction period so that no evidence remains of corrective work. Return items which cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units as required.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 05 50 10, Barriers, High Barriers, Gates shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 05 50 10, Barriers, High Barriers, Gates shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 05 50 20
RAILINGS AND GUARDRAILS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions and Division 1 Specification sections, apply to this section.

1.02 SUMMARY

A. This section includes, but is not limited to, providing materials, labor and equipment to provide and install all handrails, railings, cane rails, guardrails and gates:

1. Types: Wall mounted handrails; railings, cane rails, guardrails and gates with infill of pickets or panels attached to railing posts and/or to the building or platform.
2. Shapes: Round or square solid shapes for rails and pickets; round hollow pipe for rails; square tubes for posts.
3. Materials: Stainless steel, galvanized metal left exposed, galvanized metal primed and painted, aluminum, wood.

B. Related Sections: The following sections contain requirements that relate to this section:

1. Section 05 10 30, Structural Steel.
2. Section 05 50 00, Metal Fabrications.
3. Section 05 50 10, Barriers, High Barriers, Gates.
4. Section 05 51 10, Metal Stairs with Stainless Steel Treads.
5. Section 06 10 00, Rough Carpentry.
6. Section 08 80 00, Glass and Glazing.
7. Section 09 90 00, Painting.
8. Section 26 50 10, Lighting Fixtures (for LED handrails).

1.03 REFERENCES

A. Standard provided by the following professional organizations are referred to in this section for technical requirements:

1. ADA: American with Disabilities Act
2. ANSI: American National Standards Institute
3. ASTM: American Society for Testing and Materials
4. AWS; American Welding Society

1.04 DEFINITIONS

A. Definitions in ASTM E 985 for railing-related terms apply to this section.

1.05 SUBMITTALS

A. Submit product data for products used for handrails, railings, cane rails, guardrails and gate systems; including materials, sizes and thicknesses; fasteners; finishes, paint products and grout.

B. Submit shop drawings showing sizes and detailing fabrication and erection of each handrail, railing, cane rail, guardrail, gate and post installation indicated. Include plans, elevations, sections, profiles, and details of metal fabrications, their connections, and their installation. Indicate heights, sizes and spacing of components. Include brackets for wall mounted installation. Show supports, posts, anchorage, joinery and accessory items. Show hardware for any gates.

1. Include setting drawings, templates, and directions for installation of anchor bolts, inserts, or fabrications to be installed. Indicate core drilling details.
2. Indicate actual field verified dimensions and conditions on shop drawings.

C. Submit product data and shop drawings for in-fill pickets and panels of wire mesh, perforated metal, metal panels, grating, glass or other material.

D. Furnish engineering calculations for rails and guardrails as prepared by a licensed structural engineer and as required by the Authority, showing that rails and guardrails meet code and required design loads and that maximum stresses and deflections do not exceed specified performance requirements under full design loading. Calculations shall be prepared and sealed by an Illinois licensed structural engineer.

E. Submit samples representative of materials and finished products as may be requested by the Authority; fabricated of specified materials and in specified finishes including, but not limited to:

1. Sections of each distinctly different linear railing member including handrails, top rails, posts and balusters.
2. Fittings and brackets.
3. Assembled sample of railing system, made from full size components, including top rail, post, handrail and infill. Sample need not be full height.

F. Submit welder certificates signed by Contractor certifying that welders comply with requirements specified under "Quality Assurance" article.

G. For galvanized coating applications, submit notarized Certificate of Compliance with ASTM Standards and Specifications listed, signed by galvanizing applicator.

H. Submit qualification data for manufacturer, fabricator, installer and testing agency.

1.06 QUALITY ASSURANCE

A. Fabricator Qualifications: Firm experienced in successfully producing handrails, railings, cane rails, guardrails and gate systems similar to that indicated for this Project, with sufficient production capacity to produce required units without causing delay in the Work.

B. Installer Qualifications: Arrange for installation of handrails, railings, cane rails, guardrails and gates specified in this section by same firm that fabricated them; a firm authorized by the manufacturer or another experienced and approved installer.

C. Qualify welding processes and welding operators in accordance with AWS D1.1 "Structural Welding Code - Steel". Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

D. Regulatory Requirements: Comply with applicable requirements of all governing codes, ordinances and regulations. Fabricate and install handrails, railings, cane rails, guardrails and gate systems in accordance with the ADA Guidelines.

E. Welding Standards: Comply with applicable provisions of the following procedures for welding and welding personnel:

1. AWS D1.1 "Structural Welding Code - Steel."
2. AWS D1.2 “Structural Welding Code - Aluminum.”
3. AWS D1.6 “Structural Welding Code - Stainless Steel.”

F. Galvanize Coating Applicator’s Qualifications: Company specializing in hot dip galvanizing after fabrication and following the procedures of “Quality Assurance Manual” of the American Galvanizers Association.

G. Mockups: If required by the Authority, build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockup of typical railing and/or guardrail area as shown on Drawings at the site at a location designated by the Authority.
2. Testing shall be performed on mockups according to the requirements set forth herein.

    a. Field Testing of Mockups: If required by the Authority, engage a qualified testing agency to perform testing on field constructed mockups.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless the Authority specifically approves such deviations in writing.
4. Approved mockup to remain at the site until the project is completed as a means to demonstrate the accepted quality of the work to be performed and for comparison with the new work.
4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion and approved by the Authority.

1.07 SYSTEM REQUIREMENTS

A. Structural Performance: Fabricate and install the following fabrications as designed and detailed on the structural drawings:

1. Handrails, Railings, Top Rail of Guardrail Systems and Leaning Bars:

    a. Uniform load of 50 lbf/ft. applied in any direction for handrails; uniform load of 75 lbf/ft. applied in any direction for guardrails.
    b. Concentrated load of 200 lbf applied in any direction.
    c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Infill Area of Guardrail Systems. Includes panels, intermediate rails, pickets or other elements composing the infill area.

a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.
b. Infill load and other loads need not be assumed to act concurrently.

B. Thermal Movements: Allow for thermal movements from ambient and temperature changes.

1. Temperature Change: 120 deg F. ambient; 180 deg. F. material surfaces.

C. Connections: Steel connections are to be made with shop welds and field bolting unless shown or required otherwise and approved by the Authority.

1.08 COORDINATION

A. Coordinate installation of anchorages, inserts, or core drilling holes for handrail anchorage and railing, cane rail, guardrail, gate and post support and anchorage. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, core drilled holes, and items with integral anchors, that are to be installed integral with substrates. Deliver anchorages or inserts to project site in time for installation.

B. Mount handrails only on completed walls of other construction. Do not support handrails temporarily by any means not satisfying structural performance requirements.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Store fabricated handrail, railing, cane rail, guardrail, gate and post components and materials in clean, dry locations, away from uncured concrete and masonry. Cover with waterproof paper, tarpaulin or polyethylene sheeting in a manner that permits air circulation within covering.

B. Handle finished work on site to a minimum; exercise care to avoid damaging finishes.

1.10 WARRANTY

A. The materials and installation of the handrails, railings, cane rails, guardrails and gates work including all related components, supports, anchorage, fastenings, welding and finishes to be warranted by the manufacturer or fabricator and installer for a period of one year after substantial completion.

1. Failures of the system include, but are not limited to, loosening of components, supports or anchorage; “wobbly” installations; loosening or weakening of attachments; excessive deflection; failure of operating components.
2. Failures of the finish include, but are not limited to, rusting, fading, pitting, cracking, peeling, chipping or other deterioration of finish.

B. Factory Finish Warranty: Furnish manufacturer's 20 year written warranty, stating that the factory applied finishes will not develop excessive fading or excessive non-uniformity of color or shade, and will not crack, peel, pit, corrode, or otherwise fail as a result of defects in materials or workmanship within the following defined limits. This warranty shall be in addition to and not a limitation of other rights the Authority may have against the Contractor under the Contract Documents. Upon notification of such

defects, within the warranty period, make necessary repairs of replacement at the convenience of the Authority.

PART 2 - PRODUCTS

2.01 FERROUS METALS

A. Metal Surfaces, General: For metal fabrications exposed to view upon completion of the Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials whose exposed surfaces exhibit pitting, seam marks, roller marks, rolled trade names, roughness, stains, or discolorations.

B. Steel Plates, Shapes, and Bars: ASTM A 36.

C. Steel Tubing: Product type (manufacturing method) and as follows:

1. Cold-Formed Steel Tubing: ASTM A 500, Grade A, unless otherwise indicated or required for design loading.
2. Hot-Formed Steel Tubing: ASTM A 501.

a. Provide tubing with hot-dip galvanized coating per ASTM A 53.

D. Steel Pipe: ASTM A 53, Type F or Type S, Grade A, Standard Weight (schedule 40), unless another grade and weight are required by structural loads.

1. Provide galvanized finish for all pipe fabrications.

2.02 STAINLESS STEEL

A. Stainless Steel: Provide austenitic stainless steel in form and grade indicated complying with the following requirements:

1. Tubing: ASTM A 554, Grades MT 301, MT 302, or MT 304, as standard with manufacturer.
2. Pipe: ASTM A 312/A 312M, Grade TP 304.
3. Plate and Sheet: ASTM A 167, Type 301, 302 or 304.
4. Sheet, Strip, Plate, and Flat Bars: ASTM A666 Type 304 (or Type 316 for glazing stops only).
5. Bars and Shapes: ASTM A 276, Type 304.
6. Bar Stock: ASTM A 276.

2.03 ALUMINUM

A. Aluminum, General: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of alloy and temper designated below for each aluminum form required.

B. Extruded Bars and Tubing: ASTM B221, Alloy 6063-T5/T52.

C. Extruded Structural Pipe and Round Tubing: ASTM B 429, Alloy 6063-T6.

1. Provide Standard Weight (Schedule 40) pipe unless otherwise indicated.

D. Drawn Seamless Tubing: ASTM B 210, Alloy 6063-T832.

E. Plate and Sheet: ASTM B 209, Alloy 6061-T6.

F. Die and Hand Forgings: ASTM B 247, Alloy 6061-T6.

G. Castings: ASTM B 26, Alloy A356.0-T6.

2.04 BRACKETS

A. Brackets for wall mounted railings to be as shown on drawings and constructed of same material as railings. Design of bracket to be code compliance and allow sufficient space between the wall and the rail. Bracket to be of welded construction and designed to meet all design loads. Allow for anchorage into the wall.

1. Brackets for wall mounted handrails to provide 1-1/2 inch minimum clearance from inside face of handrail to finished wall surface and 1-1/2 inch minimum clearance from bottom of handrail to top of bracket, per ADA Code.

2.05 FASTENERS BRACKETS

A. General: Provide Type 300 series stainless steel fasteners unless otherwise indicated. If not stainless steel, provide fasteners of same basic metal and alloy as fastened metal. Do not use metals which are corrosive or otherwise incompatible with metals joined. Always provide Type 300 series stainless steel fasteners for all exterior use or where built into exterior walls. Select fasteners for the type, grade, and class required and for type of loading and installation condition shown or as specified by the manufacturer.

1. Provide concealed fasteners for interconnection of railing components and for their attachment to other work except where exposed fasteners are unavoidable or are the standard fastening method.
2. Provide Phillips tamper proof flat-head machine screws for exposed fasteners, unless otherwise indicated.
3. Exposed fasteners to match the material they are fastening.
4. Where subject to vandalism or as otherwise specified, provide vandal proof type fasteners.

B. Bolts and Nuts: Regular hexagon head type, ASTM A 325, Grade A (ASTM F 568, Property Class 4.6), with hex nuts, ASTM A 563 and, where indicated, flat washers. Stainless steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, nuts and where indicated, flat washers; ASTM F 593 for bolts and ASTM F 594 for nuts, Alloy Group 1.

C. Lag Bolts: ANSI B18.2.1.

D. Machine Screws: ANSI B 18.6.3.

E. Plain Washers: Round, carbon steel, ANSI B 18.22.1.

F. Lock Washers: Helical, spring type, carbon steel, ANSI B 18.21.1.

G. Expansion Anchors: Anchor bolt and sleeve assemblies of type as required for installation condition shown; and of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry and equal to 4 times the load imposed when installed in concrete as

determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

1. Material: Group 1 alloy 304 or 316 stainless-steel bolts and nuts complying with ASTM F 593 and ASTM F 594.
2. Drilled-In Expansion Anchors: Expansion anchors complying with FS FF-325, Group VIII (anchors, expansion), Type I (internally threaded tubular expansion anchor); and machine bolts complying with FS FF-575, Grade 5.

H. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated; galvanized or stainless.

I. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A 47, or cast steel, ASTM A 27. Provide bolts, washers, shims as required, hot-dip galvanized per ASTM A 153.

2.06 GROUT BRACKETS

A. Non-shrink, Nonmetallic Grout: Factory-packaged, non-staining, non-corrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically specified by manufacturer for interior and exterior applications.

B. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

1. Non-shrink, Nonmetallic Grouts:

a. B-6 Construction Grout; W. R. Bonsal Co.
b. Diamond-Crete Grout; Concrete Service Materials Co.
c. Supreme; Cormix Construction Chemicals.
d. Sure-grip High Performance Grout; Dayton Superior Corp.
e. Euco N-S Grout; Euclid Chemical Co.
f. Five Star Grout; Five Star Products.
g. Vibropruf #11; Lambert Corp.
h. Crystex; L&M Construction Chemicals, Inc.
i. Masterflow 928 and 713; Master Builders Technologies, Inc.
j. Sealtight 588 Grout; W. R. Meadows, Inc.
k. Sonogrout 14; Sonneborn Building Products--ChemRex, Inc.
l. Kemset; The Spray-Cure Company.

2.07 WELDING BRACKETS

A. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for the metal alloy to be welded. Provide type and alloy of filler metal and electrodes as specified by producer of metal to be welded, complying with applicable AWS specifications, and as required for color match, strength and compatibility in the fabricated items.

B. All structural welds to be 3/16” fillet all around continuous welds unless noted or required otherwise. Ground smooth and flush all welds exposed to view unless noted otherwise.

2.08 GALVANIZING AND PAINT BRACKETS

A. Hot-dip galvanize items as indicated to comply with ASTM A 123, for galvanizing both fabricated and un-fabricated iron and steel products made of uncoated rolled,

pressed, and forged shapes, plates, bars, and strips 0.0299 inch thick and heavier. Comply with ASTM A 153 for galvanizing steel and iron hardware.

B. Galvanizing Repair Paint: High zinc dust content paint for re-galvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, complying with DOD-P-21035 or SSPC-Paint-20.

C. Shop Primer for Ferrous Metal: Primer to be recommended for application over galvanizing and be manufacturer's or fabricator's standard, fast-curing, lead-free, universal modified alkyd primer selected for good resistance to normal atmospheric corrosion, for compatibility with finish paint systems indicated, and for capability to provide a sound foundation for field or shop-applied topcoats despite prolonged exposure complying with performance requirements of FS TT-P-645.

D. Bituminous Paint: Cold-applied asphalt mastic complying with ASTM D 1187 and containing no asbestos fibers.

E. Zinc Chromate Primer: FS TT-P-645.

2.09 FABRICATION, GENERAL BRACKETS

A. Form railing fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.

1. Provide for indicated post spacing, wall bracket spacing and anchorage, but not less than that needed to withstand indicated loads.

B. Form exposed work true to line and level with accurate angles, curves and surfaces and straight edges. Form to required shapes and sizes. Finish exposed surfaces to smooth, sharp, well-defined lines and arrises.

C. Cut and drill metals cleanly and accurately. Cut, reinforce, drill and tap as indicated to receive finish hardware, screws and similar items. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

E. Fabricate connections that are exposed to weather in a manner that excludes water. Provide weep holes where water may accumulate.

F. Connections: Assemble by welding unless approved otherwise. Weld corners, joints and seams continuously to comply with AWS specifications and the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed welds, finish welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches

those adjacent. Grind exposed welds flush and smooth to match and blend with adjoining surfaces, forming smooth transitions and maintaining sharp lines.

G. Mechanically fastened connections, where approved, to have exposed connections with hairline joints, flush and smooth. Use concealed fasteners wherever possible and where exposed fasteners are permitted, use type indicated or, if not indicated, vandal-proof flat-head (countersunk) screws. Locate joints where least conspicuous. Round corner joints.

H. Form changes in direction of railings by bending unless shown otherwise. For changes in direction by bending, maintain cross section of member throughout entire bend without buckling, twisting, cracking or otherwise deforming exposed surfaces of components.

H. Provide necessary rebates, lugs and brackets for assembly of units.

I. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

J. Infill panels to be welded to rails and posts. Avoid exposed fasteners unless approved otherwise in writing by the CTA. Provide bar stops or angles as required and shown for securing infill panels to rail system. Preassemble items in the shop to the greatest extent possible. Weld panels/frame in the shop and use bolted connections with vandal proof fasteners to secure panel assembly to structural framing unit at the site to avoid welding in the field.

2.10 HANDRAILS, RAILINGS, CANE RAILS, GUARDRAILS AND GATES BRACKETS

A. General: Fabricate handrails, railings, cane rails, guardrails and gates to comply with requirements indicated for their design, dimensions, heights, details, finish, and member sizes, including thickness, profiles, post spacings, and anchorage, but not less than that required to support applied loads. Form to required shapes and sizes, with true curves, lines and angles. Assemble components at right angles, straight, flush and with equal spacing. Fabrication to follow approved shop drawings. Verify that installations will meet all applicable building codes and ADA requirements, including maximum clearance between members.

B. Fabricate handrails and rails of railings, cane rails, guardrails and gates from the following, unless indicated and approved otherwise:

1. One (1) inch stainless steel square stock, using fully welded construction.
2. One (1) inch ferrous metal, using fully welded construction. Metal fabrications and components to be galvanized, primed and painted.
3. One and one-half (1-1/2) inch diameter stainless steel pipe, using fully welded construction.
   Provide closure plates or caps at ends, of the same material as the rails, welded for a continuous, smooth appearance.
4. One and one-half (1-1/2) inch diameter ferrous metal steel pipe, using fully welded construction.
   Provide closure plates or caps at ends, of the same material as the rails, welded for a continuous, smooth appearance.
5. Fabricate posts of same material as rails; size as shown on shop drawings.

6. Picket Infill, 1/2 inch or 3/4 inch solid metal round or square pickets as shown or selected by the Authority, spaced less than 4 inches clear.
7. See related specification sections for additional infill materials for railings, guardrails and gates including wire mesh, perforated panels, solid panels.

C. See approved shop drawings and Drawings for sizes, spacings, design, sizes of members, anchorage, location, operation, and size of gates, if any. Verify all dimensions and conditions in the field.

D. Interconnect members with full butt welds unless otherwise indicated. Corners to be rounded. At tee and cross intersections, notch ends of intersecting members to fit contour to which end is joined and weld all around. All joints to be tight and smooth. Members to be parallel and perpendicular to each other. Weld joints and connections to form solid joints. Grind and smooth all welds.

E. Form corners and joints to a tight, hairline fit. Changes in direction of members to be formed by bending. Form bends to smooth and uniform radius without distortion of the cross-sectional shape.

F. Where indicated or where required by code (toe boards required at utility platforms per OSHA), provide toe boards at railings around openings and at the edge of open-sided floors and platforms. Fabricate to dimensions and details indicated, or, if not indicated, use 4 inches high x 1/8 inch steel plate welded to, and centered between, each railing post.

G. Provide wall brackets, base plates, end closures, flanges, miscellaneous fittings, and anchors of same material as rails as required for interconnections of members and attachment of railings to other work. Close exposed ends of railing members with prefabricated end fittings. Furnish inserts and other anchorage devices for connecting railings and gates to substrate; secure fabrications securely to substrate (floor, walls, ceiling, columns, beams).

1. Railing, cane rail, guardrail and gate posts set in grout, provide preset sleeves of Schedule 80 steel pipe or drill holes, not less than 6 inches long and with inside dimensions not less than 2 inch greater than outside dimensions of post.

H. Provide wall returns at ends of wall-mounted handrails as required by ADA.

1. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.

I. Fasteners: Unless noted otherwise, provide fasteners fabricated from Type 300 series stainless steel. Galvanized metal fasteners may be used for ferrous metal fabrications in interior locations. Do not use metals that are corrosive or incompatible with materials joined. Provide concealed fasteners except where welded or where exposed fasteners are unavoidable or are the standard method of fastening. Provide tamper-proof flat-head machine screws for exposed fasteners, unless otherwise indicated.

J. Gates: Provide pivots and mounting plates to securely anchor gates to structure. Cut, drill and tap gates to receive hardware plate box and similar items. Ease edges of locking plates. Provide minimum 3 heavy duty stainless steel hinges, closer, bumper, mortise lock, and electric strike. Cut, drill and tap gates to receive hardware plate box and similar items. See approved submittals, drawings and hardware schedule for required hardware to be provided and installed.

K. Material for sleeves, flanges, wall returns, wall brackets, end closures, toe boards, miscellaneous fittings and anchors: Provide of same material as railings and gates.

L. For ferrous metal, hot dip galvanize all items and entire assemblies after their fabrication, cutting and drilling of holes. Use galvanized accessories and galvanized or stainless steel anchors. Install primer and top coats of paint to the assemblies in the shop.

M. Comply with AWS for specified practices in shop welding. Provide welds behind finished surfaces without distortion or discoloration of exposed side. Clean exposed welded joints of all welding flux, and dress on all exposed and contact surfaces. Grind exposed welds flush and smooth to match and blend with adjoining surfaces. Weld continuously along entire line of contact unless spot welding is indicated.

N. Provide steel sheet or plate fillers of thickness and size indicated or required to support structural loads of handrails where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses. Size fillers to produce adequate bearing to prevent bracket rotation and over-stressing of substrate.

2.11 PLATFORM RAILINGS BRACKETS

A. See drawings and approved shop drawings for locations, sizes, conditions and installation details for platform railings. Platform railings typically consist of metal top and bottom pipe rails, metal tube posts, and metal infill panels of woven or welded wire mesh, perforated metal, metal bar grating or metal plate. Vertical support for platform railings typically include light poles, windbreaks and canopy supports as well as the railing posts.

B. Top and bottom platform railing horizontal rails typically are 3-1/2” in diameter schedule 40 galvanize pipe with metal cap welded to each open end. Vertical railing supports typically are 4” x 4” x 1/2” metal tubes with a rounded final welded to top. Provide railing support brackets welded to support and to anchor horizontal top and bottom rails. Provide slotted holes for horizontal adjustment.

C. Platform railing panels to fit in between top and bottom rails and posts. Modify size and shape of panels to fit conditions and as shown on approved shop drawings. Picket infill to consist of 1/2 or 3/4 inch pickets spaced less than 4 inches clear welded to top and bottom rails.

D. All metal and metal fabrications for platform railing assemblies to be of stainless steel or, if not stainless steel, to be hot dip galvanized. All pipe and tube members to be galvanized inside and out. Galvanize railing members and assemblies after fabrication to greatest extent possible. Galvanize after brackets, end caps, and anchorage bars are welded on to railing members. Grind all welds smooth and flush. Galvanize members, pieces, and sheets after perforations are made, holes are drilled, cuts are made or welds are made in the shop. Touch up galvanizing with galvanize paint after any necessary field welding, cutting or drilling.

2.12 METAL BAR GRATING VERTICAL PANELS FOR RAILINGS BRACKETS

A. General: Type of grating; method of attachment; size and shape as indicated on drawings and approved shop drawings. Bar sizes, spacing, cross bars and other

details as shown on the drawings, approved shop drawings, as required by code or as otherwise required.

B. Fabrication: Fabricate steel frames and supports to sizes, shapes, and profiles indicated and require to receive gratings. Fabricate from structural steel of welded construction; miter and weld connections.

C. Perimeter Frame: Metal bar grating panel perimeter frame shall be fabricated from steel members as shown on the drawings, as standard by the manufacturer or as otherwise structurally required. Miter corners of frame and weld. Grind smooth flush. Type, sizes and thicknesses of perimeter framing members as shown on the drawings or as required by the manufacturer to meet structural and code requirements.

D. Holes for attachment to Supports: Provide holes in frame members prior to galvanizing to accept stainless steel tamper resistant fasteners to secure the panel frames to the railing posts or other supports. Size of holes, size of fasteners and spacings as shown on the drawings or as required by the manufacturer to meet structural and code requirements.

E. Galvanize Perimeter Frame: Hot dip galvanize panel frame after fabrication and drilling.

F. Grating Infill: Metal bar grating infill to be swaged carbon steel grating panel as manufactured by Ohio Grating or approved equal. Weld grating to perimeter edge band which is then welded to perimeter continuous bar. Miter corners and weld. Grind smooth and flush. Grating type and size as shown on the drawings or as selected by the Authority. Edge band and perimeter bar sizes and details as shown on the drawings or as required by the manufacturer to meet structural and code requirements.

G. Galvanize Grating Infill: Hot dip galvanize grating, edge band and square continuous bar assembly after fabrication.

H. Installation: Weld grating bar infill assembly to perimeter grating panel frames. Secure the frames to vertical and/or horizontal supports with bolts as shown on the drawings. Provide attachment flanges or angles as shown on the drawings. Type, size and spacing of flanges, angles, supports and fasteners as shown on the drawings or as required by the manufacturer to meet structural and code requirements.

I. Gates: Where indicated, provide gates to match metal grating. Provide steel hinges or pivots, ball bearing type. Provide lock strike enclosure to securely hold lock and strike. Unless of stainless steel, finish of enclosure to match grating. Hinges and other hardware to be stainless steel for stainless steel gates and galvanized steel for galvanized steel gates.

2.13 FINISHES, GENERAL BRACKETS

A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.

B. Finish metal fabrications after assembly.

C. Protect mechanical finishes on exposed surfaces from damage by application of strippable temporary protective covering prior to shipment.

2.14 STAINLESS STEEL FINISHES BRACKETS

A. Finish designations prefixed by AISI conform with the system established by the American Iron and Steel Institute for designating finishes for stainless steel sheet.

B. Satin Finish: AISI No.4 polished, directional texture to match approved sample. Direction of texture shall be parallel to the long dimension of the member or surface.

2.15 STEEL AND IRON FINISHES BRACKETS

A. Galvanizing: Galvanize all items fabricated from ferrous metal. Apply zinc-coating by the hot-dip process after fabrication of assemblies. Galvanize in compliance with the following requirements:

1. ASTM A 153 for galvanizing iron and steel hardware.
2. ASTM A 123 for galvanizing both fabricated and un-fabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299 inch thick and heavier.

B. Preparation for Galvanizing: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:

1. SSPC Zone 1B: SSPC-SP6 "Commercial Blast Cleaning."

C. Steel that is to also be finished with primer and top coat, except portions to be embedded in concrete or masonry, which do not require a top coat. Comply with requirements of SSPC-PA1 "Paint Application Specification No. 1" for shop painting. Stripe paint all edges, corners, crevices, bolts, welds, and sharp edges.

1. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux and other foreign matter and treat with etching cleaner.
2. See Painting section of these specifications for primer and finished coats of paint.
3. High Performance Coating: Apply epoxy intermediate and polyurethane topcoats to prime coated surfaces. Comply with coating manufacturer’s written instructions and with requirements in SSPC-PA 1, “Shop, Field and Maintenance Painting of Steel” for shop painting. Apply at spreading rates recommended by coating manufacturer. Color and finish as selected by the Authority.

2.16 ALUMINUM FINISHES BRACKETS

A. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are unacceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

B. Mill Finish: AA-M12, as fabricated.

C. Clear Anodic Finish: AAMA 611.

1. Color and Gloss: As selected by the Authority from manufacturer’s full range.

D. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

1. Color and Gloss: As selected by the Authority from manufacturer's full range.

E. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Color and Gloss: As selected by the Authority from manufacturer's full range.

F. High-Performance Organic Finish: Four-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Color and Gloss: As selected by the Authority from manufacturer's full range.

2.17 SOURCE QUALITY CONTROL BRACKETS

A. All components for each handrail, railing, cane rail, guardrail and gate system installation to be provided and fabricated from a single source that is experienced, proficient and approved by the Authority for providing the system. The materials and components to perform together to create a uniform system aesthetically and functionally.

PART 3 - EXECUTION

3.01 PREPARATION

A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, including concrete inserts, sleeves, anchor bolts, core drilling and miscellaneous items having integral anchors that are to be integral with the substrate. Coordinate delivery of such items to project site.

B. Set sleeves in concrete with tops flush with finish surface elevations; protect sleeves from water and concrete entry.

C. Field verify all dimensions and conditions for the installation of all metal fabrications. Coordinate with approved shop drawings.

3.02 INSTALLATION, GENERAL

A. Adjust railings before anchoring to ensure matching alignment at abutting joints.

B. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous fabrications to in-place construction; include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required. Secure to meet all design loading and stresses.

1. Except where grouted into substrate, fasten metal fabrications to substrates with expansion bolts.

C. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installation of miscellaneous fabrications. Set handrails, railings, cane rails, guardrails and gates accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

1. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.

D. Fit exposed connections accurately together to form hairline joints or, where indicated, with uniform reveals and spaces for sealants and joint fillers. Where cutting, welding and grinding are required for proper shop fitting and jointing of metal items, restore finishes to eliminate any evidence of such corrective work.

E. All connections, including connection of infill panels to rails and posts to be welded. Avoid exposed fasteners unless approved otherwise in writing by CTA.

F. Weld connections that are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of units which have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections. Grind exposed welded joints smooth and restore finish to match finish of adjacent surfaces.

G. Field Welding (only when approved by the CTA): Comply with applicable AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, methods used in correcting welding work, and the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Weld connections which cannot be shop welded because of shipping size limitations.
5. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.

H. Do not cut or abrade finishes which cannot be completely restored in the field. Return items with such finishes to the shop for required alterations, followed by complete refinishing or provide new units as required.

I. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint or zinc chromate primer.

1. Paint the contact surfaces of dissimilar materials and metal in contact with masonry or concrete work, with a heavy coating of epoxy paint.

3.03 INSTALLATION OF HANDRAILS, RAILINGS, CANE RAILS, GUARDRAILS, GATES AND POSTS

A. Adjust members prior to securing to ensure matching alignment at abutting joints. Space posts at spacing indicated, or if not indicated, as required by design loadings. Plumb posts in each direction. Secure posts and rail ends to substrates as follows:

1. Anchor posts in concrete by core drilling holes not less than 5 inches deep and 3/4 inch greater than outside diameter of post. Clean holes of all loose material, insert posts and fill annular space between post and concrete with nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's directions.
2. Anchor posts to steel with steel oval flanges, angle type or floor type as required by conditions, welded to posts and bolted to steel supporting members.
3. Anchor rail ends into substrates with steel flanges welded to rail ends and anchored into wall construction with lead expansion shields and bolts.
4. Anchor railing ends to steel with steel flanges welded to rail ends and bolted to structural steel members, unless otherwise indicated.

B. Secure handrails to wall with wall brackets and end fittings. Provide bracket with not less than 1-1/2-inch minimum clearance from inside face of handrail and finished wall surface and 1-1/2 inch minimum clearance from bottom of handrail to top of bracket, per ADA requirements. Locate brackets as indicated, or if not indicated, at spacing required to support structural loads. Secure wall brackets and wall return fittings to building construction as follows:

1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.
2. Use type of bracket with pre-drilled hole for exposed bolt anchorage.
3. For concrete and solid masonry anchorage, use drilled-in expansion shield and either concealed hanger bolt or exposed lag bolt, as applicable.
4. For hollow masonry anchorage, use toggle bolts having square heads.

C. Align railings so that variations from level for horizontal members do not exceed 1/4 inch in 12 feet. Align at abutting joints.

D. Welded Connections: Use fully welded joints; cope or butt components to provide full contact. At exposed welded connections, finish exposed welds and surfaces smooth and blended so that no roughness is evident (by sight or touch) after finishing, and welded surface matches contours of adjoining surfaces.

E. Non-welded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.

F. Installation to be rigid, straight, level, and secure. Installation to meet all applicable codes and ADA. Anchorage, fastening and setting of posts to be firm, secure, and be able to withstand design loadings as specified above. Follow approved shop drawings.

G. Install railings, cane rail, barriers and gates as shown on Drawings. Install all hardware for gate according to hardware manufacturer’s directions for proper operation. Install using recommended tamper proof type fasteners. Provide all required accessories, and make all necessary adjustments.

1. Install railing gates level, plumb and secure for full opening without interference.
2. Attach gate hardware using tamper-resistant or concealed fasteners.

H. Railing Posts: Space railing posts at spacing indicated or as required by design loads. Plumb posts in each direction, within a tolerance of 1/16 inch in 3 feet. Secure posts and rail ends to building construction by welding, anchoring to structural supporting members, or anchoring rail ends to construction with steel round flanges anchored with post-installed anchors and bolts.

1. Connect posts to stair framing by direct welding prior to hot dip galvanizing assembly, unless otherwise indicated.
1. Install posts set in grout, provide preset sleeves of Schedule 80 steel pipe or drill holes, not less than 6 inches long and with inside dimensions not less than 2 inch greater than outside dimensions of post.

3.04 EXPANSION JOINTS

A. Allow for thermal movement resulting from the maximum change (range) in ambient and surface temperature in the installation of metal assemblies to prevent buckling, opening up of joints and over-stressing of welds and fasteners. Base design calculations on actual surface temperatures of metals due to both solar heat gain and night time sky heat loss.

B. Provide expansion joints at locations indicated, as required or as recommended by the manufacturer or fabricator. Provide expansion joints at intervals not to exceed 40 feet. Provide slip joint with internal sleeve extending 2 inches beyond joint on either side; fasten internal sleeve securely to one side; locate joint within 6 inches of posts. All surfaces at expansion joints to be smooth, with eased edges and without burrs and sharp edges.

3.05 WALL BRACKETS

A. Wall brackets to allow for proper location of rail, can rails, gates and proper distance from the wall, and required slope and elevation of the rail. Coordinate handrail bracket clearances with ADA requirements.

B. Secure wall brackets to the wall using expansion anchors or other approved anchors to secure rail and meet all design loads. Anchors to be stainless steel except galvanized steel anchors may be used with galvanized steel brackets. Screws to be tamperproof.

3.06 FINISHES

A. Unless fabricated of pre-finished material or stainless steel, all metal fabrications to be hot dip galvanized in the factory after fabrication per referenced standards.

B. For fabrications exposed to view, finish galvanized fabrications in the shop, if possible, by cleaning galvanized surfaces, priming and application of finish coats. Follow paint manufacturer’s recommendations. See painting section of these specifications for painting system. Touch up any welded or otherwise damaged galvanized surfaces with galvanizing repair paint prior to prime and finish coats.

C. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting. Apply by brush or spray to provide a minimum 3.0 mil dry film thickness.

3.07 PROTECTION

A. Protect finishes of metalwork from damage during construction period by use of temporary protective coverings approved by fabricators. Remove protective covering at time of substantial completion.

B. For pre-finished surfaces or stainless steel, restore protective coverings which have been damaged during shipment or installation of the work. Remove protective coverings only when there is no possibility of damage from other work yet to be performed at the same location. Retain protective coverings intact and remove simultaneously from similarly finished items to preclude non-uniform oxidation and discoloration.

3.08 ADJUSTING AND CLEANING

A. Clean aluminum and stainless steel by washing thoroughly with clean water and soap and rinsing with clean water.

B. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 requirements for touch-up of shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

C. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in the painting section of these specifications

D. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A 780.

E. Restore finishes damaged during installation and construction period so that no evidence remains of corrective work. Return items which cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units as required.

F. Adjust gate hardware for smooth operation.

3.09 FIELD QUALITY CONTROL

A. Contractor to hire and pay for an independent testing agency, submitted and approved by the Authority, to verify that all handrail, railing, cane rail, guardrail and gate system installations are provided and installed according to the requirements of this specification section and to ADA and building code requirements.

1. A report of the testing agency's finding to be delivered to the Authority.
2. Any repairs or replacements required as noted by the report to be performed by the Contractor to the satisfaction of the Authority at no cost to the Authority.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 05 50 20, Railings and Guardrails shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 05 50 20, Railings and Guardrails shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 05 50 30

CABLE AND LIGHT TRAY ENCLOSURE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions and Division 01 Specification sections, apply to this section.

1.02 SUMMARY

A. This section includes all labor and materials for the complete installation of the Cable and Light Tray Enclosure.

B. Work Included: Work under this section is designated as a Specialty Item as defined in Book 1, and as such shall be the sole single source responsibility of a Specialty Contractor, and consists of furnishing all labor and materials necessary for and incidental to the execution and completion of the Cable and Light Tray Enclosure at the platforms, including, but not limited to the extruded aluminum enclosure and access doors (PVDF Coated), associated hardware, door seals, stainless steel aircraft cables and associated hardware, internal structural components, extruded aluminum wireway, luminaires, lenses and diffusers, mounting plates and other shapes required for attachment of signage displays, speakers, cameras, and other light tray suspended or supported materials, provided and installed by other Contractors. The work also includes PVDF coated aluminum conduit pathway covers with internal structural components for the support of the covers, at points where conduit feeds into the Light Tray.

C. Related Sections: The following sections contain requirements that relate to and shall be incorporated into the work of this section:

1. Section 01 43 41 Special Mockups
2. Section 05 12 50 Architecturally Exposed Structural Steel
3. Section 05 50 00 Metal Fabrications
4. Section 10 81 00 Pigeon Control System
5. Division 10 Signage Specification Sections
6. Section 26 05 00 Raceway and Boxes
7. Section 26 12 30 Wires, Cables, Splices and Terminations
8. Section 26 50 10 Lighting Fixtures
9. Section 27 05 33 Conduit and Back Boxes for Communication Systems
10. Section 27 15 13 Communications Copper Horizontal Cabling
11. Section 27 51 17 Public Address Speakers
12. Section 28 23 31 Closed Circuit Television Fixed Cameras
13. Section 28 23 32 Closed Circuit Television PTZ Cameras

1.03 REFERENCES

A. Standard provided by the following professional organizations are referred to in this section for technical requirements:

1. ADA: American with Disabilities Act
2. ANSI: American National Standards Institute

3. ASTM: American Society for Testing and Materials
4. AWS: American Welding Society
5. OSHA: Occupational Safety and Health Administration
6. Standard Specifications: Standard Specifications for Road and Bridge Construction, Illinois Department of Transportation (IDOT).

1.04 DELEGATED DESIGN

A. Delegated Design: The entire scope shall be engineered, fabricated and UL listed by a single Specialty Contractor with all design elements submitted in one comprehensive shop drawing submittal, stamped and signed by a structural engineer Licensed in the State of Illinois, including shop drawings and structural calculations as required for the contractor to procure required permits. The complete Cable and Light Tray Enclosure shall be purchased from a single source Specialty Contractor. Division of scope, or supply of components, is not permitted under this section.

1.05 MANUFACTURERS

A. Acceptable Specialty Contractors:

1. Apogee Lighting, Long Island, NY.
2. Kenall Manufacturing, Kenosha, WI.
3. Paramount Lighting, St. Charles, IL.
4. Winona / Acuity Brands Lighting, Inc., Conyers, GA.
5. Approved equal as defined under Article 1.07B.

1.06 SUBMITTALS

A. General: Submit each item in this Article according to the General and Special Conditions and Division 01 Specification Sections.

B. Product data for products used in the work, including miscellaneous metal fabrications, bolts, anchors, finishes, paint products and sealants.

C. Shop drawings showing sizes and detailing fabrication and erection of each component thereof as shown in the drawings and as required to complete the work. Include plans, elevations, sections, profiles, and details of metal fabrications and their connections. Indicate heights, sizes and spacings of components. Show anchorage, joinery and accessory items. Where applicable, indicate field verified dimensions on shop drawings.

1. Include setting drawings, templates, and directions for installation of anchor connection points to structure and adjacent work.

2. Indicate field verified dimensions on shop drawings.

3. Indicate on shop drawings location of all components and all details and dimensions. Provide cuts for all accessories, fasteners and hardware.

4. Indicate adjacent work of other trades as incidental and required for coordination purposes, including, but not limited to, attached and suspended signage, displays, speakers, and cameras.

D. Provide structural calculations for the Light Tray and supporting aircraft cables subject

to or designed to sustain structural loadings and stresses, including but not limited to, those induced by self-weight, loads of attached devices and signage, exposure to wind, deflection of the main supporting structure by any cause, and from vibration caused by train movement. Calculations shall be signed, sealed and submitted by a structural engineer licensed in the State of Illinois.

E. Provide samples of specified finishes, and any additional samples representative of materials and finished products as may be requested by Authority.

F. Welder certificates signed by Contractor certifying that welders comply with requirements specified under "Quality Assurance" article.

G. Qualification data for firms and persons specified in "Quality Assurance" article to demonstrate their capabilities and experience. Include list of completed projects with project name, addresses, names of Architects and Owners, and other information specified.

1.07 QUALITY ASSURANCE

A. Specialty Contractor's Quality Control Responsibilities: Specialty Contractor is soley responsible for quality control of the Work.

B. Specialty Contractor Qualifications:

1. Specialty Contractor shall provide in-house services including design, engineering, fabrication and installation for scope of Work specified in this section. General Contractor shall contract this Work directly from one of the listed acceptable Specialty Contractors. Contracting through an intermediary is not acceptable. Specialty Contractor shall be experienced in successfully producing custom UL Listed lighting enclosures of similar complexity to that indicated for this Project, including coordination and integration of electrical items, with sufficient production capacity to produce required units without causing delay in the Work.

2. Bidding: Only listed acceptable Specialty Contractors, or other companies demonstrating equivalence in every aspect of these Contract Documents, shall be allowed to bid the Work. The Specialty Contractor bidding for the work must submit proposed details, preliminary engineering analysis confirming proposed systems and structural members, and all loading reactions to the structure supporting the Work of this section.

3. Equivalence Requirements: To be considered for acceptance, Specialty Contractors not listed under 1.05 A, shall provide proof of relevant equal experience no later than ten (10) days prior to bid. Provide a list of a minimum of four (4) projects completed within the last five (5) years, using the specified systems or equivalent. Projects must demonstrate the project delivery under a single contract including design, engineering, fabrication and installation. Each contract must have a minimum contract value of $5 million. For each project, provide photographs to illustrate detail characteristics and complexity of installations.

4. Commissioner's determination to allow approved equal Specialty Contractors to bid shall be final. All approvals shall be made in writing and evidence shall be provided via addenda prior to bid.

C. Specialty Contractor shall comply with the Federal Transit Administration's Buy America requirements. Refer to Book 1 for additional details.

D. Installer Qualifications: Arrange for installation of metal fabrications specified in this section by same firm that fabricated them.

E. Regulatory Requirements: Comply with applicable requirements of all governing codes, ordinances and regulations.

F. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel" and AWS D1.3 "Structural Welding Code--Sheet Steel", or when applicable, comparable AWS standards for 316 stainless steel.

1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

G. Pre-Installation Conference: Conduct conference at Project site to comply with requirements of Division 01 Section "Project Meetings".

H. Mockup: Specialty Contractor shall produce full scale mockup section as indicated on drawings, to verify full assembly process and final appearance of the Cable and Light Tray Enclosure. Refer to Section 01 43 41 Special Mockups.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Store fabricated components and materials in clean, dry locations, away from uncured concrete and masonry. Cover with waterproof paper, tarpaulin or polyethylene sheeting in a manner that permits air circulation within covering.

B. Include temporary protective film on exposed finished surfaces and lenses. Handle components to a minimum; exercise care to avoid damaging metal and plastic finishes.

C. Workers shall handle all components with gloves, to prevent the transfer of hand soiling and fingerprints to the elements.

1.09 PROJECT CONDITIONS

A. Field Measurements: Check actual locations of structure, walls and other construction to which metal fabrications shall fit, by accurate field measurements before fabrication; show recorded measurements on final shop drawings.

B. Where field measurements cannot be made without delaying the Work, Specialty Contractor or General Contractor shall guarantee dimensions and proceed with fabrication of products without field measurements.

C. Coordinate construction of Cable and Light Tray to ensure that actual opening dimensions correspond to guaranteed dimensions. Allow for adjustments, trimming and fitting.

D. Coordinate fabrication schedule with construction progress to avoid delay of Work. Verify all conditions for installation of the Work.

1.10 COORDINATION

A. Coordinate geometry and positioning of cable suspension anchorage points at the main structure, including but not limited to, structural gusset plates furnished and installed by the structural steel Contractor. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, fittings, adjustments, and items with integral anchors.

B. Coordinate and include in the work of this section the necessary finished metal fixing and mounting plates, tubes, angles, including on such any required mounting holes and conduit pathways, for the installation of devices and signage, displays, speakers, cameras, and other light tray suspended or supported materials by other contractors as shown on the drawings and specified elsewhere.

1.10 WARRANTY

A. General Warranty: Submit a five (5) year written warranty, beginning from date of substantial completion, and executed by the Contractor, manufacturer and the installer agreeing to repair or replace metal fabrication components that develop defects in materials or workmanship within the specified warranty period. Defects include, structural failures, deterioration of metals, metal finishes, improper installation, and other conditions beyond normal weathering and use.

B. Special Finish Warranty in addition to General Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Sheet, Strip, Plate, and Flat Bars: ASTM A666 Type 316L, as indicated on the Drawings.

2. Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D2244.

b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.

c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

3. Warranty Period: Twenty years from date of Substantial Completion.

4. Provide contact information for Specialty Contractor.

PART 2 - PRODUCTS

2.01 STAINLESS STEEL

A. Stainless Steel: Provide austenitic stainless steel in form and 316 grade complying with the following requirements:

1. Sheet, Strip, Plate, and Flat Bars: ASTM A666 Type 316L, as indicated on the Drawings.
2. Bars and Shapes: ASTM A 276, Type 316L.
3. Bar Stock: ASTM A 276.
4. Castings: ASTM A 743, Grade CF 8 or CF 20.
5. Stainless Steel Aircraft cable and Cable Fittings, Type 316, as indicated on the Drawings. ASTM A 492, ASTM A 555.

2.02 NONFERROUS METALS

A. Aluminum Plate and Sheet: ASTM B 209, Alloy 6061-T6.

B. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6.

C. Aluminum-Alloy Rolled Tread Plate: ASTM B 632, Alloy 6061-T6.

D. Aluminum Castings ASTM B 26, Alloy 443.0-F.

2.03 FASTENERS

A. Always provide Type 316 stainless steel fasteners for all exterior use. Select fasteners for the type, grade, and class required and for type of loading and installation condition shown or as specified by the manufacturer.

1. Conceal all fasteners except those required for captive retained fasteners at access doors.
2. Provide Phillips flat-head machine screws for exposed fasteners, unless otherwise indicated.
3. Where subject to vandalism or as otherwise specified, provide vandal proof type fasteners.

B. Bolts and Nuts: Regular hexagon head type, ASTM A 307, Grade A (ASTM F 568, Property Class 4.6), with hex nuts, ASTM A 563 and, where indicated, flat washers. Stainless steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, nuts and where indicated, flat washers; ASTM F 593 for bolts and ASTM F 594 for nuts, Alloy Group 1.

C. Machine Screws: ANSI B 18.6.3.

D. Plain Washers: Round, Type 316 Stainless Steel.

E. Lock Washers: Type 316 Stainless Steel.

2.04 FABRICATION, GENERAL

A. Extruded aluminum enclosures and access doors shall be of size, thickness as shown on drawings, but not less than that needed to comply with performance requirements indicated.

B. Panel module supports, including, but not limited to channel and plate extrusions, threaded studs and fasteners shall be constructed from engineered Type 316 stainless steel.

C. Gap between access door and frame must be watertight and gasketed. Captive fasteners shall be tamper-proof type.

D. Gasketing must be continuous on both sides and ends of the fixture between the door panels and the housing (chassis).

E. Extruded aluminum wire way shall consist of extruded aluminum segments with sealed cover plates for running wiring horizontally in light tray. Extruded aluminum segments must provide separate continuous wire ways per Drawings and shop drawings. Provide gasketed openings in wire ways where extruded aluminum segments connect for wiring of devices mounted to the light tray (cameras, illuminated and electronic signage, speakers). Isolate dissimilar metals.

F. General: Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.

G. Form exposed work true to line and level with accurate angles, curves and surfaces and straight sharp edges. Form to required shapes and sizes. Finish exposed surfaces to smooth, sharp, well-defined lines and arises.

H. Allow for thermal movement in the design, fabrication, and installation of installed metal assemblies to prevent buckling, opening up of joints, and overstressing of welds and fasteners.

I. Cut, drill, shear and punch metals cleanly and accurately. Remove burrs.

J. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

K. Remove sharp or rough areas on exposed surfaces.

L. Weld corners and seams continuously to comply with AWS specifications and the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent. Grind exposed welds flush and smooth to match and blend with adjoining surfaces.

M. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use concealed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous. Cope or miter corner joints.

N. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate

and space anchoring devices to provide adequate support for intended use.

O. Provide necessary rebates, lugs and brackets for assembly of units. Use concealed fasteners wherever possible.

P. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

Q. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware, screws, and similar items.

R. Fabricate joints that will be exposed to weather in a manner to exclude water Provide weep holes where water may accumulate.

S. The fixture shall be so constructed that ballast replacement, wireway wire replacement, new wire placement, and LED light source component replacement can be performed safely by one individual from a step ladder. Access doors shall include a device to hold in a full open position until manually closed.

2.05 WELDING

A. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for the metal alloy to be welded. Provide type and alloy of filler metal and electrodes as specified by producer of metal to be welded, complying with applicable AWS specifications, and as required for color match, strength and compatibility in the fabricated items.

B. All structural welds shall be 3/16-inch fillet all around continuous welds unless noted or required otherwise. Ground smooth and flush all welds exposed to view unless noted otherwise.

2.06 PVDF COATING FOR ALUMINUM EXTRUSIONS

A. Organic Coating: Thermosetting, modified-acrylic or polyester enamel primer/topcoat system complying with AAMA 2603, minimum dry film thickness of 1.5 mils, medium gloss.

B. Color: To match PT-2, Federal #27722 (CTA Standard White)

A. Aluminum Extrusions: ASTM B221/B221M. Shapes and thicknesses as required to fulfill performance requirements, but not less than 1/8 inch thick unless otherwise shown. 6061-T6, or alloy and temper as recommended by the manufacturer or fabricator to develop required strength of assembly.

1. PVDF Finish Coating: AAMA 2605. Polyvinylidene fluoride finish coating, containing not less than 70% of Arkema Inc. “Kynar 500" or Solvay Solexis “Hylar 5000" fluorocarbon resin. Shop-applied and heat-cured by licensed applicator. Remove die markings, scratches, abrasions, dents and other blemishes before applying finish.

2. Standard PVDF Finish: Color as selected by Architect. Minimum 1.6 mil total dry

film thickness, three-coat system.

a. Akzo Nobel Coatings “Trinar"
b. PPG Industries “Duranar"
c. Valspar Corp. “Fluropon"

PART 3 - EXECUTION

3.01 PREPARATION

A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

B. Field verify all dimensions and conditions for the installation of the Cable and Light Tray Enclosure. Coordinate with approved shop drawings.

3.02 INSTALLATION, GENERAL

A. Leveling: Once main supporting structure is erected with all final adjustments completed, install the Cable and Light Tray Enclosure accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack as measured from established lines and level. Provide a permanent means of fine adjustment to the level, permitting adjustments during first installation, final adjustments, and for future maintenance purposes. Line and level height is shall be measured from the platform finished surface to the dimension shown on the drawings, with adjustments as necessary to establish a single true alignment line, free of peaks and valleys as viewed along the entire length of installed Light Tray.

B. Fit exposed connections accurately together to form hairline joints or, where indicated, with uniform reveals and spaces for sealants and joint fillers. Where cutting, welding and grinding are required for proper shop fitting and jointing of metal items, restore finishes to eliminate any evidence of such corrective work.

C. All components of light tray shall be weather tight. End-to end connection of shipped sections of light trays shall be gasketed.

D. Field Welding (only when approved by the Authority): Comply with applicable AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, methods used in correcting welding work, and the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Weld connections which cannot be shop welded because of shipping size limitations.
5. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.
6. Repair painted finishes such that repairs are not discernable by architect from a distance of five (5) feet.

E. Do not cut or abrade finishes which cannot be completely restored in the field. Return items with such finishes to the shop for required alterations, followed by complete refinishing or provide new units as required.

F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint or zinc chromate primer.

3.03 ADJUSTING AND CLEANING

A. After installation of devices and signage by other trades, make final adjustments as required to correct any misalignments from established plumb and level lines and levels.

B. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 requirements for touch-up of field painted surfaces. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.

3.04 PROTECTION

A. Protect finishes of metalwork from damage during construction period by use of temporary protective coverings approved by fabricators. Retain protective coverings intact and remove simultaneously from similarly finished items to preclude non-uniform oxidation and discoloration. Remove protective covering at time of substantial completion.

B. For pre-finished surfaces, restore protective coverings which have been damaged during shipment or installation of the work. Remove protective coverings only when there is no possibility of damage from other work yet to be performed at the same location.

C. Restore finishes damaged during installation and construction period so that no evidence remains of corrective work when reviewed by architect from a distance of five (5) feet. Return to the shop any items which cannot be refinished in the field; make required alterations and refinish entire unit, or provide new units as required.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 05 50 30, Cable and Light Tray Enclosure shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 05 50 30, Cable and Light Tray Enclosure shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000.

END OF SECTION

SECTION 05 51 10
METAL STAIRS WITH STAINLESS STEEL TREADS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions and Division 01 Specification sections, apply to this section.

1.02 SUMMARY

A. This section includes, but is not limited to, the following metal fabrications:

1. Metal supported stairs, landings, platforms.
2. Stainless steel treads and nosings and risers (if applicable) with non-slip abrasive finish on the treads.
3. Handrails and railings.

B. Related Sections: The following sections contain requirements that relate to this section:

1. Division 5 Section "Structural Steel" for structural steel framing system components.
2. Division 5 Section “Architecturally Exposed Structural Steel”.
3. Division 5 Section “Metal Fabrications”.
4. Division 9 "Painting".

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes and Tubes.
2. ASTM C 633 - Adhesion or Cohesive Strength of Flame-Sprayed Coatings.
3. ASTM E 140 - Hardness Conversion Tables for Metals.
4. ASTM E 384 - Microhardness of Materials.
5. ASTM E 303 - Standard Test Method for Measuring Surface Functional Properties Using the British Pendulum Tester.

B. American National Standards Institute. (ANSI)

1. ANSI B 101.1 - Test Method for Measuring Wet Static Coefficient of Friction of Common Hard-Surface Floor Materials.
2. ANSI B 101.3 - Test Method for Measuring Wet Dynamic Coefficient of Friction of Common Hard-Surface Floor Materials.
3. ANSI A 326.3 - American National Standard Test Method for Measuring Dynamic Coefficient of Friction of Hard Surface Flooring Materials.
4. NAAMM Stair Standard: Comply with “Recommended Voluntary Minimum Standards for Fixed Metal Stairs” in NAAMM AMP 510, “Metal Stairs Manual”.

1.04 DEFINITIONS

A. Definitions in ASTM E 985 for railing-related terms apply to this section.

1.05 SYSTEM DESCRIPTION

A. The stair tread and nosing and riser (if applicable) shall extend over the entire width of the stair and be anchored to the stair structure; except provide a 1/8-inch tolerance gap between the stair stringers and the stainless steel treads and nosing and risers (if applicable).

1. Stainless steel stair treads surface part of stair landings to have grooves in a parallel pattern through length of the tread in compliance with detectable warning accessibility codes.
2. Stainless steel stair tread to be double nose type or as shown on the drawings.
3. Stainless steel stair tread surface to be a non-slip granular surface.

1.06 SYSTEM REQUIREMENTS

A. Fabricate and install the following metal fabrications as designed and detailed on the structural and architectural drawings:

1. Infill Area of Guardrail Systems. Includes panels, intermediate rails, balusters or other elements composing the infill area.
2. Steel Stairs, including treads, tread supports platforms, platform support and stringers:

a. Treads: Capable of withstanding a uniform load of 100 lb per sq. ft. or a concentrated load of 300 lb on a area of 4 sq. inches located in the center of the tread, whichever produces the greater stress.
b. Platforms: Capable of withstanding a uniform load of 100 lb per sq. ft.
c. Limit deflection of treads, platforms, and framing members to L/360 or 1/4" whichever is less.

B. In general, steel connections are to be made with shop welds and field bolting.

C. Stair systems are to be designed for heavy duty usage in exterior applications and be resistant to adverse environmental conditions in regards to extreme temperature variations, freezing, moisture, snow, ice and road salt. Stair treads to provide an anti-slip walking surface when wet, oily or greasy.

D. Galvanization:

1 For items, components or assemblies to receive Hot Dip Galvanized Finish (non- aluminum metals); fabricator shall comply with detailing recommendations contained the AGA publication, “The Design of Products to be Hot Dip Galvanized After Fabrication”. Detailing shall eliminate the need for field welding of hot dip galvanized fabrications.
2 For galvanized coating applications to surfaces exposed to view, submit notarized Certificate of Compliance with ASTM Standards and Specifications listed herein, signed by galvanize applicator. In certificate, give detail description of material processed, include information as to the ASTM Standards used for coating, and include visual examination and test results.

E. Stair and railing system to meet all applicable local building and ADA codes.

F. Slip resistance: Test each surface finish to be used for walking. Slip resistance tests must be performed by a qualified independent testing agency approved by

the Authority and the tests to be done according to ANSI B 101.3, Test Method for Measuring Wet DCOF of Common Hard Surface Floor Materials using the BOT-3000E digital tribometer measuring device and/or according to ASTM E303 using the British pendulum tester. The test device and method to be as selected by and approved by the Authority.

1.07 SUBMITTALS

A. General: Submit each item in this Article according to the General and Special Conditions and Division 01 Specification Section, “Submittals”:

B. Submit catalog cuts, product data, specifications, technical data, installation instructions for stair riser, tread and nosing products and accessories. Provide product data for stainless steel abrasive stair risers, treads and nosings including surface design, spacing, depth, type of slip resistant granules, color, texture and method of fusion to stainless steel tread.

1. Provide specifications for type of stainless steel specified.
2. Provide color and finish charts for metal risers, treads and nosing and abrasive granulars for Authority’s initial selections.

C. Submit shop drawings showing sizes and detailing fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, profiles, and details of stair structure, stair components, metal fabrications; their assembly and their connections. Indicate heights, sizes and spacings of components. Show anchorage, joinery and accessory items. Where applicable, indicate field verified dimensions on shop drawings.

1. Include setting drawings, templates, and directions for installation of anchor bolts and other anchorages to be installed.
2. Indicate field verified dimensions on shop drawings.
3. Indicate conformance to minimum code requirements.

D. Provide a sample of typical stair tread assembly, 12” long with score pattern and abrasive finish selected. Samples representative of other materials and finished products as may be requested by Authority; in specified finish.

E. Provide welder certificates signed by Contractor certifying that welders comply with requirements specified under "Quality Assurance" article.

F. Provide qualification data for firms and persons specified as fabricator and installer in "Quality Assurance" article to demonstrate their capabilities and experience. Include list of completed projects with project name, addresses, names of Architects and Owners, and other information specified.

G. Provide specifications for galvanizing, primer, and top coat finishes. Provide samples of specified finishes. Provide color charts. Indicate compatibility of painting system and recommendations for application of galvanizing, primer and top coats.

H. For galvanized coating applications, submit notarized Certificate of Compliance with ASTM Standards and Specifications listed, signed by galvanizing applicator.

I. Provide product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency for stairs and railings.

1. Provide test results for coefficient of friction for tread surface.
2. Test railings according to ASTM E894 and ASTM E935.

J. Provide structural calculations for stair structure, treads, platforms and railings demonstrating compliance with all requirements and codes. Calculations shall be signed and sealed by a structural engineer licensed in the State of Illinois.

K. Submit a copy of the warranty for Authority's review and approval.

L. Submit method of separation for dissimilar metals and materials proposed to be used to prevent corrosion.

1.08 QUALITY ASSURANCE

A. Fabricator Qualifications: Firm experienced in successfully producing metal fabrications similar to that indicated for this Project, with sufficient production capacity to produce required units without causing delay in the Work.

B. Installer Qualifications: Arrange for installation of metal fabrications specified in this section by same firm that fabricated them.

C. Structural Engineer's Qualifications: Provide a copy of the engineers current State of Illinois license.

D. Regulatory Requirements: Comply with applicable requirements of all governing codes, ordinances and regulations. Fabricate and install handrails in accordance with the ADA Guidelines.

E. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual", for class of stair designated, unless more stringent requirements are indicated.

F. Qualify welding processes and welding operators in accordance with AWS D1.1 "Structural Welding Code - Steel" and D1.3 "Structural Welding Code - Sheet Steel"; or when applicable, comparable AWS standards for 304 stainless steel.

1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

G. Pre-Installation Conference: Conduct conference at Project site to comply with requirements of Division 01 Section "Project Meetings" with all trades involved.

H. Galvanize Coating Applicator's Qualifications: Company specializing in hot dip galvanizing after fabrication and following the procedures of "Quality Assurance Manual" of the American Galvanizers Association.

I. Provide certification that the galvanizing, primer, and top coats and their method of application are a compatible system.

1.09 PROJECT CONDITIONS

A. Field Measurements: Check actual locations of walls and other construction to which metal fabrications shall fit, by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of Work. Verify all conditions for installation of the work.

B. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabrication of products without field measurements. Coordinate construction to ensure that actual opening dimensions correspond to guaranteed dimensions. Allow for adjustments, trimming and fitting.

1.10 COORDINATION

A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to project site in time for installation.

B. Coordinate installation of steel weld plates and angles for casting into concrete that are specified in this section but required for work of another section. Deliver such items to Project site in time for installation.

C. Mount handrails only on completed walls or other construction. Do not support handrails temporarily by any means not satisfying structural performance requirements.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Store fabricated components and materials in clean, dry locations, away from uncured concrete and masonry. Cover with waterproof paper, tarpaulin or polyethylene sheeting in a manner that permits air circulation within covering.

B. Handle metalwork on site to a minimum; exercise care to avoid damaging metal finishes.

1.12 WARRANTY

A. Special Warranty for Stair System and Abrasive Stair Treads: Submit a five (5) year warranty from the date of substantial completion and executed by the Contractor, manufacturer and the installer agreeing to repair or replace at the direction of the Authority and at no cost to the Authority components of the stair system, including the abrasive stair tread materials that develop defects in materials or workmanship within the specified warranty period.

B. Failure and defects of the stair system and abrasive stair treads include, but are not limited to:

1. Structural failures.
2. Steel framing members, rails and/or treads bending, twisting or deflecting.
3. Connections failing.
4. Metal fatigue or cracking.
5. Deterioration of metals.
6. Deterioration of metal finishes.
7. Development of rust and corrosion.

8. Evidence of stains caused by rust or corrosion.
9. Non-slip abrasive material dislodging.
10. Loss of abrasive surface.
11. Other defects or failures beyond normal weathering and use.

PART 2 - PRODUCTS

2.01 METALS

A. Metal Surfaces, General:

1. For metal fabrications exposed to view upon completion of the Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials whose exposed surfaces exhibit pitting, seam marks, roller marks, rolled trade names, roughness, stains, discolorations, and, for steel sheet, "oil canning" and variations in flatness exceeding those permitted by reference standards for stretcher-leveled sheet.
2. Provide materials for galvanizing that are geometrically suitable for galvanizing as described in ASTM A384 and A385.

B. Steel Plates, Shapes, and Bars: ASTM A36.

C. Steel Tubing: Product type and as follows:

1. Cold-Formed Steel Tubing: ASTM A500, Grade A, unless otherwise indicated or required for design loading.

a. Provide tubing with hot-dip galvanized coating per ASTM A53 or ASTM A385; inside and out for hollow tubing.

D. Galvanized Steel Sheet: Quality as follows:

1. Commercial Quality: ASTM A653, G90 coating designation unless otherwise indicated.

E. Steel Pipe: ASTM A53; finish, type, and weight class as required; galvanized inside and out.

F. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, galvanized.

G. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A47, or cast steel, ASTM A27. Provide bolts, washers, shims as required per ASTM A153.

H. Elastomeric Pads: Comply with Section 783 of the Standard Specifications.

I. Stainless Steel: Provide austentic stainless steel in form and grade indicated complying with the following requirements:

1. Plate and Sheet: ASTM A 167, Type 316.
2. Sheet, Strip, Plate and Flat Bars: ASTM A666 Type 316.
3. Bars and Shapes: ASTM A 276, Type 316.
4. Rolled Floor Plate: ASTM A 793.
5. Bar Stock: ASTM A 276.

6. Castings: ASTM A 743, Grade CF 8 or CF 20.
7. Rolled-Stainless-Steel Floor Plate: ASTM A 793.
8. Tubing: ASTM A 554, Grades MT 301, MT 302 or MT 304, as standard with manufacturer.
9. Pipe: ASTM A 312, Grade TP 304.

2.02 RAILING BRACKETS

A. Brackets for wall mounted railings to be as shown on drawings and constructed of same material as railings. Design of bracket to be code compliance and allow sufficient space between the wall and the rail. Bracket to be of welded construction and designed to meet all design loads. Allow for anchorage into the wall.

2.03 FASTENERS

A. General: Provide Type 300 series stainless steel fasteners unless otherwise indicated and approved. Do not use metals which are corrosive or otherwise incompatible with metals joined. Select fasteners for the type, grade, and class required and for type of loading and installation condition shown or as specified by the manufacturer.

1. Provide concealed fasteners for interconnection of treads and other metalwork components and for their attachment to other work except where exposed fasteners are unavoidable or are the standard fastening method.
2. Provide Phillips flat-head machine screws for exposed fasteners, unless otherwise indicated.
3. All holes or countersinks shall be machine made. Screw heads shall not protrude above tread surface.

B. Bolts and Nuts: Regular hexagon head type, ASTM A307, Grade A (ASTM F568, Property Class 4.6), with hex nuts, ASTM A563 and, where indicated, flat washers. Stainless steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, nuts and where indicated, flat washers; ASTM F593 for bolts and ASTM F594 for nuts, Alloy Group 1.

C. Lag Bolts: ANSI B18.2.1 (ANSI B18.2.3.8 M).

D. Machine Screws: ANSI B 18.6.3 (ANSI B 18.6.7 M).

E. Plain Washers: Round, carbon steel, ANSI B 18.22.1 (ANSI B 18.22 M).

F. Lock Washers: Helical, spring type, carbon steel, ANSI B 18.21.1.

G. Expansion Anchors: Anchor bolt and sleeve assemblies of type as required for installation condition shown; and of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E488 conducted by a qualified independent testing agency.

1. Material: Group 1 alloy 304 or 316 stainless-steel bolts and nuts complying with ASTM F593 and ASTM F594.
2. Drilled-In Expansion Anchors: Expansion anchors complying with FS FF-325, Group VIII (anchors, expansion), Type I (internally threaded tubular expansion anchor); and machine bolts complying with FS FF-575, Grade 5.

H. Cast-In-Place Anchors in Concrete: Anchors capable of sustaining, without failure, a load equal to four times the load imposed, as determined by testing according to ASTM E488, conducted by a qualified independent testing agency.

1. Threaded or wedge type; galvanized ferrous castings, either ASTM A47 malleable iron or ASTM A27 cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A153.

I. Toggle Bolts: Tumble-wing type, FS FF-B-588, type, class, and style as required.

2.04 GROUT

A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107. Provide grout specifically specified by manufacturer for interior and exterior applications.

B. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

1. Nonshrink, Nonmetallic Grouts:

a. B-6 Construction Grout; W. R. Bonsal Co.
b. Diamond-Crete Grout; Concrete Service Materials Co.
c. Supreme; Cormix Construction Chemicals.
d. Sure-grip High Performance Grout; Dayton Superior Corp.Euco N-S Grout; Euclid Chemical Co.
e. Five Star Grout; Five Star Products.
f. Vibropruf #11; Lambert Corp.
g. Crystex; L&M Construction Chemicals, Inc.
h. Masterflow 928 and 713; Master Builders Technologies, Inc.
i. Sealtight 588 Grout; W. R. Meadows, Inc.
j. Sonogrout 14; Sonneborn Building Products--ChemRex, Inc.
k. Kemset; The Spray-Cure Company.

2.05 WELDING

A. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for the metal alloy to be welded. Provide type and alloy of filler metal and electrodes as specified by producer of metal to be welded, complying with applicable AWS specifications, and as required for color match, strength and compatibility in the fabricated items.

B. All structural welds to be 3/16” fillet all around continuous welds unless noted or required otherwise. Ground smooth and flush all welds exposed to view unless noted otherwise.

2.06 GALVANIZING AND PAINT

A. Hot-dip galvanize items as indicated to comply with ASTM A123, for galvanizing both fabricated and unfabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strips 0.0299 inch thick and heavier. Comply with ASTM A153 for galvanizing steel and iron hardware.

B. Galvanizing Repair Paint: High zinc dust content paint for regalvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, complying with DOD-P-21035 or SSPC-Paint-20.

C. Shop Primer for Ferrous Metal: Primer to be recommended for application over galvanizing and be manufacturer's or fabricator's standard, fast-curing, lead-free, universal modified alkyd primer selected for good resistance to normal atmospheric corrosion, for compatibility with finish paint systems indicated, and for capability to provide a sound foundation for field or shop-applied topcoats despite prolonged exposure complying with performance requirements of FS TT-P-645.

D. Zinc Chromate Primer: FS TT-P-645.

E. Top Coats of Finish: Type, color, gloss and number of coats as approved by the Authority. Top coats of finish shall be heavy duty, suitable for application, and compatible with primer.

F. Bituminous Paint: Cold-applied asphalt mastic complying with ASTM D 1187 and containing no asbestos fibers.

2.07 STAIR FRAMING

A. Stringers: Fabricate stringers of steel plates or channels. Provide welded closures for exposed ends of channel stringers.

2.08 ABRASIVE STAINLESS STEEL TREADS

A. Abrasive Molten metal Surface on Stainless Steel Substrate:

1. Provide 1/4-inch-thick minimum stainless steel substrate plate.
2. Type: Anti-slip, non-gritted, stainless steel or compatible metals alloy surface on stainless steel substrate.
3. Surface Texture: Grade 2, Medium.
4. Surface: Anti-slip stainless steel or compatible metals alloy surface consisting of a random hatch matrix. All metal plasma stream deposition process bonds surface to substrate. Surface coverage to be 100%.
5. Surface Hardness, Rockwell C Scale, ASTM E 140 and E 384: Minimum of 55.
6. Bond Strength, Surface to Substrate, ASTM C 633: Minimum of 4,000 psi.
7. Coefficient of Friction, Anti-Slip Surface: To meet ADA and OSHA requirements.
8. UL Listed: Slip-resistant.
9. Color Contrast Nosing: Provide powder coated safety yellow at nosing portion of treads, extending back 2 inches from leading edge of nosing.

B. Provide 3/8 inch diameter countersunk holes for 5/16 inch diameter fasteners with maximum 1/32 inch (plus or minus) tolerance on pattern detailed. Provide 5/16 inch x 1-1/4 inch stainless steel Philips flathead machine screws with flanged locknuts.

C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following:

1. IKG Industries, a Harsco Company; Mebac.
2. Ohio Gratings, Inc.
3. W. S. Molnar Company; Slipnot.
4. Approved equal.

2.09 FABRICATION, GENERAL

A. Provide complete stair structure including metal framing, hangers, struts, brackets, bearing plates and other components necessary to support and anchor stairs, landings, platforms and railings. Cut to size and preassemble stair components in shop to greatest extent possible to minimize field splicing, assembly and cutting. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for assembly and coordinated installation. Install treads in shop or field. Install railings in the field.

1. Join components by welding, unless indicated otherwise.
2. Use connections that maintain structural value of joined pieces.
3. Fabricate treads, landings and platforms of stairs so finished walking surfaces slope to drain.

B. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.

1. Size of treads as shown on drawings, approved shop drawings and to meet code; usually 11”; depth including nosing. Units shall be free of surface irregularities, blow- holes and twists or bows.
2. Thickness of treads as shown on the drawings or required structurally to span between supports for the design loading; 1/4” minimum thickness.

C. Form exposed work true to line and level with accurate angles, curves and surfaces and straight sharp edges. Form to required shapes and sizes. Finish exposed surfaces to smooth, sharp, well-defined lines and arrises.

D. Allow for thermal movement in the design, fabrication, and installation of installed metal assemblies to prevent buckling, opening up of joints, and overstressing of welds and fasteners.

E. Cut, drill, shear and punch metals cleanly and accurately. Remove burrs.

F. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

G. Remove sharp or rough areas on exposed surfaces.

H. Weld corners and seams continuously to comply with AWS specifications and the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent. Grind exposed welds flush and smooth to match and blend with adjoining surfaces.

I. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous. Cope or miter corner joints.

J. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.

1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1 1/2 inches, with a minimum 6 inch embedment and 2 inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

K. Provide necessary rebates, lugs and brackets for assembly of units. Use concealed fasteners wherever possible.

L. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware, screws, and similar items.

M. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

N. Corrosion Protection:

1. Separate surfaces of dissimilar metals with an approved method.
2. Coat concealed surfaces of stainless steel that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint or zinc chromate primer.
3. To prevent corrosion, paint or coat the contact surfaces of metals in contact with masonry or concrete work, with a heavy coating of epoxy paint; or provide separation material as submitted and approved by the Authority.
4. To prevent corrosion, paint or coat the contact surfaces of dissimilar materials and dissimilar metals with a heavy coating of epoxy paint; or provide separation material as submitted and approved by the Authority.

O. Slip Resistance: Tread and other walking surfaces to have a slip resistance with a minimum value of 0.42 DCOF measured with the BOT-3000E and using a 0.05% SLS water solution per the specified test method.

2.10 ROUGH HARDWARE

A. Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Division 6 sections.

B. Fabricate items to sizes, shapes, and dimensions required. Furnish steel washers for heads and nuts.

2.11 MISCELLANEOUS FRAMING AND SUPPORTS

A. Provide steel framing and supports for applications indicated or which are not a part of structural steel framework, as required to complete work.

B. Provide shop drawings showing applicable field verified sizes, details. Coordinate with supplier of equipment or product framing is supporting, if applicable.

C. Fabricate units to sizes, shapes, and profiles indicated and required to receive adjacent other construction retained by framing and supports. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitered joints for field connection. Cut, drill, and tap units to receive hardware, hangers, and similar items. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed. Except as otherwise indicated, space anchors 24 inches o.c. and provide minimum anchor units in the form of steel straps 1-1/4 inches wide x 1/4 inch x 8 inches long. Secure miscellaneous framing securely to structure by welding or anchoring as approved. Install to withstand all applicable loadings and stresses.

2.12 MISCELLANEOUS STEEL TRIM

A. Provide shapes and sizes indicated for profiles shown. Unless otherwise indicated, fabricate units from structural steel shapes, plates, and steel bars, with continuously welded joints and smooth exposed edges. Use concealed field splices wherever possible. Provide cutouts, fittings, and anchorages as required for coordination of assembly and installation with other work. Anchorages to be concealed unless approved otherwise.

B. Galvanize miscellaneous steel trim, framing and supports after fabrication. Also prime and provide top coats for any exposed steel trim.

2.13 STEEL FRAMED STAIRS

A. General: Construct stairs to conform to sizes, thicknesses, shapes, details and arrangements indicated. Follow approved shop drawings. Verify dimensions and conditions in field. Verify code requirements, performance requirements, and method of support. Join pieces together by welding, unless otherwise indicated. Provide complete stair assemblies, including metal framing, hangers, columns, railings, newels, balusters, wire mesh panels, struts, clips, brackets, bearing plates, and other components necessary for the support of stairs and platforms, and as required to anchor and contain the stairs on the supporting structure.

1. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM "Metal Stair Manual" for Architectural Class of stair except where more stringent requirements are indicated.
2. Fabricate treads and platforms of exterior stairs to accommodate slopes to drain in finished traffic surfaces. Provide minimal gap for drainage between panels and treads and risers.
3. Provide stiffener plates, bracing and additional framing to resist torsion, and properly secure stairs to the structural elements.

B. Stair Framing: Fabricate stringers of structural steel channels, or plates, or a combination thereof, as indicated. Provide closures for exposed ends of stringers. Construct platforms of structural steel channel headers and miscellaneous framing members as indicated. Bolt or weld headers to stringers, newels, and framing members to strings and headers; fabricate and join so that bolts, if used, do not appear on finish surfaces.

C. Treads and Landings: Fabricate risers, treads, nosings, landings and platforms as shown on the drawings and specified herein and assemble as shown on the drawings. Unless shown otherwise on the drawings, form risers, treads, nosings, landings and platforms of stainless steel. Thickness of stainless steel shall be as required for the loadings, spans of the material and locations of supports; as shown on the drawings and verified by structural calculations. Stainless steel treads shall be of1/4" thickness minimum. Attach treads and platforms to stringers with brackets made of steel angles or bars. Weld brackets to stringers and attach treads to brackets by bolting, as indicated. Provide continuous integral nosings. Provide continuous solid steel front or risers, and rear plates under the treads if detailed on drawings.

D. Installation of risers, treads and nosings: To avoid electrolytic action at connections and contact areas of dissimilar metals fully coat contact areas with asphaltic coating or provide other separation as approved by the manufacturer and the Authority.

2.14 RAILINGS, HANDRAILS, AND BARRIERS

A. General: Fabricate railings, handrails, cane rails, and barriers to comply with requirements indicated for their design, dimensions, heights, details, finish, and member sizes, including thickness, profiles, post spacings, and anchorage, but not less than that required to support structural loads. Form to required shapes and sizes, with true curves, lines and angles. Design to follow approved shop drawings. Also, verify that installations will meet all applicable building codes and ADA requirements. For fabrication, follow approved shop drawings for design, sizes, heights and details. Assemble components at right angles, straight, flush and with equal spacing. Shop drawings to indicate actual field verified dimensions, details, and conditions.

B. Fabricate from structural tubing, bar and plate as indicated. Miter corners to provide tight joints.

C. Stair Railings and Handrails: Comply with applicable requirements specified elsewhere in this section for steel railings and handrails. Connect railing posts to stair framing by direct welding, unless otherwise indicated.

D. Interconnect railing, handrail, and barrier with full butt welds unless otherwise indicated. At tee and cross intersections, notch ends of intersecting members to fit contour to which end is joined and weld all around. All joints to be tight and smooth. Members to be parallel and perpendicular to each other. Miter and weld joints and connections to form solid joints. Grind and smooth all welds.

E. Changes in direction of railing members to be formed by mitering and welding; or, if indicated, railings to be bent at corners, rail returns, and wall returns.

F. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated.

G. Unless indicated otherwise, provide toe boards at railings around openings and at the edge of open-sided floors and platforms. Fabricate to dimensions and details indicated, or, if not indicated, use 4 inches high x 1/8 inch steel plate welded to, and centered between, each railing post.

H. Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors as required for interconnections of members and attachment of railings and handrails to other work. Furnish inserts and other anchorage devices for connecting railings and handrails to concrete or masonry work. Secure railings and barriers securely to structure (floor, walls, columns).

1. For railing posts set in concrete provide preset sleeves of Schedule 80 steel pipe, not less than 6 inches long and with inside dimensions not less than 2 inch greater than outside dimensions of post, with steel plate forming bottom closure.

I. Fasteners: Provide fasteners fabricated from type 304 or type 316 stainless steel. Do not use metals that are corrosive or incompatible with materials joined. Provide concealed fasteners except where welded or where exposed fasteners are unavoidable or are the standard method of fastening. Provide Phillips flat-head machine screws for exposed fasteners, unless otherwise indicated.

J. Provide steel sheet or plate fillers of thickness and size indicated or required to support structural loads of handrails where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses. Size fillers to produce adequate bearing to prevent bracket rotation and over-stressing of substrate.

K. Material for sleeves, flanges, wall returns, wall brackets, end closures, toe boards, miscellaneous fittings and anchors: Provide of same material as railings and barriers; ferrous metal.

L. Allow for thermal movement resulting from the following maximum change (range) in ambient temperature, in the design, fabrication, and installation of installed metal assemblies to prevent buckling, opening up of joints and over-stressing of welds and fasteners. Base design calculations on actual surface temperatures of metals due to both solar heat gain and night time sky heat loss. Temperature Change (Range); 100 deg F, (55.5 deg C).

M. Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with in compatible materials.

N. Provide necessary rebates, lugs and brackets for assembly of units. Use concealed fasteners when possible.

O. Comply with AWS for specified practices in shop welding. Provide welds behind finished surfaces without distortion or discoloration of exposed side. Clean exposed welded joints of all welding flux, and dress on all exposed and contact surfaces. Grind exposed welds flush and smooth to match and blend with adjoining surfaces. Weld continuously along entire line of contact unless spot welding is indicated.

P. Mill joints to a tight, hairline fit. Cope or miter corner joints. Form joints exposed to weather to exclude water penetration.

Q. Provide castings that are sound and free of warp or defects which impair strength and appearance.

R. Finish exposed surfaces to smooth, sharp, well-defined lines and arises.

S. Preassemble items in shop to greatest extent possible to minimize splicing and assembly of units at project site. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

T. Fabricate newels of square steel tubing and provide newel caps as shown. Connect posts to stair framing by direct welding unless otherwise indicated.

U. Rails, intermediate rails and posts to be 1-1/2” square metal unless shown otherwise. Picket infill shall be ½” square metal spaced less than 4 inches clear. Changes in direction shall be made as detailed on shop drawings. Provide wall returns at ends of wall mounted handrails unless otherwise indicated.

2.15 FINISHES, GENERAL

A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.

B. Hot dip galvanize ferrous metal components of the stair system including framing, supports, tread supports, ferrous metal risers, stair stringers, rough hardware, ferrous metal railings and trim after fabrication. For galvanized metal exposed to view after installation, apply primer and top coats in the shop; touch-up in the field unless indicated otherwise. Platforms or other walking surfaces of ferrous metal, if any, to be galvanized separately prior to installation of non-skid abrasive wearing surface. Do not galvanize or paint walking surfaces that are cross hatched and/or have an abrasive granular coating already applied.

1. Protect mechanical finishes on exposed surfaces from damage by application of strippable temporary protective covering prior to shipment.

C. Unless noted otherwise, all galvanized metal shall be shop primed and finish paint coats applied in the shop or field, as directed.

2.16 STEEL AND IRON FINISHES

A. Galvanizing: Galvanize all items fabricated from ferrous metal. Apply zinc-coating by the hot-dip process after fabrication of assemblies. Galvanize in compliance with the following requirements:

1. ASTM A153 for galvanizing iron and steel hardware.
2. ASTM A123 for galvanizing both fabricated and unfabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299 inch thick and heavier.

B. Preparation for Galvanizing: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:

1. SSPC Zone 1B: SSPC-SP6 "Commercial Blast Cleaning."

C. Where steel is to also be finished with primer and top coats, apply shop primer to galvanized surfaces of metal fabrications, except portions to be embedded in concrete or masonry. Comply with requirements of SSPC-PA1 "Paint Application Specification No. 1" for shop painting. Stripe paint all edges, corners, crevices, bolts, welds, and sharp edges.

2.17 STAINLESS STEEL FINISHES

A. Finish designations prefixed by AISI conform with the system established by the American Iron and Steel Institute for designating finishes for stainless steel sheet.

B. Satin Finish: AISI No. 4 polished, directional texture to match approved sample. Direction of texture shall be parallel to the long dimension of the member or surface.

PART 3 - EXECUTION

3.01 PREPARATION

A. Installer shall examine conditions under which work is to be performed and shall notify the Authority in writing of unsatisfactory conditions. Installer shall not proceed until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

B. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

C. Set sleeves in concrete with tops flush with finish surface elevations; protect sleeves from water and concrete entry.

D. Field verify all dimensions and conditions for the installation of all metal fabrications. Coordinate with approved shop drawings.

3.02 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required. Secure to meet all design loading and stresses.

1. Except where otherwise shown or specified, fasten metal fabrications to solid concrete or masonry with expansion bolts.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installation of miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels. Provide temporary bracing or anchors in formwork for items which are to be built into concrete, masonry or similar construction.

C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete masonry or similar construction.

D. Fit exposed connections accurately together to form hairline joints or, where indicated, with uniform reveals and spaces for sealants and joint fillers. Where cutting, welding and grinding are required for proper shop fitting and jointing of metal items, restore finishes to eliminate any evidence of such corrective work.

E. Weld connections that are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units which have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections. Grind exposed welded joints smooth and restore finish to match finish of adjacent surfaces.

F. Field Welding (when approved by the Authority): Comply with applicable AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, methods used in correcting welding work, and the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Weld connections which cannot be shop welded because of shipping size limitations.
5. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.

G. Do not cut or abrade finishes which cannot be completely restored in the field. Return items with such finishes to the shop for required alterations, followed by complete refinishing or provide new units as required.

H. Corrosion Protection:

1. Separate surfaces of stainless steel treads from other materials or dissimilar metals with an approved coating, membrane or other approved separation.
2. Coat concealed surfaces of stainless steel that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint or zinc chromate primer.
3. Paint the contact surfaces of dissimilar materials and metal in contact with masonry or concrete work, with a heavy coating of epoxy paint; or provide separation material as submitted and approved by the Authority.

3.03 INSTALLING METAL STAIRS

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing steel stairs to in place construction. Include threaded fasteners for concrete inserts, through-bolts, lag bolts, and other connectors as required; weld stair framing to steel structure.

B. Set steel stair base plates on wedges, shims, or leveling nuts. After stairs have been positioned and aligned, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge or bearing plate.

C. If stair is to be set into concrete, pack voids solid with nonmetallic, non-shrink grout after installation.

D. Install stair units accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack.

3.04 INSTALLATION OF TREADS

A. Install slip-resistant metal fabricated treads at locations indicated on the drawings and in accordance with manufacturer's instructions.

B. Install slip-resistant treads level, straight, square, rigid with flush installation.

C. Fasten slip-resistant treads to support steel as indicated on the drawings, with approved method of separation for dissimilar metals.

D. Repair damaged factory-applied finishes as directed by the Authority.

E. Replace defective or damaged slip-resistant metal fabricated treads as directed by the Authority.

3.05 INSTALLATION OF RAILINGS, HANDRAILS, AND BARRIERS

A. Adjust railings prior to anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated, or if not indicated, as required by design loadings. Plumb posts in each direction. Secure posts and railing ends to building construction as follows:

1. Anchor posts in concrete by core drilling holes not less than 5 inches deep and 3/4 inch greater than outside diameter of post. Clean holes of all loose material, insert posts and fill annular space between post and concrete with non-shrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's directions.
2. Anchor posts to steel with steel oval flanges, angle type or floor type as required by conditions, welded to posts and bolted to steel supporting members.
3. Anchor rail ends into concrete and masonry with steel flanges welded to rail ends and anchored into wall construction with lead expansion shields and bolts.
4. Anchor rail ends to steel with steel flanges welded to rail ends and bolted to structural steel members, unless otherwise indicated.

B. Secure handrails to wall with wall brackets and end fittings. Provide bracket with not less than 1-1/2 inch clearance from inside face of handrail and finished wall surface. Locate brackets as indicated, or if not indicated, at spacing required to support structural loads. Secure wall brackets and wall return fittings to building construction as follows:

1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.
2. Use type of bracket with pre-drilled hole for exposed bolt anchorage.
3. For concrete and solid masonry anchorage, use drilled-in expansion shield and either concealed hanger bolt or exposed lag bolt, as applicable.
4. For hollow masonry anchorage, use toggle bolts having square heads.

C. Align rails so that variations from level for horizontal members and from parallel with rake of steps for sloping members do not exceed 1/4 inch in 12 feet. Align at abutting joints.

D. Welded Connections: Use fully welded joints; cope or butt components to provide full contact. At exposed welded connections, finish exposed welds and surfaces smooth and blended so that no roughness is evident (by sight or touch) after finishing, and welded surface matches contours of adjoining surfaces.

E. Expansion Joints: Provide expansion joints at locations indicated, or if not indicated, at intervals not to exceed 40 feet. Provide slip joint with internal sleeve extending 2 inches beyond joint on either side; fasten internal sleeve securely to one side; locate joint within 6 inches of posts.

F. Install railings, cane rail, barriers and gates as shown on drawings. Install all hardware for gate, provide all required accessories, and make all necessary adjustments.

G. Installation to be rigid, straight, level, and secure. Installation to meet all applicable codes. Touch up any paint finish after installation.

3.06 ADJUSTING AND CLEANING

A. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 requirements for touch-up of field painted surfaces. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. For galvanized surfaces clean welds, bolted connections and abraded areas and apply galvanizing repair paint to comply with ASTM A 780.

C. Clean stainless steel with soap and water; rinse with clear water.

3.07 FINISHES

A. Unless fabricated of prefinished material or stainless steel, all metal fabrications to be hot dip galvanized in the factory after fabrication per referenced standards.

B. For fabrications exposed to view, finish galvanized fabrications in the shop, if possible, by cleaning galvanized surfaces, priming and application of finish coats. Follow paint manufacturer's recommendations. See Painting Section of these specifications for painting system. Touch up any welded or otherwise damaged galvanized surfaces with galvanizing repair paint prior to prime and finish coats.

C. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting. Apply by brush or spray to provide a minimum 3.0 mil dry film thickness.

3.08 PROTECTION

A. Protect finishes of metalwork from damage during construction period by use of temporary protective coverings approved by fabricators. Remove protective covering at time of substantial completion.

B. For pre-finished surfaces, restore protective coverings which have been damaged during shipment or installation of the work. Remove protective coverings only when there is no possibility of damage from other work yet to be performed at the same location. Retain protective coverings intact and remove simultaneously from similarly finished items to preclude non-uniform oxidation and discoloration.

C. Restore finishes damaged during installation and construction period so that no evidence remains of corrective work. Return items which cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units as required.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 05 51 10, Metal Stairs with Stainless Steel Treads shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 05 51 10, Metal Stairs with Stainless Steel Treads shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 05 53 00
METAL GRATINGS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this section.

1.02 SUMMARY

A. This section includes, but is not limited to all materials, equipment and labor required to provide and install:

1. Metal Gratings and frame set into concrete.
2. Metal Gratings at floor openings.
3. Metal Gratings at vent shaft openings.
4. Metal Gratings for equipment platforms and machinery rooms.
5. Metal gratings used for stair treads, landings and platforms.

B. Related Sections: The following sections contain requirements that relate to this section:

1. Division 03 Section "Cast In Place Concrete".

1.03 REFERENCES

A. ANSI/NAAMM-MBG-532-00 Heavy Duty Metal Bar Grating Manual.

B. ASTM A-123 Standard Specification for Zinc Hot-Dip Galvanized Products.

C. ANSI/NAAMM Metal Bar Grating Manual for requirements for fabrication and tolerances of metal gratings.

D. Chicago Building Code (CBC), latest edition.

E. International Building Code (IBC), latest edition.

1.04 SYSTEM PERFORMANCE REQUIREMENTS

A. Structural Performance: Design, engineer, fabricate, and install the following metal fabrications to withstand the specified structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections, as well as no excessive deflection. Apply each load to produce the maximum stress in each respective component of each metal fabrication.

1. Roadway, Median and Walkway Heavy-Duty Serrated Metal Bar Grating and Frame Applications:

a. Ventilation shaft gratings should not be located in roadways whenever possible. When unavoidable, gratings to support the required clear span with deflection not to exceed 1/4" shall be designed as follows:

1) Grating in roadway areas shall be designed for HS20-44 loading with impact.
2) Grating in medians or sidewalks or areas surrounded by curbs less than 12 inches tall shall be designed for HS20-44 loading without impact, and allowing a 50% overstress for occasional applications of wheel loads.
3) Grating surrounded by parapet walls 12 inches or greater in height and grating in subway shall be designed for 200 psf.

2. Stair Tread Grating Applications: Design Live Load shall be 100 psf or 300 pounds, whichever governs.

3. Metal Grating and Frame Used to Span Floor Openings: Design live load shall be the same as the floor design live load.

4. Metal Grating and frame Used as the Main Floor for Equipment Platforms, Storage and Machinery Rooms: Design live load shall be a minimum uniform live load of 200 psf.

5. For other live loads on metal gratings not covered under this section, refer to the Chicago Building Code (CBC) or International Building Code (IBC) as required by local municipality. If local jurisdiction is undefined, then CBC shall govern.

B. Thermal Movements: Provide exterior metal fabrications and their fasteners that consider thermal forces resulting from the following maximum range in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and air temperature.

1. Temperature Range: 120 degrees F. ambient; 180 degrees F. material surfaces.

1.05 SUBMITTALS

A. General: Submit each item in this Article according to the Division 01 Specification Section, “Submittals”:

B. Product Data: Provide product data for grating; framing and supports for grating; means of attachment or embedment for grating frames; hinge plates, hinges, locking mechanism and other hardware where required in Drawings.

C. Provide product data for repair of galvanizing of grating, frame and all other ferrous metal components per ASTM A780.

D. Shop Drawings: Provide shop drawings showing sizes and detailing for fabrication and erection of each type and size of metal grating, frame and supports. Include plans, elevations, sections, profiles, and details of metal gratings and their installation. Indicate heights, sizes and spacings of all members and components. Indicate pattern, sizes of members, spacings and interconnection of grating components. Show anchorage, joinery, weld details, hardware and accessory items. Show type and location of all fasteners and anchorage of frame into concrete. Indicate required notches in concrete for frame and grate support.

1. Indicate field verified dimensions and conditions on the shop drawings for all grated openings.

2. Include setting drawings, templates, and directions for installation of framing, anchorages and accessories to be installed.

E. Calculations: Where installed metal gratings are indicated to comply with certain design loadings, provide load tables, anchor details and standard installation details. Include structural computations, material properties, and other information needed for structural analysis that has been signed and sealed by the qualified professional engineer who was responsible for their preparation. Engineering calculations for gratings and their framing and supports to show that the maximum stresses and deflections do not exceed specified performance requirements under full design loading. Calculations shall be prepared and sealed by a structural engineer licensed in the State of Illinois.

1. Indicate design loads for gratings.

F. Samples: Provide 12” X 12” corner samples of the serrated surfaced grating and frame in the specified finish for approval by the Authority. As requested by the Authority, provide samples of the plates, anchors, hardware or accessory items.

G. Materials: Fabricator and/or Contractor to provide certification that the materials provided meet all requirements of the Drawings and Specifications.

H. Welding: Provide welder certificates signed by the Fabricator (for shop welding) and/or Contractor (for field welding) certifying that welders comply with requirements specified under "Quality Assurance" article.

I. Qualification Data: Provide qualification data for firms and persons fabricating grating as specified in "Quality Assurance" article to demonstrate their capabilities and experience. Include list of completed projects with project name, addresses, names of Architects and Owners, and other information specified.

J. Galvanizing Certificate: For galvanized coating applications, submit notarized Certificate of Compliance with ASTM Standards and Specifications listed, signed by galvanizing applicator.

K. Process Plan: Contractor to provide a Process Plan for the installation of grating assembly.

1.06 QUALITY ASSURANCE

A. Fabricator Qualifications: Firm experienced in successfully producing metal fabrications similar to that indicated for this Project for a period of at least 10 years; with sufficient production capacity to produce required units without causing delay in the Work.

B. Installer Qualifications: Arrange for installation of metal fabrications specified in this section by same firm that fabricated them or a firm approved by the manufacturer.

C. Engineer Qualifications: Professional engineer licensed to practice in jurisdiction where project is located and experienced in providing engineering services of the kind indicated that have resulted in the successful installation of metal fabrications similar in material, design, and extent to that indicated for this project.

D. Regulatory Requirements: Comply with applicable requirements of all design loads, governing codes, ordinances and regulations.

E. Welding Qualifications: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel" and AWS D1.3 "Structural Welding Code--Sheet Steel".

1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

F. Galvanize Coating Applicator's Qualifications: Company specializing in hot dip galvanizing after fabrication and following the procedures of "Quality Assurance Manual" of the American Galvanizers Association.

G. Grating Requirements: Comply with applicable provisions and recommendations of the NAAMM Metal Bar Grating Manual designated ANSI/NAAMM MBG 532 for Heavy Duty Steel Grating.

H. Steel Requirements: Comply with ASTM A1011 for heavy duty hot rolled carbon steel sheet and strip and ASTM A510 for carbon steel wire rods and coarse round wire.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store fabricated components and materials in clean, dry locations, away from uncured concrete. Cover with waterproof paper, tarpaulin or polyethylene sheeting in a manner that permits air circulation within covering.

B. Handle metalwork on site to a minimum; exercise care to avoid damaging metal finishes.

1.08 PROJECT CONDITIONS

A. Field Measurements for Framing: Check actual locations, sizes and details of openings and other construction to which metal grating framing and studs shall fit, by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of Work. Verify all conditions for installation of the work.

1. Framing and anchorage for gratings to be fabricated and set into place allowing the framing and anchorage to be formed with and into the new concrete.

B. Field Measurements for Grating: Check actual locations, sizes and details of framing and other construction to which metal grating shall fit and set into the metal framing that is set into the new concrete, by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Verify all conditions for installation of the work.

C. Coordination: Coordinate installation of anchorages, framing and support for gratings. Furnish setting drawings, templates, and directions for installing anchorages, including concrete inserts, anchor bolts, and items with integral anchors that are to be embedded in concrete. Deliver such items to project site in time for installation.

PART 2 - PRODUCTS

2.01 FERROUS METALS

A. Metal Surfaces, General: For metal fabrications exposed to view upon completion of the Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials whose exposed surfaces exhibit pitting, seam marks, roller marks, rolled trade names, roughness, stains, discolorations, and, variations in flatness exceeding those permitted by reference standards.

1. All metal to be hot-dip galvanized per ASTM A 123 after fabrication.

B. Steel Plates, Angles, Shapes, and Bars: ASTM A 36.

C. Galvanized Steel Sheet: Quality as follows:

1. Commercial Quality: ASTM A653, G90 coating designation unless otherwise indicated.

D. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported angles, unless otherwise indicated.

E. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A 47, or cast steel, ASTM A 27. Provide bolts, washers, shims as required, hot-dip galvanized per ASTM A 153.

F. Steel Bars for Gratings: ASTM A 569 or ASTM A36. Wire Rod for Grating Cross Bars: ASTM A 510.

2.02 FASTENERS

A. General: Provide Type 300 series stainless steel fasteners where built into exterior concrete unless otherwise indicated. If not stainless steel, provide fasteners of same basic metal and alloy as fastened metal, galvanized. Do not use metals which are corrosive or otherwise incompatible with metals joined. Select fasteners for the type, grade, and class required and for type of loading and installation condition shown or as specified by the manufacturer.

1. Provide concealed fasteners for interconnection of metal components and for their attachment to other work except where exposed fasteners are unavoidable or are the standard fastening method.
2. Provide Phillips flat-head machine screws for exposed fasteners, unless otherwise indicated.
3. Where subject to vandalism or as otherwise specified, provide vandal proof type fasteners.

B. Bolts and Nuts: Regular hexagon head type, ASTM A 307, Grade A (ASTM F 568, Property Class 4.6), with hex nuts, ASTM A 563 and, where indicated, flat washers. Stainless steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, nuts and where indicated, flat washers; ASTM F 593 for bolts and ASTM F 594 for nuts, Alloy Group 1.

C. Lag Bolts: ANSI B18.2.1.

D. Machine Screws: ANSI B 18.6.3.

E. Plain Washers: Round, carbon steel, ANSI B 18.22.1.

F. Lock Washers: Helical, spring type, carbon steel, ANSI B 18.21.1.

G. Expansion Anchors: Anchor bolt and sleeve assemblies of type as required for installation condition shown; and of material indicated below with capability to sustain, without failure, a load equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

1. Material: Group 1 alloy 304 or 316 stainless-steel bolts and nuts complying with ASTM F 593 and ASTM F 594.

H. Cast-In-Place Anchors in Concrete: Anchors capable of sustaining, without failure, a load equal to four times the load imposed, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47 malleable iron or ASTM A 27 cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153.

2.03 WELDING

A. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for the metal alloy to be welded. Provide type and alloy of filler metal and electrodes as specified by producer of metal to be welded, complying with applicable AWS specifications, and as required for color match, strength and compatibility in the fabricated items.

B. All structural welds to be fillet type all around.

C. Continuous welds unless noted or required otherwise.

D. Ground smooth and flush all welds exposed to view unless noted otherwise.

2.04 FABRICATION, GENERAL

A. Form metal gratings and frames from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.

B. Form exposed work true to line and level with accurate angles, curves and surfaces and straight sharp edges. Form to required shapes and sizes. Finish exposed surfaces to smooth, sharp, well-defined lines and arrises.

C. Allow for thermal movement in the design, fabrication, and installation of installed metal assemblies to prevent buckling, opening up of joints, and overstressing of welds and fasteners.

D. Cut, drill, shear and punch metals cleanly and accurately. Remove burrs.

E. Remove sharp or rough areas on exposed surfaces.

F. All connections to be welded. All bars and cross bars to be welded. Weld corners and seams to be continuously welded to comply with AWS specifications and the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent. Grind exposed welds flush and smooth to match and blend with adjoining surfaces.

G. Form exposed connections with hairline joints, flush and smooth. Cope or miter corner joints and continuously weld.

H. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

I. Cut, reinforce, drill and tap metal work as indicated to receive indicated hardware and similar items.

2.05 FRAMING, SUPPORTS AND ANCHORAGE

A. Fabricate steel frames and supports to sizes, shapes, and profiles indicated and required to receive gratings. Fabricate from structural steel of welded construction; miter and weld connections. Equip units with integrally welded anchors for casting into concrete.

B. Provide frame shapes and sizes indicated for profiles shown. Unless otherwise indicated, fabricate units from structural steel shapes, plates, and steel bars, with continuously welded joints and smooth exposed edges. Anchorages to be concealed unless approved otherwise.

1. See drawings and approved shop drawings for framing member shapes, sizes and configuration. Provide for all welded construction.
2. Provide for anchors set into concrete of type, size, length and at locations shown on the drawings. All connections to be welded.

C. Provide for anchorages of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.

1. Where units are indicated to be cast into concrete, equip with integrally welded steel anchors of size, shape, length of embedment, spacing and at locations indicated on the drawings, approved shop drawings and/or as recommended by grating manufacturer.

D. Fabricate framing and supports to sizes, shapes and profiles indicated and required to receive adjacent other construction retained by framing and supports. Fabricate from structural steel shapes, plates and steel bars of welded construction using mitered joints for field connection. Cut, drill and tap units to receive hardware and similar items. Equip units with integrally welded anchors for casting into concrete. Secure framing securely to structure by setting into concrete or anchoring as approved. Install to withstand all applicable loadings and stresses.

2.06 METAL GRATINGS

A. Fabrication shall be in accordance with Heavy-Duty Metal Bar Grating Standard: "Guide Specifications for Heavy Duty Metal Bar Grating" published in ANSI/NAAMM MBG 532 "Heavy Duty Metal Bar Grating Manual".

B. Metal grating deflection limits shall be the applicable of the following:

1. Pedestrian Live Load: L/360.
2. Pedestrian Live Load Maximum Allowed Deflection: 0.25 inches.

C. Type of grating; method of attachment; size and shape as indicated. Bar sizes, spacing, cross bars, and bearing as shown on drawings, approved shop drawings, codes, or as otherwise required. Gratings to be of all welded construction.

D. Fabricate grating to pattern, sizes, spacing and profiles indicated on drawings and approved shop drawings. Unless indicated or required otherwise, use manufacturer's standard gratings.

1. Where possible, metal grating bars shall be orientated perpendicular to the main direction of traffic.
2. The maximum clear spacing of metal grating bars shall satisfy current ADA requirements.

E. All metal grating bars exposed to exterior weather conditions shall be serrated.

F. Where indicated, provide metal grating with stainless steel hinges or pivots, ball bearing type. Provide lock and strike enclosure to securely hold lock and strike and finish enclosure to match grating or hardware.

2.07 GALVANIZING AND GALVANIZING REPAIR

A. Hot-dip galvanize all items (except those fabricated of stainless steel) including grating, framing, supports and anchors as indicated to comply with ASTM A 123, for galvanizing both fabricated and unfabricated metal products. Comply with ASTM A 153 for galvanizing steel and iron hardware. Galvanize after fabrication when possible.

1. All required metal studs or steel reinforcement bars shall be welded to metal grating frames prior to hot-dip galvanizing.

B. Preparation for Galvanizing: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:

1. SSPC Zone 1B: SSPC-SP6 "Commercial Blast Cleaning."
2. Clean welds.

C. Galvanizing Repair Paint: High zinc dust content paint for re-galvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, complying with DOD-P-21035 or SSPC-Paint-20.

D. Touch up galvanizing that has become abraded or damaged prior to installation or in the field.

1. Clean welds, bolted connections, and abraded areas and treat exposed areas with galvanizing repair paint. Apply by brush or spray to provide a minimum 3.0 mil dry film thickness.

PART 3 - EXECUTION

3.01 PREPARATION

A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, including concrete inserts, sleeves, anchors, and miscellaneous items having integral anchors that are to be embedded in concrete construction. Coordinate delivery of such items to project site. Coordinate with concrete forming.

B. Field verify all dimensions, details and conditions for the installation of all metal fabrications. Coordinate with approved shop drawings.

C. Set grating frames in concrete with tops flush with finish surface elevations.

D. For metal gratings on sidewalks, the steel frames shall be cast into new concrete allowing 1% to 1.5% pitch.

3.02 INSTALLATION, GENERAL

A. Setting Frames into Construction: Provide anchorage devices where necessary for securing fabricated frame assemblies to be set into poured in place concrete construction. Set so frames will be secure to meet all design loading and stresses.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installation of frames. Set frames accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels. Provide temporary bracing or anchors in formwork for items which are to be built into the concrete.

C. Fit exposed connections accurately together to form hairline joints. Where cutting, welding and grinding are required for proper shop fitting and jointing of metal items, restore finishes to eliminate any evidence of such corrective work.

D. Do not cut or abrade finishes which cannot be completely restored in the field. Return items with such finishes to the shop for required alterations, followed by complete refinishing or provide new units as required.

3.03 INSTALLING GRATINGS

A. Prior to grating installation, Contractor shall inspect frames and supports in the field for correct size, layout and alignment. Cut to size or make any other adjustments as required to the grating to fit into the framing only with the Authority's approval.

B. Install gratings in accordance with the drawings, approved shop drawings, and standard installation clearances and standard anchoring details as recommended by ANSI/NAAMM Metal Bar Grating Manual.

C. Set gratings at proper elevations, flush with adjacent surfaces. Grating shall be placed such that cross bars align. Utilize standard panel widths wherever possible.

D. Cut openings in gratings as required for openings, obstructions or hardware only with the approval of the Authority. Openings shall be framed with welded closure pieces to match.

3.04 ADJUSTING AND CLEANING

A. Touch-Up Galvanizing: Immediately after erection, clean field welds, bolted connections and abraded areas and touch up galvanizing with galvanizing repair paint to comply with ASTM A 780.

3.05 PROTECTION

A. Protect finishes of metalwork from damage during construction period by use of temporary protective coverings approved by fabricators. Remove protective covering at time of substantial completion.

B. Restore finishes damaged during installation and construction period so that no evidence remains of corrective work. Return items which cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units as required.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 05 53 00, Metal Gratings shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 05 53 00, Metal Gratings shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 05 80 10

ELASTOMERIC EXPANSION ASSEMBLIES, SLIDE BEARING ASSEMBLIES,
BEARING PADS AND ISOLATION PADS, PTFE SLIDING BEARINGS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. The Contractor shall furnish all labor, material, equipment, and services necessary to fabricate, deliver and install elastomeric expansion bearing assemblies, Teflon or stainless steel slide bearings, bearing pads or isolation pads as required by the Drawings, as required for the conditions shown on the Drawings, at the locations shown, and as specified herein that will allow movements as shown or required.

B. The work under this Section shall include the installation of all elastomeric expansion bearing, slide bearing assemblies, bearing pads or isolation pads as necessary for the project; including, but not limited to expansion assemblies, slide bearing assemblies, or isolation pads integrated with the following members:

1. Columns.
2. Base plates.
3. Stair stringers.
4. Ramp and stair support at platform
5. Precast stair support
6. Platform stringers.
7. Track stringers.
8. Bent cross girders.

C. The Contractor shall correct fabricated assemblies or materials as required whether due to fabrication error, survey irregularities or other causes to provide fabricated elastomeric expansion, slide bearing assemblies, bearing pads or isolation pads that conform to the requirements of the Contract Documents and fit with field conditions.

D. Related Sections: The following Sections contain requirements that relate to this Section:

1. Section 05 10 30 – Structural Steel

1.03 REFERENCES

A. IDOT Standard Specifications

B. American Railway Engineering and Maintenance of Way Association (AREMA) “Manual for Railway Engineering”, Chapter 15, “Steel Structures”, current issue.

1.04 SUBMITTALS

A. Shop Drawings: Provide large scale drawings completely illustrating the design and construction of each bearing assembly and of each type of bearing assembly coordinated with adjacent structural elements. Indicate size and thickness of bearing pads, isolation pads, washers, and bushing. Indicate size and thickness for each assembly. Indicate location of each assembly or pad.

B. Product Data: Provide manufacturer's published product data for materials proposed to be incorporated into each bearing assembly and fabrication of assemblies. Provide product data for bearing pads and isolation pads.

C. Provide manufacturer's technical specifications for each assembly and material proposed to be used, including:

1. Compression.
2. Density.
3. Hardness.
4. Stability.
5. Tolerances.
6. Service Life.
7. Resistance to water, oil, and heat.
8. Conductivity.
9. Maximum load.
10. Deflection.
11. Damping.
12. Tolerance to temperature.

D. Indicate manufacturer's recommended installation instructions, including recommended environmental conditions for installation of materials and assemblies.

E. Provide test reports for the materials making up the expansion assembly, the slide bearing assembly, bearing pads, isolation pads, and for the elastomeric expansion assembly or slide bearing assembly indicating that the materials and assemblies meet all requirements of the IDOT Standard Specifications for Road and Bridge Construction and this specification. Indicate fatigue test reports for the material being used.

F. Indicate the allowable movement in each direction for each pad or assembly, as specified by manufacturer. Indicate required movement in each direction for each pad or assembly.

1.05 QUALITY ASSURANCE

A. Except as modified herein, the Contractor shall provide elastomeric expansion bearing assemblies or slide bearing assemblies in conformance with the IDOT Standard Specifications for Road and Bridge Construction, latest edition, Section 1083, including the current applicable Supplemental Specifications.

B. Manufacturer of assemblies, bearing pads, and isolation pads shall have a minimum of three years experience in designing and fabricating assemblies and pads similar to that specified herein.

1.06 SEQUENCING/SCHEDULING

A. The Contractor shall schedule and perform tasks required to furnish and deliver the elastomeric

expansion bearing assemblies, slide bearing assemblies, bearing pads, or isolation pads in conformance with the requirements of the accepted project schedule.

1.07 PRODUCT DELIVERY, STORAGE AND HANDLING

A. The Contractor shall repair or replace, to the satisfaction of the Authority, any components that are damaged, corroded or otherwise deteriorated at no additional expense to the Authority and without any delay to the completion of the work.

B. The Contractor shall deliver complete, sealed, packaged elastomeric expansion bearing assemblies or slide assemblies to the project site for immediate installation. On-site storage of assemblies prior to installation shall be minimized.

PART 2 – PRODUCTS

2.01 MATERIALS AND PRODUCTS FOR ELASTOMERIC EXPANSION ASSEMBLIES

A. The Contractor shall provide elastomeric expansion pads of the size and type indicated on the Drawings, or if not indicated, of size and type adequate for all design loads and movements in accordance with the requirements of Section 1083 of the IDOT Standard Specifications, and Chapter 15, Part 10 of the AREMA Manual for Railway Engineering.

B. The various products for the elastomeric expansion pads are to be comprised of all new (unused) materials including laminated multiple layers of prestressed cotton duck or cotton-polyester blend duck that has been impregnated and bound with a high quality rubber compound, containing rot, oil, mildew, and mold resistant synthetic rubber elastomer, inhibitors and anti-toxins, compounded into resilient pads, sleeves or washers of uniform thickness for use in shock, vibration, and structure-borne noise reduction applications on the Authority's elevated structures. The cotton duck shall weigh in at 8.1 ounce per net square yard, duck wrap count 50 plus or minus 1 thread per inch and filling count 40 plus or minus 2 threads per inch, 2 yards per thread, 64 plies per inch of finished pad thickness.

C. The insulation materials shall have a dielectric strength of more than 3,200 volts and an electrical resistivity exceeding 1,000,000 ohm-cm. They shall withstand compressive loads perpendicular to the plane of laminations of not less than 15,000 psi before breakdown. Load deflection properties shall be the following maximum percentages of total pad thickness: 10% at 1000 psi, 15% at 2000 psi. When loaded to 1500 psi, permanent set as load is removed shall be a maximum of 2.5% of the original "zero point" thickness. Shore Durometer shall not exceed 0.25 when loaded to 1500 psi. The material shall not lose effectiveness throughout a temperature range of -65°F to +150°F. There shall be no visual evidence of damage or deterioration by environmental effects of sunshine, humidity, salt spray, fungus, or dust. Thickness shall be as shown on Drawings within tolerances of ± 5%.

D. All products furnished shall be free of frayed or irregularly cut edges, nicks, cuts or any other defects that can affect the service life of the product. The ends of all bushings shall be cut straight, 90 degrees plus or minus 1 degree to the center longitudinal axis.

E. Flat Stock Products: The sheet material used for flat stock products (washers and pads) shall meet the following requirements, unless otherwise shown on the Drawings:

1. The material shall have a dielectric strength of 25.0 KV per 5/32 inch thickness.
2. The material shall withstand compressive loads perpendicular to the plane of lamination of not less than 10,000 p.s.i. before breakdown.
3. Load deflection tests for the material shall be in accordance with the following maximum of total pad thickness: 10% at 1,000 p.s.i., 15% at 2000 p.s.i.

4. When the material is loaded to 1,500 p.s.i., and load is removed permanent set shall be a maximum of 2.5% of the original "zero point" thickness.
5. Material durometer hardness shall be 85 to 95 Shore A, unless otherwise shown on the Drawings
6. The ratio of lateral expansion to vertical deflection shall not exceed 0.25 when loaded to 1,500 p.s.i.
7. The material shall not lose effectiveness throughout a temperature range of minus 65 to plus150 degrees F.
8. The material shall show no visual evidence of damage or deterioration by environmental effects of sunshine, humidity, salt spray, fungus, and dust.

F. Tolerances for the flat stock products of this specification shall be as follows:

1. Thickness shall be within plus or minus 5% of that required.
2. Length and width of pads shall be plus or minus 1/16".
3. O.D. and I.D. dimensions of washers shall be plus or minus 1/16".

G. Bushings: Bushings furnished shall meet all the requirements above for Flat Stock Products, the tolerances noted above for Flat Stock Products, and the following requirements:

1. Bushings shall be fabricated by wrapping a single ply of the impregnated fabric continuously around a round mandrel the same size as the required inside diameter, until the outside diameter is reached. Spiral wound bushings will not be accepted.
2. Bushings furnished must be one piece in length. Bushings furnished as layers of flat stock stacked and glued together to length will not be accepted.
3. The manufacturing process used to fabricate the bushings shall leave the inner and outer wall surfaces completely smooth around the diameters, free of raised overlaps, wrinkles, and bulges. The inner and outer diameters, and length shall be within plus or minus 1/32" of the required dimensions.

H. All metal components and attachment devices of the expansion assembly shall be galvanized or stainless steel.

2.02 TEFLON OR STAINLESS STEEL SLIDE BEARINGS

A. Expansion slide bearings shall be as specified herein or approved equal. The bearings shall be used only after the Authority has reviewed and approved the shop drawings and material test data submitted as required above.

B. The slide bearing shall consist of mechanically interlocked bronze and filled TFE structure, TFE metal composite or approved equal and a smooth finished stainless steel plate. Brass may be substituted for bronze if it meets the requirements of these specifications and approved by the Authority.

1. Interlocked bronze and filled TFE structure shall consist of a phosphor bronze plate with a 0.010 inch thick porous bronze surface layer into which is impregnated a lead/TFE compound. There shall be an overlay of compound TFE not less than 0.001 inch thick. The phosphor bronze back plate shall conform to ASTM B 100 and the porous bronze layer shall conform to ASTM B 103. The interlocked bronze and filled TFE sheets, subject to the approval of the Authority, shall be welded to the stainless steel back up plate. The stainless steel backup plate shall then be welded to steel base plate as shown on the Drawings.
2. TFE metal composite shall consist of virgin TFE molded on each side and completely through 1/32" perforated stainless steel ASTM A 240, Type 304 sheet. The metal composite plate shall be mechanically connected to steel base plate using flathead stainless steel screws spaced as shown on the Drawings.
3. TFE resin shall be 100% virgin material (not reprocessed) meeting the requirements of

ASTM D 4894. Specific gravity shall be 2.13 to 2.19. Melting point shall be 623 ±18 degrees F.

4. Filler material used for filled TFE shall be milled glass fibers, carbon, or other approved inert filler materials.
5. Filled TFE sheet shall be made from 100% virgin TFE resin uniformly blended with inert filler materials. Finished TFE sheets containing glass fiber or carbon shall conform to the following requirements:

	ASTM Method
Tensile Strength (Min.)	D 4894
Elongation (Min.)	D 4894
Specific Gravity (Min.)	D 792
Melting Point	D 4894

6. Interlocked bronze and filled TFE structure shall have a thickness of 1/32" minimum to 1/8" maximum. TFE perforated metal composite shall have a thickness of 1/16" minimum to 1/8" maximum.
7. The slide bearing surface shall have the following properties:

Type of Bearings	Coefficient of Friction (Min) at Bearing Pressure of 3,500 psi	Avg. Bearing Pressure Due to all Loads
TFE- Perforated Metal Composite	0.08	6,000 psi
Interlocked Bronze and Filled TFE	0.05	6,000 psi

8. TFE material shall be mechanically connected to a brass backing plate which in turn shall be spot welded with stainless steel spot washers to a 3/16" thick, ASTM A 240, Type 304 stainless steel base plate with 1/8" minimum lip around the perimeter of the brass backing plate. The spot welds shall be sufficiently strong to resist a horizontal shear fore equal to twenty-five percent (25%) of total vertical load.
9. Stainless steel used for TFE mating surface shall conform to ASTM A 240, Type 304 with a surface finish less than 20 micro inches root mean square (rms). Stainless steel used as mating surface shall be polished or rolled as necessary to meet the above friction requirements.
10. Submit manufacturer's printed technical data and descriptive literature for approval prior to purchasing same.

2.03 ISOLATION PADS

A. Isolation pads shall be an individual resilient laminated fabric pad comprised of all new (unused) materials including laminated multiple layers of prestressed cotton duck or cotton-polyester blend duck that has been impregnated and bound with a high quality elastomeric compound containing mold and mildew inhibiting agents. Thickness of pad as shown on the drawing. Verify size of pad with size of steel base plate. The dielectric strength must be a minimum of 160 volts per mil.

1. Isolation pad shall be Fabreeka or approved equal.

2.04 PTFE SLIDING BEARINGS

A. PTFE sliding bearings shall be as specified herein or approved equal. The bearings shall be used only after the Authority has reviewed and approved the shop drawings and material test data

submitted as required above.

B. The sliding bearing shall consist of a self- lubricating polytetrafluoroethylene (PTFE) sliding expansion bearing surface and a mating stainless steel surface against which the PTFE expansion bearing slides. The PTFE surface is bonded to the bottom plate and the stainless steel surface is welded to the sole plate.

1. The self-lubricating PTFE sliding expansion bearings shall be composed of virgin PTFE resin, PTFE sheets, or woven PTFE fabric conforming to the requirements of AREMA Chapter 15 Section 10.5.2.1.
2. Fabrication shall meet the requirements of AREMA Chapter 15 Section 11.4.3.
3. Erection shall meet the requirements of AREMA Chapter 15 Section 11.4.4.
4. The static coefficient of friction shall not exceed the value listed below when measured under the correspondence bearing pressure:

Bearing Pressure	Maximum Coefficient of Friction
500 psi	0.08
2,000 psi	0.06

5. Stainless steel used for TFE mating surface shall conform to ASTM A 240, Type 304 with a surface finish less than 20 micro inches root mean square (rms). Stainless steel used as mating surface shall be polished or rolled as necessary to meet the above friction requirements.
6. Submit manufacturer's printed technical data and descriptive literature for approval prior to purchasing same.

PART 3 – EXECUTION

3.01 FABRICATION

A. The Contractor shall conform to the requirements of the referenced Section of the IDOT Standard Specifications and Chapter 15, Part 11 of the AREMA Manual for Railway Engineering.

B. The expansion joint system shall be appropriately designed to accommodate all expected longitudinal movements (i.e. thermal, creep, shrinkage, elastic shortening, etc.), vibration, as well as vertical and horizontal rotations.

3.02 INSTALLATION

A. The installation of elastomeric expansion bearing assemblies, Teflon or stainless steel slide assemblies, bearing pads, and isolation pads shall be subject to the requirements of Section 05 10 30, Structural Steel, for Track and Platform Structure, of these Specifications.

B. The expansion joint system, slide assembly, bearing pad, or isolation pad shall be installed in strict accordance with the manufacturer’s instructions and recommendations.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of ELASTOMERIC EXPANSION ASSEMBLIES, SLIDE BEARING ASSEMBLIES, BEARING PADS AND ISOLATION PADS, PTFE SLIDING BEARINGS shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of ELASTOMERIC EXPANSION ASSEMBLIES, SLIDE BEARING ASSEMBLIES, BEARING PADS AND ISOLATION PADS, PTFE SLIDING BEARINGS shall be included in the contract lump sum price as shown in the Schedule of Prices for STRUCTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Structural Work: 030000

END OF SECTION

SECTION 06 05 73
FIRE RETARDANT TREATED WOOD FOR EXTERIOR APPLICATIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes requirements for furnishing and installing treated wood products as indicated on the drawings or specified to be fire retardant and used for exterior and high humidity applications.

B. Types of wood specified in this Section include the following:

1. Solid wood.
2. Plywood.

C. Related Sections:

1. Section 06 31 00 Wood Roof Deck Repair
2. Section 07 52 60 Modified Bituminous Sheet Roofing Heat Welded
3. Section 07 52 65 Modified Bituminous Sheet Roofing Cold Applied
4. Section 07 62 00 Sheet Metal Flashing and Trim
5. Section 07 71 00 Roof Specialties
6. Section 07 72 00 Roof Accessories
7. Section 09 90 00 Painting

1.03 APPLICATIONS

A. Fire retardant treated wood for exterior applications is not preservative treated and is not rot resistant. The fire retardant wood and plywood is typically for applications where the wood or plywood:

1. Will not be in contact with water, concrete, or the ground.
2. Will be protected, enclosed, or covered from the elements by other construction or materials.
3. Will be used for temporary structures where the useful life of the wood is not a priority.

B. Applications include, but are not limited to, the following:

1. Wood blocking, nailers and cants protected by roof membranes and/or flashing.
2. Plywood sheathing or decking under roof membranes or enclosed by other construction.
3. Plywood underlayment.
4.
5. Wood shims, sleepers or furring.
6. Soffits.
7. Temporary stairs, platforms, enclosures and other temporary construction.

1.04 REFERENCES

A. ASTM E84-09 and ASTM E 84-07, Standard Test Method for Surface Burning Characteristics of Building Materials; ASTM International, American Society for Testing and Materials.

B. ASTM D-2898 Standard Method of Accelerated Weathering of Fire Retardant Treated Wood for (Rain) Tests.

C. AWPA C20 - Structural Lumber - Fire-Retardant Treatment by Pressure Processes; American Wood Protection Association.

D. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association.

E. NFPA 703 – Standard for Fire Retardant Wood.

F. UL723-2008 and UL 723-03 – Standard for Test for Surface Burning Characteristics of Building Materials, Underwriters Laboratories, Inc.

G. UL 1256 – Standard for Fire Test of Roof Deck Construction.

H. ASTM D143 and MIL-L-19140E – For strength of wood.

I. AWPB – American Wood Preservers Bureau.

J. IBC – International Building Code.

K. IFC – International Fire Code.

L. ICC-ES – International Code Council – Evaluation Service.

M. ASTM D143 and MIL-L-19140E – For strength of wood.

1.05 PERFORMANCE REQUIREMENTS

A. Class A Rating: Exterior fire retardant treated wood and plywood to control flame spread and have a 25 or less flame spread when tested in accordance with ASTM E-84 and has no increase in fire hazard classification when this test is extended from the standard duration of 10 minutes to 30 minutes.

B. Exterior fire retardant treated wood and plywood to meet the requirements of ASTM D-2898.

C. All exterior fire retardant treated wood and plywood products to bear the Underwriters Laboratories Classification mark identifying it as being produced under its Classification.

1.06 SUBMITTALS

A. Product data and installation instructions for fire retardant treated wood and plywood, including wood fabrication process, wood fire retardant treatments, and accessories.

1. Submit certification by treating plant that required treatments comply with specified standards.
2. Provide certification that the fire retardant wood meets Class A requirements.

3. Provide certification that the wood is suitable for exterior applications.
4. Provide a copy of manufacturer's product test results.
5. Provide information for the types of wood that is to be pressure impregnated with fire retardant and provide manufacturer's certification that the process is suitable for that wood.

B. Submit the qualifications, experience and approvals required by the Quality Assurance section of this specification for the manufacturer of the fire retardant treated wood, the installer, and the testing laboratory.

C. Provide written approval from the city code official stating that the product, when installed as directed, meets the code requirements.

D. Provide a sample of each type of fire retardant treated wood.

1. Provide test results of the sample.

E. Provide a sample copy of the manufacturer's warranty.

1.07 QUALITY ASSURANCE

A. Single-Source Responsibility for Fire-retardant Treated Wood: Obtain each type of fire-retardant treated wood products from one source for both treatment and formulation.

B. Testing Laboratory Qualifications: To qualify for acceptance, an independent testing laboratory to demonstrate to Authority's satisfaction, based on evaluation of laboratory-submitted criteria conforming to ASTM E548, that it has the experience and capability to conduct satisfactorily the testing indicated without delaying the progress of the Work.

C. Manufacturer's Qualifications: Manufacturer of fire retardant treated wood to provide information indicating his experience in successfully producing the specified product for a period of at least five (5) years.

D. Installer's Qualifications: Installer of the fire retardant treated wood to be familiar with the product, follow the manufacturer's directions and recommendations and be approved by the manufacturer to install the product.

E. Code Approval: Manufacturer to provide written approval from the City of Chicago indicating the product has been approved for use in the city and when installed as directed, provides the required fire resistance rating.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Time delivery and installation of material to avoid extended on-site storage, and to avoid delaying work of other trades.

B. Keep material dry and protected during fabrication, delivery, storage, handling, and erection.

C. Keep material off of the ground during storage.

D. Store the material under shelter or cover the top of bundle.

1.09 WARRANTY

A. Submit a written warranty signed by manufacturer agreeing to repair or replace wood or plywood that fails in materials or workmanship within the specified warranty period after the date of substantial completion. Failures include, but are not limited to, deformation or deterioration of wood beyond normal weathering, cracking, splitting, and deterioration of its fire retardant properties.

1. Warranty Period: The fire retardant properties of the wood or plywood to be maintained throughout the useful life of the wood or plywood.

B. Wood or plywood replaced to match existing.

C. The wood or plywood is to be repaired or replaced as approved by the CTA and at no cost to the CTA.

PART 2 - PRODUCTS

2.01 WOOD

A. Wood to be one of the following, or approved equal:

1. No. 2 Southern Yellow Pine Lumber, of the Southern Pine Inspection Bureau, except as amended herein.
2. Douglas Fir.
3. Other species of wood or plywood subject to the approval of the manufacturer of the fire-retardant coating.

B. All lumber to be Kiln Dried (KD) and dressed 4 sides to the dimensions shown on the drawings.

C. Lumber and plywood to be pressure impregnated with fire retardant chemicals meeting NFPA Class A and UBC Type I. The treated lumber and plywood to be recommended for exterior use.D. Lumber and Plywood:

1. Moisture Content: Partially air-dried to a moisture content of 15 to 20 percent.
2. Dimension Tolerance: Plus or minimum 0.04-inch in both width and thickness (measured at 30 percent moisture content).
3. End Coating: Mobil CER-M, or approved equal, aqueous wax log end sealer.

D. Fasteners:

1. Screws, bolts, nuts and washers as indicated on the drawings, selected by the CTA, or as required: Type 304 or 316 Stainless Steel or hot-dipped galvanized steel fasteners as selected by CTA.

2.02 FIRE RETARDANT TREATMENT

A. General: All wood and plywood must be pressure impregnated with fire retardant chemicals approved for exterior applications. Fire retardant treatment to comply with applicable requirements of AWPA Standard C20.

B. Fire retardant wood must meet the surface burning characteristics of one of the following tunnel test: UL 723, ASTM E84, NFPA 255 or UBC Standard 8-1. The fire treated wood must have an acceptable rating for flame spread and smoke development after 10

minutes and show no progressive combustion when the test period is extended to 30 minutes.

C. Fire retardant wood to have a flame spread rating of 25 or less when tested in accordance with ASTM E-84, “Standard Test Method for Surface Burning Characteristics of Building Materials.”

D. Each piece of fire retardant impregnated wood to be manufactured under independent third party inspection service, and is required to bear the appropriate qualified inspection agency’s label indicating surface burning characteristics in the 30 minute ASTM E-84 flame spread test. Each piece to also be labeled indicating kiln dried after treatment (KDAT).

E. There is to be no increase in the listed classification when tested after ASTM D-2898 “Standard Method of Accelerated Weathering of Fire Retardant Treated Wood for Rain Testing.”

F. Identify all pieces of fire retardant treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.

G. Pressure impregnate all lumber with exterior type, non-leachable fire retardant chemicals.

H. The fire retardant formulation must be free of halogens, sulfates, chlorides, or ammonium phosphate.

I. The pressure impregnated retardant is to provide permanent fire retardant protection for the wood.

J. The fire retardant treated wood, when exposed to fire, will only produce non-combustible gas and water vapor and form a layer of protective char which hinders combustion and insulates the wood against further damage. The smoke produced by the treated wood is to be no more toxic than the smoke produced by untreated wood.

K. The structural strength and dimensional stability of the wood to not be compromised by the impregnation of the wood with the fire retardant chemicals.

L. The fire retardant treated wood is to be non-corrosive and capable of being finished with sealer or paint, if directed, after its treatment and fabrication.

2.03 FIRE RETARDANT EXTERIOR WOOD PRODUCTS

A. Subject to conformance with these specifications, fire retardant wood products suitable for exterior use include, but are not limited to, the following:

1. Chemonite Wood: Douglas Fir lumber pressure treated with 1.86 pcf of ACZA (ammonical copper zinc arsenate) which has a 24.8 flame spread rating qualifying for a Class A rating.
2. Chicago Flameproof Exterior Fire retardant Wood Products as manufactured by Flame Safe Wood Products.
3. Exterior Fire – X by Hoover Treated Wood Products, Inc.
4. FRX Fire Retardant treated Wood for Exterior Applications.
5. Approved equal.

2.04 FABRICATION OF FIRE RETARDANT EXTERIOR WOOD PRODUCTS

A. Complete cutting, drilling, and fabrication of treated items prior to fire retardant treatment, when possible. If cut after treatment, coat cut surfaces to comply with AWPA requirements. Do not rip or mill fire retardant lumber; limit cutting to end cuts, drilling holes and joining cuts.

1. Coat cut ends of wood with fire retardant coating, sealer, or other materials as required and approved by the manufacturer as required to maintain the products' fire retardant properties.
2. Apply coating as directed by the manufacturer.

B. All exterior fire retardant treated wood and plywood must be kiln dried after treatment to a moisture content of 19% for lumber and 15% for plywood. Kiln drying after treatment to be monitored by manufacturer of fire retardant product or their designated inspection representative. Inspect each piece of lumber after drying and discard damaged or defective pieces.

2.05 SOURCE QUALITY CONTROL

A. Manufacturer to engage the services of a third party qualified testing agency to sample pieces of wood of the type(s) used on this project prior to delivery to the project site. Samples will be identified, sealed, and certified by testing agency.

B. Testing agency will perform tests for compliance with product requirements including testing for:

1. Fire retardant attributes including flame spread, smoke developed.
2. Weather resistance.
3. Structural strength.
4. Dimensional stability.
5. Moisture content.

C. Manufacturer to replace material if test results show the material does not comply with requirements. Re-test as required to indicate compliance.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Site Storage: Fire retardant treated wood and plywood is supplied as partially air-dried lumber for outdoor use. Store out of direct sunlight and allow to acclimate and stabilize to the installation humidity levels before installation.

C. Install miscellaneous galvanized or stainless steel connectors, anchors, and accessories as indicated.

D. Install plywood with straight joints and fastened securely to supports.

E. Where there are openings or where items pass through the wood or plywood, cut wood or plywood around these neat and tight. Place additional blocking under these locations

when necessary to provide support and sound deck.

F. Where treated members are cut during erection, apply a field-treatment sealer to comply with AWPA M4.

G. Repair damaged surfaces and finishes after completing erection, or replace damaged members, as directed, where damage is beyond satisfactory repair.

H. Cutting and Drilling: Pre-drill wood ends to avoid splitting.

I. Fastening Methods: Fasten wood with self-drilling screws, with a minimum of 2 screws at each piece.

1. Fasteners to be Stainless Steel or Hot-Dipped Galvanized Steel as selected by the CTA.

J. Treated wood or plywood to be covered as soon as practical after installation. If wetted during construction, allow the material to dry before enclosing or covering with other construction materials.

3.02 FINISH COATS

A. For fire treated wood or plywood that is to be left exposed either temporarily or permanently, provide and apply exterior grade finish coat(s) of paint or sealer over the material to prolong the life of the wood.

1. Use paint or sealer that is compatible with the fire retardant treated wood and approved by its manufacturer for the substrate and specific application.
2. Apply finish coats of paint or sealer according to paint manufacturer's directions and recommendations.
3. See Painting Section of these Specifications.

3.03 CLEANING AND PROTECTION

A. At the end of each workday, remove rubbish and other discarded materials from the project site.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 06 05 73, Fire Retardant Treated Wood for Exterior Applications shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 06 05 73, Fire Retardant Treated Wood for Exterior Applications shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 06 10 00
ROUGH CARPENTRY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 01 Specification Sections apply to this section.

1.02 SUMMARY

A. This Section includes providing all labor, equipment and materials required to provide and install new structural lumber and decking and all accessories as shown on the drawings and required for a complete structural wood system including:

1. Framing with dimensioned lumber.
2. Framing with timber.
3. Framing with engineered wood products.
4. Plywood decking.
5. Wood furring and sleepers.
6. Wood blocking, nailers, curbs, supports and backing panels.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 04 Section, Masonry.
2. Division 07 Section, Roofing.

1.03 DEFINITIONS

A. Structural Wood Deck System for Floors or Roofs: Plywood deck sheathing supported by dimensional wood beams and/or joists supported by bearing walls and/or steel beams and columns. System includes metal joist hangers, anchors, blocking, cross bridging and other accessories.

B. Structural Wood Wall System: Dimensional wood stud framing with top and bottom plates and headers. Plywood sheathing where indicated.

C. Temporary Barriers and Enclosures: Dimensional wood framing and plywood sheathing system for temporary barriers and enclosures for protection of construction and persons.

1.04 REFERENCES

A. National Design Specification (NDS).

B. American Lumber Standards Committee (ALSC).

C. Factory Mutual-Loss Prevention Data 1-28.

D. PS 20 – American Softwood Lumber Standard.

E. NeLMA: Northeastern Lumber Manufacturers' Association.

F. NLGA: National Lumber Grades Authority.

G. RIS: Redwood Inspection Service.

H. SPIB: The Southern Pine Inspection Bureau.

I. WCLIB: West Coast Lumber Inspection Bureau.

J. WWPA: Western Wood Products Association.

1.05 SUBMITTALS

A. General: Submit the following for the Authority's review and approval according to Division 01 Section, "Submittals":

1. Product data for wood and plywood materials.
2. Product data for hangers and fasteners.

B. Shop drawings showing field verified dimensions for the extent of the new structural framing, support and bearing details and conditions, elevations and other details and dimensions. Show details for support and attachment of members and decking.

C. Structural calculations for all structural wood deck system members based upon the actual spans and actual loading conditions and certified by a licensed in Illinois structural engineer.

D. Material certificates for dimensional lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use as well as design values approved by the Board of Review of American Lumber Standards Committee.

E. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.

F. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.

G. For fire-retardant treatments specified to be High-Temperature (HT) type, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.

H. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.06 QUALITY ASSURANCE

A. Qualifications Manufacturer: Products used in the work included in this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the Authority.

B. Qualifications of Contractor: The Contractor and his personnel shall be qualified to do carpentry work.

C. Standards: Comply with American Institute for Timber Construction AITC 108, "Standard for Heavy Timber Construction."

D. Grading Lumber: Provide lumber graded by a recognized agency, with rules and service

1. For fabrication of wood, use only pieces that bear inspection service's grade mark.
2. Submit certificate of grade compliance, obtained from grading agency with each shipment.

1.07 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery and Storage: Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber and plywood. For pressure treated materials, provide for air circulation within and around stacks and under temporary coverings including polyethylene and similar materials. Place spacers between each bundle to provide air circulation.

1.08 PROJECT CONDITIONS

A. Contractor required to examine existing conditions to verify all existing dimensions and conditions and areas to be repaired and the extent required.

B. There will be no extras allowed to compensate Contractor for his failure to review and verify existing conditions and dimensions.

C. Structural wood deck work to adhere to the phasing plan for installation of the new roof system.

1.09 WARRANTY

A. Submit a written warranty signed by manufacturer and installer agreeing to repair or replace wood that fails in materials or workmanship within the specified warranty period. Failures include, but are not limited to, deformation or deterioration of wood beyond normal weathering. Wood replaced shall match existing.

1. Warranty Period: One (1) year after date of Substantial Completion.

PART 2 - PRODUCTS

2.01 STRUCTURAL WOOD, GENERAL

A. Lumber Standards: Furnish lumber manufactured to comply with PS 20 "American Softwood Lumber Standard" and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee's (ALSC) Board of Review.

1. Inspection Agencies: Inspection agencies and the abbreviations used to reference them with lumber grades and species include the following:

a. SPIB - Southern Pine Inspection Bureau.
b. WWPA - Western Wood Products Association.

B. Grade Stamps: Provide lumber with each piece factory marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill. For

exposed lumber furnish pieces with grade stamps applied to ends or back of each piece; or omit grade stamps entirely and provide certificates of grade compliance issued by inspection agency.

C. The lumber shall be Dense Select Structural Grade Yellow Pine, conforming to Standard Grade Rules for Southern Pine Lumber, of the Southern Pine Inspection Bureau, except as amended herein. All lumber shall be Kiln Dried (KD).

D. Nominal sizes are indicated, except as shown by detail dimensions. Provide actual sizes as required by PS 20, for moisture content specified for each use.

E. Unless indicated otherwise, provide seasoned lumber with 19 percent maximum moisture content at time of dressing and shipment for all lumber and boards.

F. Provide dressed lumber, S4S, to the dimensions shown on the drawings, unless otherwise indicated.

G. Grade: "Standard" grade lumber of any species or board-size lumber as required. "No. 3 Common" or "Standard" grade boards per WWPA rules or "No. 2 Grade Boards" per SPIB rules.

2.02 DIMENSIONED LUMBER

A. General: Provide dimensioned lumber of grades indicated according to the ALSC National Grading Rule (NGR) provisions of the inspection agency indicated.

B. Roof or Floor Framing: Use No. 1 Structural Grade. Southern pine, SPIB; Hem-fir, WCLIB or WWPA; Douglas fir, WWPA; or any species of machine stress-related dimensioned lumber with a grade of 1450f – 1.3E, minimum.

C. Wall Framing: Use No. 2 Structural Grade. Southern pine, SPIB; Hem-fir, WCLIB or WWPA; Douglas fir, WWPA; or any species of machine stress-related dimensioned lumber with a grade of 1450f – 1.3E, minimum.

2.03 ENGINEERED LUMBER

A. Engineered Wood Products: Provide engineered wood products acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.

1. Allowable Design Stresses: Provide engineered wood products with allowable design stresses, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

B. Laminated-Veneer Lumber: Structural composite lumber made from wood veneers with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559 and containing no urea formaldehyde.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Boise Cascade Corporation.
b. Finnforest USA.
c. Georgia-Pacific.
d. Louisiana-Pacific Corporation.
e. Pacific Woodtech Corporation.
f. Roseburg Forest Products Co.
g. Weldwood of Canada Limited; Subsidiary of International Paper Corporation.
h. Weyerhaeuser Company.
i. Approved Equal.

2. Extreme Fiber Stress in Bending, Edgewise: 2900 psi unless shown otherwise for 12-inch nominal depth members.
3. Modulus of Elasticity, Edgewise: 2,000,000 psi unless shown otherwise.

C. Parallel-Strand Lumber: Structural composite lumber made from wood strand elements with grain primarily parallel to member lengths, evaluated and monitored according to

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Weyerhaeuser Company.
b. Approved Equal.

2. Extreme Fiber Stress in Bending, Edgewise: 2900 psi unless noted otherwise for 12- inch nominal depth members.
3. Modulus of Elasticity, Edgewise: 2,200,000 psi unless shown otherwise.

D. Wood I-Joists: Prefabricated units, I-shaped in cross section, made with solid or structural composite lumber flanges and wood-based structural panel webs, let into and bonded to flanges. Provide units complying with material requirements of and with structural capacities established and monitored according to ASTM D 5055.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Anthony-Domtar Inc.
b. Boise Cascade Corporation.
c. Georgia-Pacific.
d. Huber, J. M. Corporation.
e. International Beams Inc.
f. International Paper Corporation.
g. Jager Building Systems Inc.
h. Louisiana-Pacific Corporation.
i. Nascor Incorporated.
j. Pacific Woodtech Corporation.
k. Roseburg Forest Products Co.
l. Standard Structures Inc.
m. Stark Truss Company, Inc.
n. Superior Wood Systems.
o. Weyerhaeuser Company.
p. Approved Equal.

2. Provide I-joists manufactured without urea formaldehyde.
3. Web Material: Plywood, complying with DOC PS 1, Exterior grade.
4. Structural Properties: Provide units with depths and design values not less than those indicated.
5. Provide units complying with APA PRI-400, factory marked with APA trademark indicating nominal joist depth, joist class, span ratings, mill identification, and compliance with APA standard.

E. Rim Boards: Product designed to be used as a load-bearing member and to brace wood I- joists at bearing ends, complying with research/evaluation report for I-joists.

1. Manufacturer: Provide products by same manufacturer as I-joists.
2. Material: Glued-laminated wood.
3. Thickness: 1 inch unless shown otherwise.
4. Provide performance-rated product complying with APA PRR-401, rim board grade, factory marked with APA trademark indicating thickness, grade, and compliance with APA standard.

2.04 BOARDS

A. Species and grade of boards not exposed to view in the finished work to be Western woods, Standard per WCLIB rules; Mixed southern pine, No. 2 per SPIB rules; or approved equal.

2.05 MISCELLANEOUS LUMBER

A. General: Provide lumber for support or attachment of other construction, including rooftop equipment curbs and support bases, cant strips, bucks, nailers, blocking and similar members.

B. Fabricate miscellaneous lumber from dimension lumber of sizes indicated and into shapes shown.

C. Grade: For dimension lumber sizes, provide No. 3 or Standard grade lumber per ALSC's NGR's of any species. For board-size lumber, provide No. 3 Common grade per NELMA, NLGA, or WWPA; No. 2 grade per SPIB; or Standard grade per NLGA, WCLIB or WWPA of any species.

2.06 WOOD-BASED STRUCTURAL-USE PANELS, GENERAL

A. Structural-Use Panel Standard: Provide plywood panels complying with DOC PS 1, "U.S. Product Standard for Construction and Industrial Plywood".

B. Trademark: Factory mark structural-use panels with APA trademark evidencing compliance with grade requirements.

C. Plywood panels to be APA-performance-rated panels, square edged, exterior grade.

2.07 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process:

1. Preservative Chemicals: Acceptable to authorities having jurisdiction, containing no arsenic or chromium and affords long term protection from rot, decay and termite infestation.

B. Application: Treat items indicated on the Drawings, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, stripping and similar concealed members in contact with masonry or concrete.
3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
4. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
5. Wood floor plates that are installed over concrete slabs-on-grade.

C. General: Pressure treatment shall comply with applicable requirements of AWPA Standards T1-12 and U1, Commodity Standards A; Sawn Products; AASHTO (American Society of State Highway and Transportation Officials) M-133, Standard Specification for Preservatives and Pressure Treatment Processes for Timber (ICC-ES, AC326), and be a USEPA registered preservative.

D. Pressure treat above ground items with Micronized Copper Azole (MCA) preservatives to comply with AWPB LP-2 to a minimum retention as specified in ICC-ES and AC 326.

E. Micronized copper azole treatment shall comply with the requirements of the International Code Council – Evaluation Service (ICC-ES) AC 326 Acceptance Criteria for Proprietary Wood Preservative Systems – Common Requirements for Treatment Process Test Methods and Performance including Appendix A.

F. After treatment, kiln-dry lumber again to a maximum moisture content of 19 percent. Inspect each piece of lumber or plywood after drying and discard warped, damaged or defective pieces or wood that does not comply with requirements of untreated wood.

G. Complete fabrication of treated items prior to treatment, where possible. All boards milled, cut or drilled for any reason after pressure treatment shall have the milled, cut, or drilled surface sealed and coated per AWPA M4.

H. Identify pressure treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.

2.08 FIRE-RETARDANT-TREATED MATERIALS

A. General: Comply with performance requirements in AWPA C20 (lumber) and AWPA C27 (plywood).

1. Use Exterior type for exterior locations and where indicated.

B. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.

C. Application: Treat items indicated on Drawings, and the following:

1. Framing for raised platforms.
2. Concealed blocking.
3. Framing for non-load-bearing partitions.
4. Framing for non-load-bearing exterior walls.
5. Roof construction.

6. Plywood backing panels.

2.09 FASTENERS

A. General: Provide screw or nail fasteners of size and type required and, as selected by the Authority.

B. Nails, Wire, Brads, and Staples: FS FF-N-105.

C. Power Driven Fasteners: National Evaluation Report NER-272.

D. Wood Screws: ANSI B18.6.1. For decking shall be No. 10 flat head wood screws with sufficient length to penetrate at least 1-1/4 inch minimum into supporting member. Follow manufacturer's recommendations.

E. All screw, nail or other fasteners to be Type 304 or 316 Stainless Steel or Hot Dipped Galvanized, as selected by the Authority.

2.10 HANGERS

A. Heavy duty grade type size and type as required for actual conditions and lumber sizes. All hangers and other metal supports shall be of hot dip galvanized metal or Type 304 or 316 Stainless Steel or Hot Dipped Galvanized, as selected by the Authority.

PART 3 - EXECUTION

3.01 PREPARATION

A. Contractor is to verify all conditions and dimensions.

B. Examine substrates, with installer present, for compliance with requirements for installation for installation tolerances and other conditions affecting installation and performance of carpentry. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

A. Discard units of material with defects that impair quality of rough carpentry construction and that are too small to use in fabricating rough carpentry with minimum joints or optimum joint arrangement.

B. Set rough carpentry to required levels and lines, with members plumb and true to line and cut and fitted.

C. Fit rough carpentry to other construction; scribe and cope as required for accurate fit. Correlate location of curbs, nailers, blocking and similar supports to allow attachment of other construction.

D. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated or as required by fastening schedules for specific building code.

E. Select fasteners of size that will not penetrate through members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting of wood; predrill as required. Use hot-dip galvanized or stainless-steel bolts, screws or nails. Countersink bolt, screw or nail heads.

3.03 WOOD FRAMING, GENERAL

A. Comply with AFPA's "Manual for Wood Frame Construction", unless otherwise indicated. Install engineered wood products to comply with manufacturer's written instructions. Install framing members of size and at spacing indicated.

3.04 INSTALLATION, STRUCTURAL LUMBER

A. General: Erect framing true and plumb of sizes as indicated on the drawings. Maintain lines and levels until permanent anchors are in place.

B. Install miscellaneous steel connectors, anchors, and accessories as indicated.

C. Repair damaged surfaces and finishes after completing erection, or replace damaged members, as directed, where damage is beyond satisfactory repair.

3.05 WALL AND PARTITION FRAMING

A. Arrange studs so that wide face of stud is perpendicular to direction of wall or partition and narrow face is parallel. Provide single bottom plate and top plate using members of 2 inch nominal thickness whose widths equal that of studs. Anchor plates to supporting construction, unless otherwise indicated. Unless noted otherwise, provide 2 X 4 vertical studs at 16 inch centers.

B. Construct corners and intersections with 3 or more studs. Provide miscellaneous blocking and framing as shown and as required to support facing materials, fixtures, specialty items, and trim.

C. Install continuous horizontal blocking row at mid-height of single-story partitions over 8 feet high and at midpoint of multi-story partitions, using 2-inch thick members of same width as wall or partitions.

D. Frame openings with multiple studs and headers. Install nailed header members of thickness equal to width of studs. Set headers on edge and support on jamb studs.

1. For nonbearing partitions, install double-jamb studs and headers not less than 4 inches deep for openings 3 feet and less in width, and not less than 6 inches deep for wider openings.
2. Install headers of depth shown, or if not shown, as recommended by N.F.P.A. "Manual for House Framing."

3.06 FLOOR JOIST FRAMING INSTALLATION

A. General: Install floor joists with crown edge up and support ends of each member with not less than 1-1/2 inches of bearing on wood or metal, or 3 inches on masonry. Attach floor joists as follows:

1. Where supported on wood members, by toe nailing or by using metal framing anchors.
2. Where framed into wood supporting members, by using wood ledgers as indicated or, if not indicated, by using metal joist hangers.

B. Fire Cuts: At joists built into masonry, bevel cut ends 3 inches and do not embed more than 4 inches.

C. Frame openings with headers and trimmers supported by metal joist hangers; double headers and trimmers where span of header exceeds 48 inches.

D. Do not notch in middle third of joists; limit notches to one-sixth depth of joist, one-third at ends. Do not bore holes larger than 1/3 depth of joist; do not locate closer than 2 inches from top or bottom.

E. Provide solid blocking of 2-inch nominal thickness by depth of joist at ends of joists unless nailed to header or band.

F. Lap members framing from opposite sides of beams, girders, or partitions not less than 4 inches or securely tie opposing members together. Provide solid blocking of 2-inch nominal thickness by depth of joist over supports.

G. Anchor members paralleling masonry with 1/4 by 1-1/4 inch metal strap anchors spaced not more than 96 inches o.c., extending over and fastening to 3 joists. Embed anchors at least4 inches into grouted masonry with ends bent at right angles and extending 4 inches beyond bend.

H. Provide solid blocking between joists under jamb studs for openings.

I. Under non-load-bearing partitions, provide double joists separated by solid blocking equal to depth of studs above.

J. Provide triple joists separated as above, under partitions receiving ceramic tile and similar heavy finishes or fixtures.

K. Provide bridging of type indicated below, at intervals of 96 inches o.c., between joists.

1. Diagonal wood bridging formed from bevel-cut, 1-by-3-inch nominal size lumber, double-crossed and nailed at both ends to joists.
2. Steel bridging installed to comply with bridging manufacturer's written instructions.

3.07 CEILING JOIST AND RAFTER FRAMING INSTALLATION

A. Ceiling Joists: Install ceiling joists with crown edge up and complying with requirements specified above for floor joists. Face nail to ends of parallel rafters.

1. Where ceiling joists are at right angles to rafters, provide additional short joists parallel to rafters from wall plate to first joist; nail to ends of rafters and to top plate and nail to first joist or anchor with framing anchors or metal straps. Provide 1-by-8- inch nominal size or 2-by-4-inch nominal size stringers spaced 48 inches o.c. crosswise over main ceiling joists.

B. Rafters: Notch to fit exterior wall plates and toe nail or use metal framing anchors. Double rafters to form headers and trimmers at openings in roof framing, if any, and support with metal hangers. Where rafters abut at ridge, place directly opposite each other and nail to ridge member or use metal ridge hangers.

1. At valleys, provide double-valley rafters of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches deeper. Bevel ends of jack rafters for full bearing against valley rafters.
2. At hips, provide hip rafter of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches deeper. Bevel ends of jack rafters for full bearing

against hip rafter.

C. Provide collar beams (ties) as indicated or, if not indicated, provide 1-by-6-inch nominal size boards between every third pair of rafters, but not more than 48 inches o.c. Locate below ridge member, at third point of rafter span. Cut ends to fit roof slope and nail to rafters.

D. Provide special framing as indicated for eaves, overhangs, dormers, and similar conditions, if any.

3.08 WOOD FRAMING INSTALLATION

A. Install wood members with crown edge up and provide not less than 4 inches of bearing on supports. Provide continuous members, unless otherwise indicated; tie together over supports as indicated if not continuous.

B. Where beams or girders are framed into pockets of exterior concrete or masonry walls, provide 1/2 inch air space at sides and ends of wood members.

C. Install wood posts using metal anchors indicated.

D. Treat ends of wood beams and posts exposed to weather by dipping in wood preservative for 15 minutes.

3.09 WOOD FURRING INSTALLATION

A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

1. Furring to Receive Gypsum Board: Install 1-by-2-inch nominal size furring vertically at 16 inches o.c.

3.10 INSTALLATION OF CONSTRUCTION PANELS

A. General: Comply with applicable recommendations contained in Form No. E30, "APA Design/Construction Guide - Residential & Commercial," for types of construction panels and applications indicated.

B. Fastening Methods: Fasten panels as indicated below:

1. Plywood Panels: Screw to supports.

C. General: Install plywood panels to face of stud framing. Use 1-1/2-inch long, hot dipped galvanized screws. Keep perimeter fasteners 3/8 inch from edges and ends of board units. Fit boards tightly against each other and around openings.

D. Install 4-foot by 8-foot or longer plywood panels vertically with long edges parallel to, and centered over, studs. Install solid wood blocking where end joints do not bear against framing sills or plates. Screw to each support to comply with manufacturer's recommended spacing, but space fasteners not more than 4 inches o.c. around perimeter at edge and end supports and 8 inches o.c. at intermediate supports.

3.11 WOOD GROUNDS, NAILERS AND BLOCKING

A. Install wood grounds, nailers and blocking where shown and where required for

screeding or attachment of other work. Form to shapes as shown and cut as required for true line and level of work to be attached. Coordinate location with other work involved.

B. Attach to substrates as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise indicated. Attach wood nailers at roof level with anchor bolts at 4'-0" centers, anchored to roof structure 5/8 inch dia. unless noted otherwise. Use expansion anchors when securing to existing masonry or concrete.

3.12 PROTECTION

A. Protect installed products from damage from weather and other causes during construction.

B. Remove and replace rough carpentry materials that are wet, moisture damaged and mold damaged.

1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging or irregular shape.
2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

3.13 CLEAN UP

A. Clean building areas on a daily basis. Upon completion of the deck repair work, remove all construction debris and equipment from the site.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 06 10 00, Rough Carpentry shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 06 10 00, Rough Carpentry shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 07 10 00
MEMBRANE WATERPROOFING

PART 1 - GENERAL

1.01 DESCRIPTION

A. This Section specifies requirements for furnishing and applying a reinforced liquid membrane waterproofing system at below grade concrete surfaces. The work under this Section shall include furnishing all labor, materials, tools, equipment and incidentals necessary to install membrane waterproofing materials including primer, reinforcing fabric, waterproofing membrane, protection board or drainage board and other materials as indicated on the drawings and specified herein.

1.02 RELATED WORK

A. Related work specified elsewhere:

1. Section 03 30 00, Cast-in-Place Concrete

1.03 QUALITY ASSURANCE

A. Obtain all primary waterproofing materials from a single manufacturer. Provide secondary materials (and materials not available from primary materials manufacturer) which are recommended by manufacturer of the primary materials.

B. A firm which has not less than 3 years of successful experience in the installation of waterproofing membrane similar to requirements for this project; and which is acceptable to or certified by the manufacturer of primary waterproofing materials for installation of thosematerials.

1.04 REFERENCES

A. ASTM D6506 – Standard Specification for Asphalt Based Protection for Below-Grade Waterproofing.

1.05 SUBMITTALS

A. Submit product data, specifications, installation instructions and general recommendations from waterproofing materials manufacturer, for types of waterproofing materials required. Include manufacturer's certification or other data substantiating that materials comply with requirements. Include documentation of claims that other products or methods proposed exceed specified requirements. Provide above submittals for each of the following:

1. Primer.
2. Reinforcing Fabric.
3. Waterproofing Membrane.
4. Waterproofing Protection Board or Drainage Board.

B. Submit an 8 inch square sample of the proposed membrane assembly. Color texture and thickness hall be representative of overall appearance.

C. Submit a copy of the system warranty for review and approval.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the site in manufacturer's original, unopened containers and packaging, with labels clearly identifying the product name and manufacturer.

B. Store materials in a clean, dry area in accordance with manufacturer's instructions.

C. Protect materials during handling and application to prevent damage or contamination.

1.07 JOB CONDITIONS

A. The Installer must examine substrate and conditions under which waterproofing work is to be performed, and notify Contractor in writing of unsatisfactory conditions. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable toInstaller.

B. Waterproofing assembly to be protected from abuse, permanent exposure to the elementsand from direct sunlight until ready for use.

1.08 WARRANTY

A. The waterproofing membrane system shall be warrantied for a period of ten years. The manufacturer and installer shall warranty all products and installation against defects in materials or workmanship for the specified period and the installation shall be protected from moisture infiltration for the specified period; failures in the system shall be rectified at no cost to the Authority and to the satisfaction of the Authority throughout the warranty period.

PART 2 - PRODUCTS

2.01 LIQUID APPLIED WATERPROOFING MEMBRANE

A. Liquid Membrane 6090 V as manufactured by Hydrotech or similar system as submitted andapproved by the Authority.

B. Primer LM6090 as manufactured by Hydrotech or similar material as submitted and approved by the Authority; and certified by the manufacturer of the membrane to be compatible with their product.

C. Reinforcing fabric to be Flex Flash F spun bonded polyester reinforcing fabric as manufactured by Hydrotech or similar material as submitted and approved by the Authority; and certified by the manufacturer of the membrane to be compatible with their product.

2.02 MEMBRANE PERFORMANCE REQUIREMENTS/PROPERTIES

A. Applicable Standards:

1. Membrane system must meet or exceed the performance requirements of ASTM C836-00 and UL Class A.

B. Performance Requirements, Properties:

Property	Requirements	Test Method
Membrane Thickness	60 mils, min.	
Color	Black	

Property	Requirements	Test Method
Elongation	490%	ASTM D-412
Tear Strength	10C pli 210 psi	ASTM D-624 DieC Tensile Strength ASTM D-412
Strength @ 100% Modulus	90 psi	ASTM D-412
Hardness	80	ASTM D-2240 Shore OO
Water Vapor Permeance	0.54x103 perms metric	ASTM E-96
Solids Content	93%	

Shelf Life	Indefinite in unmixed state.
Pot Life	30-40 mins. @ 60-80 percent F.
Cure Time	Light Traffic 12 hours, Fully Cured 7 days.
Environmental Resistance	Resistant to moisture, ozone, ultra-violet, extreme temperatures, industrial atmospheres.
Chemical Resistance	Resistant to salts, diluted acids, alkali solutions, bacteria, fungi.

2.03 PROTECTION COARSE

A. Multi-ply, semi-rigid board composed of a mineral-fortified asphaltic core formed between two outside layers of asphalt-impregnated fiberglass mat, weathercoated and covered witha polyethylene anti-stick sheet.

1. Performance Based Specification: protection course shall be heavy duty and havethe following characteristics based on ASTM D6506:

a. Puncture Strength, Class A & B: 365 N (82 lbf) minimum.
b. Thickness, Class A & B: 5.6 mm to 7.1 mm (0.220 to 0.280 inches)
c. Water Absorption, Class A & B: 10% maximum.
d. Asphalt % by weight, Class A: 65% minimum.
e. Asphalt % by weight, Class B: 40% minimum.
f. Resistance to decay, Class A & B: Meets puncture requirements aftercompletion of test.

B. Geocomposite Drainage Board consisting of a high strength dimple raised moulded polystyrene core with a non-woven geotextile fabric bonded to the dimples of the core for vertical applications.

C. Geocomposite Drainage Board consisting of a high strength dimple raised moulded polystyrene core with a monofilament fabric bonded to the dimples of the core for horizontalapplications.

D. Accessories:

1. Joint tape as recommended and required by the manufacturer.
2. Termination bar as recommended and required by the manufacturer.
3. Pointing Mastic as recommended and required by the manufacturer.

E. Manufacturer: W.R. Meadows or approved equal.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine surfaces to receive waterproofing system. Notify the Authority if surfaces do not meet the manufacturer’s requirements. Do not proceed with the work until surfaces to receivethe waterproofing system meets the manufacturer’s requirements.

3.02 SURFACE PREPARATION

A. Clean and prepare surfaces to receive drainage system in accordance with manufacturer'sinstructions.

B. Protect adjacent surfaces not designated to receive drainage system.

C. The surface preparation shall be performed by means approved and recommended by the manufacturer. The surface profile is not to exceed 1/4 inch (6.3 mm) peak to valley or as required by manufacturer. Test method ASTM D 4541 shall be used to verify that the surface preparation meets the required adhesion/pull off values of 100 psi (0.7 MPa) for concrete.

D. All concrete surfaces must be clean, dry, free of voids, projections, loose material, dust, oil, unapproved curing compounds or other contaminents. Concrete must be allowed to cure and dry a minimum of 14 days and shall have a light steel troweled or broomed finish.

E. All exposed metal shall be free of paint, oils, rust and contaminants.

F. All shrinkage and non-moving structural cracks under 1/16" shall be treated with a 60 mil coating of membrane material extending 3 inches to either side of the crack. Cracks up to 1/4" and all construction joints must be pretreated with a 60 mil coating of membrane material extending 6 inches beyond either side of the crack, into which is centered and embedded a 6 inch strip of approved reinforcing and top coated with another coating of membrane material.

G. All flashing and detail work should be completed prior to the application of the membrane. All detailing must cure a minimum of 12 hours and be wiped clean and allowed to dry priorto the application of the field membrane.

H. The surface must be approved in writing by the manufacturer and installer of the waterproofing membrane prior to installation.

I. Follow manufacturer's recommendations to determine whether the polyethylene film facing on one side, or the asphalt-impregnated fiberglass mat on the other side of the protectionboard is approved as compatible to the specific waterproofing project.

J. If water testing is required, perform prior to application of the protection course.

3.03 APPLICATION PREPARATION

A. Immediately prior to the application of any component of the system, the surface shall be dry. Any remaining dust or loose particles shall be removed using a vacuum or clean, dry, oil-freecompressed air.

B. Where the area to be waterproofed is vertical, the system shall be capable of being sprayedat the specified thickness.

3.04 PRIMER APPLICATION

A. Primer to be prepared and applied according to manufacturer's directions. Do not apply primer when temperatures are at or below freezing.

B. Roller or spray apply primer to concrete at a rate of 200-300 square feet per gallon.

C. Allow primer to dry thoroughly prior to installation of the membrane.

3.05 MEMBRANE APPLICATION

A. The membrane shall only be applied by an applicator who is approved by the manufacturerto install their products.

B. Surfaces to be protected with the membrane shall be given one coat of primer or conditioner prior to the application of the membrane. The primer shall be applied by either spray or rolleras approved by the manufacturer.

C. The membrane shall be applied when substrate temperatures are in the range of 32° - 104° F (0° - 40° C) providing that the substrate is above the dew point. The condition of the substrate shall meet the manufacturer's recommendations. Material shall be sprayed on horizontal or vertical surfaces up to, around or into details.

D. The primer application must be approved by the manufacturer and installer of the waterproofing membrane prior to installation of the membrane.

E. The material shall be mixed and prepared according to manufacturer’s directions.

F. Install the waterproofing membrane according to the manufacturer’s directions.

G. The mixed membrane material shall be squeeged, troweled, or spray-applied to the concretesurface. Apply at a minimum thickness of 60 mils.

H. Install a layer of reinforcing fabric into the initial 60 mil application while it is still wet. Avoidwrinkles, folds or air pockets with the reinforcing.

I. Allow the initial membrane and fabric installation to cure a minimum of 12 hours; then applya second 60 mil coat of membrane material.

J. The membrane shall be carefully sprayed around and into drainage fittings to ensure proper runoff of water. Special care shall be taken with the spraying of the system to get full coverageover welds, bolts, etc.

K. Where the membrane is to be joined to existing cured material the new application shall overlap the existing material by at least 4 inches (100 mm) unless specified otherwise by manufacturer. No preparation shall be necessary unless the existing materials are dirty or contaminated in which case the overlap area shall be wiped with solvent (e.g. acetone).

L. The membrane shall be applied in a methodical manner to ensure proper coverage. Film thickness shall be checked once every 100 square foot (9 m^2).

M. If required by site conditions, or for application to small areas, or touch-up the membrane can be applied, by the contractor, by brush or trowel in accordance with manufacture's recommendations.

3.06 PROTECTION BOARD APPLICATION

A. Horizontal Application:

1. Install protection course as soon as permissible by membrane applicator or manufacturer.

2. Butt together all protection course sheet and cut to fit all intersecting surfaces andprotrusions.
3. Cover joints with joint tape as recommended.
4. Alternatively, if recommended by the manufacturer, cover joints with roofer's glassreinforced tape embedded in hot asphalt.
5. Ensure wearing surface is applied as soon as possible following protection courseapplication.

B. Horizontal Application, Drainage Board:

1. Unroll drainage board and apply from high point to low point ensuring that overlap is in such a way so that water runs with the overlap.
2. Add appropriate ballast as needed to hold down drainage board.

C. Vertical Application:

1. Install protection course as soon as permissible by membrane applicator or manufacturer.
2. Butt together all protection course sheet and cut to fit all intersecting surfaces andprotrusions.
3. If necessary, temporarily hold protection course in place using recommendedadhesive by membrane manufacturer.
4. Backfill immediately using care to avoid damage to waterproofing system.
5. Do not drop backfill material against protection course in such a manner that it coulddrag the sheet down as backfill drops.

D. Vertical Application, Drainage Board:

1. Unroll drainage board with flat, core side against the wall or waterproofing membrane. Drainage board can be fastened at the top side with a suitable mechanical fastening system.
2. Adhere remainder of drainage board with mastic compatible with this installation. Overlap the flat side core lip with second sheet of drainage board to provide a continuous drainage layer (shingle fashion). Ensure excess filter fabric is overlapped with the next sheet.

E. Apply protection course at the end of each day's waterproofing to both horizontal and verticalsurfaces.

3.07 INSPECTION AND BACKFILLING

A. The manufacturer has the option to inspect the installation prior to covering and issuing the warranty. Any defects or voids must be repaired to the manufacturer's specifications.

B. The membrane system shall be fully cured before it is covered. Membrane shall be inspected prior to covering and surface defects or damage shall be repaired in accordance with manufacture's recommendations.

1. The membrane must cure a minimum of 36 hours before water testing and/or covered.

C. Backfill as soon as possible using care to avoid damaging drainage layer and to ensure permanent placement of the protection or drainage board.

D. Protective cover in accordance with AREMA Chapter 29, Part 2, Subarticle 2.9.4.1 (c), 2. shall be installed prior to placing ballast if the membrane does not pass the Ballast ImpactTest or if recommended by the manufacturer.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 07 10 00, Membrane Waterproofing shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 07 10 00, Membrane Waterproofing shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 07 11 50
BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes cold-applied, emulsified- asphalt dampproofing applied to the followingsurfaces:

1. Exterior, below-grade surfaces of concrete foundation walls.
2. Exterior of elevator pits.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this Section.

1.03 RELATED WORK

A. Section 14 24 00, Hydraulic Elevators.

1.04 REFERENCES

A. ASTM D1227 - Standard Specification for Emulsified Asphalt Used as a Protective Coatingfor Roofing.

B. ASTM D1668 -Standard Specification for Glass Fabrics (Woven and Treated) for Roofingand Waterproofing.

1.05 SUBMITTALS

A. Product Data: For each type of product indicated. Include recommendations for method ofapplication, primer, number of coats, coverage or thickness, and protection course.

B. Material Certificates: For each product, signed by manufacturers.

1.06 QUALITY ASSURANCE

A. Source Limitations: Obtain primary dampproofing materials and primers through one source from a single manufacturer. Provide secondary materials recommended by manufacturer of primary materials.

1.07 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit asphalt dampproofing to be performed according to manufacturers writteninstructions.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Cold-Applied, Emulsified-Asphalt Dampproofing:

1. Karnak Corporation.

2. Koppers Industries, Inc.
3. Meadows, W. R., Inc.
4. Sonneborn, Div. of ChemRex, Inc.
5. Tamms Industries.
6. Or approved equal.

B. Protection Course, Asphalt-Board Type:

1. Grace, W. R. & Co.; Construction Products Div.
2. Meadows, W. R., Inc.
3. Sonneborn, Div. of ChemRex, Inc.
4. Or approved equal.

2.02 BITUMINOUS DAMPPROOFING

A. Cold-Applied, Emulsified-Asphalt Dampproofing:

1. Fibered Brush and Spray Coats: ASTM D1227, Type II, Class 1.
2. Brush and Spray Coats: ASTM D1227, Type III, Class 1.

2.03 MISCELLANEOUS MATERIALS

A. Emulsified-Asphalt Primer: ASTM D1227, Type III, Class 1, except diluted with water as recommended by manufacturer.

B. Asphalt-Coated Glass Fabric: ASTM D1668, Type I.

C. Protection Course, Asphalt-Board Type: Premolded, 1/8inch- thick, multi-ply, semirigid board consisting of a mineral-stabilized asphalt core sandwiched between layers of asphalt-saturated felt, and faced on 1 side with polyethylene film.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, with Applicator present, for compliance with requirements for surfacesmoothness and other conditions affecting performance of work.

1. Begin dampproofing application only after substrate construction and penetratingwork have been completed and unsatisfactory conditions have been corrected.

302 PREPARATION

A. Protection of Other Work: Mask or otherwise protect adjoining exposed surfaces from being stained, spotted, or coated with dampproofing. Prevent dampproofing materials from entering and clogging weep holes and drains.

B. Clean substrates of projections and substances detrimental to work; fill voids, seal joints, and apply bond breakers if any, as recommended by prime material manufacturer.

3.03 APPLICATION, GENERAL

A. Comply with manufacturer's written recommendations unless more stringent requirements are indicated or required by Project conditions to ensure satisfactory performance of dampproofing.

1. Apply additional coats if recommended by manufacturer or required to achieve coverage's indicated.
2. Allow each coat of dampproofing to cure 24 hours before applying subsequent coats.

B. Apply dampproofing to footings and foundation walls where opposite side of wall faces building interior whether indicated or not.

1. Apply from finished-grade line to top of footing; extend over top of footing, and downa minimum of 6 inches over outside face of footing.
2. Extend 12 inches onto intersecting walls and footings, but do not extend onto surfaces exposed to view when Project is completed.
3. Install flashings and corner protection stripping at internal and external corners, changes in plane, construction joints, cracks, and where shown as "reinforced," by embedding an 8-inch- wide strip of asphalt-coated glass fabric in a heavy coat of dampproofing. Dampproofing coat required for embedding fabric is in addition to other coats required.

3.04 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

A. Use cold-applied, emulsified-asphalt dampproofing on any surface indicated to receive dampproofing.

B. On Concrete Foundations: Apply two brush or spray coats at not less than 1.5 gal./100 sq. ft. for first coat and 1 gal./100 sq. ft. for second coat, one fibered brush or spray coat at notless than 3 gal./100 sq. ft., or one trowel coat at not less than 4 gal./100 sq. ft.

3.05 INSTALLATION OF PROTECTION COURSE

A. When indicated, install protection course over completed-and-cured dampproofing. Comply with dampproofing material manufacturers written recommendations for attaching protection course. Support protection course with spot application of trowel-grade mastic where not otherwise indicated.

3.06 CLEANING

A. Remove dampproofing materials from surfaces not intended to receive dampproofing.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 07 11 50, Bituminous Dampproofing shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 07 11 50, Bituminous Dampproofing shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 07 16 00
CRYSTALLINE CEMENTITIOUS WATERPROOFING COATING

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 01 Specification sections, apply to this section.

1.02 SUMMARY

A. Section Includes: Furnishing of all labor, materials, services and equipment necessary for the supply and installation of cementitious crystalline waterproofing to concrete substrates, above-grade or below-grade, on either dry or wet side of substrates, as indicated on drawings and as specified herein.

B. Related Sections:

1. Section 03 30 00 - Cast-in-Place Concrete
2. Section 07 90 00 - Joint Sealers
3. Section 09 90 10 - Painting

1.03 REFERENCES

A. Applicable Standards: The following standards are referenced herein.

1. American Society for Testing and Materials (ASTM)
2. Army Corps of Engineers (CRD)
3. NSF International (NSF)

1.04 SYSTEM DESCRIPTION

A. Cementitious Crystalline Waterproofing: Blend of portland cement, fine treated silica sand and active proprietary chemicals. When mixed with water and applied as a cementitious coating, the active chemicals cause a catalytic reaction which generates a non-soluble crystalline formation of dendritic fibers within the pores and capillary tracts of concrete. This process causes concrete to become permanently sealed against the penetration of liquids from any direction.

1.05 SYSTEM PERFORMANCE REQUIREMENTS

A. Testing Requirements: Crystalline waterproofing system shall be tested in accordance with the following standards and conditions, and the testing results shall meet or exceed the performance requirements as specified herein.

B. Independent Laboratory: Testing shall be performed by an independent laboratory meeting the requirements of ASTM E 329-95 and certified by the United States Bureau of Standards. Testing laboratory shall obtain all concrete samples and waterproofing product samples.

C. Crystalline Penetration: Crystallizing capability of waterproofing material shall be evidenced by independent SEM (Scanning Electron Microscope) photographs

documenting penetration of crystal-forming waterproofing material to a depth of 2 inches (50 mm).

D. Permeability: Independent testing shall be performed according to U.S. Army Corps of Engineers CRD C48-73 “Permeability of Concrete”.

1. Concrete samples (treated and untreated) to have design strength of 2000 psi (13.8 MPa) and thickness of 2 inches). No admixtures permitted.
2. Coatings to have maximum thickness of 0.05 inches (1 mm) per coat with up to two coats permitted.
3. Samples to be pressure tested to 175 psi (405 foot head of water) or 1.2 MPa (123.4 m head of water).
4. Treated samples, after crystalline growth has occurred, shall exhibit no measurable leakage.

E. Chemical Resistance: Independent testing shall be performed according to ASTM C 267-77 “Chemical Resistance of Mortars” and ASTM C 39-86 “Compressive Strength of Cylindrical Concrete Specimens”.

1. Concrete samples (treated and untreated) to have design strength of 4000 psi (27.6 MPa). No admixtures permitted.
2. Coatings to have maximum thickness of 0.05 inches (1 mm) per coat with up to two coats permitted.
3. Untreated and treated specimens to be immersed for a minimum of 84 days in following chemical solutions: hydrochloric acid (3.5pH), brake fluid, transformer oil, ethylene glycol, toluene, caustic soda.
4. Treated specimens shall exhibit no detrimental effects after exposure, and shall have a minimum of 14% increase in compressive strength versus untreated control specimens.

F. Potable Water Approval: Independent testing shall be performed according to NSF Standard 61 and approval for use of waterproofing material on structures holding potable water shall be evidenced by NSF certification.

1.06 SUBMITTALS

A. General: Submit listed submittals in accordance with conditions of the Contract and with Division 01 Submittal Procedures Section.

B. The following shall be submitted for the crystalline cementitious waterproofing coating:

1. Product Data: Submit product data, including manufacturer’s specifications, installation instructions, and general recommendations for waterproofing applications. Also include manufacturer’s certification or other data substantiating that products comply with requirements of Contract Documents.
2. Test Reports: Submit for acceptance, complete test reports from approved independent testing laboratories certifying that waterproofing system conforms to performance characteristics and testing requirements specified herein.

3. Manufacturer's Certification: Provide certificates signed by manufacturer or manufacturer's representative certifying that the materials to be installed comply in all respects with the requirements of this specification, and that the applicator is qualified and approved to install the materials in accordance with manufacturer's product data.
4. Manufacturer's Field Report: Provide copy of report from manufacturer's representative confirming that the surfaces to which waterproofing material is to be applied are in a condition suitable to receive same.
5. Manufacturer's Qualifications: Provide qualification data for manufacturer of proposed products including historical information, years in business and experience. Include locations, dates and contact information for installations similar in scope to this project.
6. Applicator's Qualifications: Provide qualification data for applicator of proposed products including historical information, years in business and experience. Include locations, dates and contact information for installations similar in scope to this project. Provide written certification that applicator has been approved by the manufacturer for installation of their products.
7. Warranty: Provide a copy of the proposed warranty from the manufacturer and applicator for the products and installation for the Authority's review and approval.
8. Process Plans: Provide written process plans detailing each item of work. Submit separate process plans for each different process, i.e. different concrete repairs, different crystalline applications, etc.

C. Curing Agent: Provide product data, specifications, directions for use and recommendations for any chemical curing agent proposed to be used in lieu of moist curing. Provide written certification from the waterproofing system manufacturer that the curing agent is specifically designed for or compatible with the approved crystalline waterproofing treatment and is approved by the waterproofing manufacturer.

1. Provide documentation that the curing agent has been used successfully with the waterproofing system for a period of at least two (2) years.

D. Non-shrink grout: Provide product data, manufacturer's specifications, and directions for use for applicable concrete repairs.

1.07 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer shall have no less than ten (10) years experience in manufacturing the cementitious crystalline waterproofing materials for the required work. Manufacturers that cannot provide the performance test data specified herein will not be considered for the project.

B. Applicator: Waterproofing applicator shall be experienced in the installation of cementitious crystalline waterproofing materials as demonstrated by previous successful installations, and shall be approved by the manufacturer in writing.

C. Pre-Installation Conference: Prior to installation of waterproofing, conduct meeting with waterproofing applicator, installers of work adjacent to or which penetrates waterproofing, the Authority's representative, and waterproofing manufacturer's representative to verify and review the following:

1. Project requirements for waterproofing as set out in Contract Document.
2. Manufacturer's product data including application instructions.
3. Substrate conditions, and procedures for substrate preparation and waterproofing installation.

D. Technical Consultation: The waterproofing manufacturer's representative shall provide technical consultation on waterproofing application.

1.08 DELIVERY, STORAGE AND HANDLING

A. Delivery*:* Deliver packaged waterproofing materials to project site in original undamaged containers, with manufacturer's labels and seals intact.

1.09 PROJECT CONDITIONS

A. Compliance: Comply with manufacturer's product data regarding condition of substrate to receive waterproofing, weather conditions before and during installation, and protection of the installed waterproofing system.

1.10 WARRANTY

A. Manufacturer's Warranty*:* Manufacturer shall provide standard product warranty executed by authorized company official. Term of warranty shall be five (5) years from Date of Final Acceptance.

B. Applicator's Warranty*:* Applicator shall warrant the waterproofing installation against defects caused by faulty workmanship or materials for a period of five (5) years from Date of Final Acceptance. The warranty will cover the surfaces treated and will bind the applicator to repair, at his expense, any and all leaks through the treated surfaces which are not due to structural weaknesses or other causes beyond applicator's control such as fire, earthquake, tornado and hurricane. The warranty shall read as follows:

1. Warranty: The applicator warrants that, upon completion of the work, surfaces treated with cementitious crystalline waterproofing will be and will remain free from water leakage resulting from defective workmanship or materials for a period of [specify term] years from Date of Final Acceptance. In the event that water leakage occurs within the warranty period from such causes, the applicator shall, at his sole expense, repair, replace or otherwise correct such defective workmanship or materials to the Authority's satisfaction and at no cost to the Authority.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Acceptable Manufacturers:

1. Xypex Chemical Corporation
13731 Mayfield Place, Richmond, B.C., Canada V6V 2G9 Tel: 800 961.4477 or 604 273.5265 Fax: 604 270.0451
2. Approved equal.

B. Products: Crystalline waterproofing materials shall be as follows:

1. Xypex Concentrate, Xypex Modified and Xypex Patch'n Plug.
2. Approved equal products.

C. Source Quality: Obtain all crystalline waterproofing products for each installation from a single manufacturer.

D. Curing Agent: If moist curing is not possible, a chemical curing agent that is specifically designed for or compatible with the approved crystalline waterproofing treatment may be used, only after approval by CTA and crystalline waterproofing treatment manufacturer. Curing agent shall have at least two years of successful field use and shall be approved by the waterproofing manufacturer.

E. Substitutions: Once a product of the waterproofing system has been submitted to and approved by the Authority, no substitutions will be permitted without the written prior approval of the Authority.

2.02 MIXES

A. General: Mix waterproofing materials in proportions as directed by the manufacturer and in a method as directed and recommended by the manufacturer of the materials. Do not deviate from the manufacturer's directions without the written approvals of both the manufacturer and the Authority.

B. Waterproofing Materials: Mix waterproofing material by volume with clean water which is free from salt and deleterious materials. Mix waterproofing material in quantities that can be applied within 20 to 30 minutes from time of mixing. As mixture thickens, stir frequently, but do not add additional water. Do not mix bonding agents or admixtures with crystalline waterproofing materials.

C. Brush Application Mix: Measure dry powder and place in mixing container. Measure water and mix into the dry powder with a paddle on a slow speed electric drill (250 RPM) or other type mixer which is acceptable to manufacturer. Use following proportions as a guide only. Mixing proportions shall be verified by manufacturer:

Coverage	Proportions (by Volume)
1.5 lb./sq. yd. (0.8 kg/m^2)	5 powder to 2 water
2.0 lb./sq. yd. (1.0 kg/m^2)	3 powder to 1 water

D. Spray Application Mix: Mixing shall be same as specified for brush application except that mixture shall be thinner. Use following proportions as a guide only. Adjust proportions to match type of spray equipment and pressures used. Mixing proportions shall be verified by manufacturer:

Coverage	Proportions (by Volume)
1.5 lb./sq. yd. (0.8 kg/m^2)	5 powder to 3 water

E. Dry-Pac Mix: Using a trowel, mix 1 part clean water with 6 parts concentrate Powder, mixing proportion shall be verified by manufacturer, for 10 to 15 seconds. It is acceptable that lumps may be present in mixture if verified that this is acceptable to the manufacturer. Mix only as much as can be applied in 15 minutes.

PART 3 – EXECUTION

3.01 GENERAL

A. Waterproofing system shall be prepared for, mixed and applied strictly according to manufacturer's directions and recommendations.

B. Contractor shall prepare surfaces according to waterproofing manufacturer's instructions and recommendations.

C. Install shall follow manufacturer's recommendations for environmental conditions for installation of the waterproofing system.

3.02 EXAMINATION

A. Site Visit: Prior to waterproofing installation, arrange visit to project site with water-proofing manufacturer's representative. Representative shall inspect and certify that concrete surfaces are in acceptable condition to receive waterproofing treatment.

B. Verification of Substrates: Verify that concrete surfaces are sound and clean, and that form release agents and materials used to cure the concrete are compatible with waterproofing treatment.

C. Examination for Defects: Examine surfaces to be waterproofed for form tie holes and structural defects such as honeycombing, rock pockets, faulty construction joints and cracks. Such defects to be repaired in accordance to manufacturer's product data and Article 3.03 below.

3.03 PREPARATION

A. Concrete Finish: Concrete surfaces to receive waterproofing treatment shall have an open capillary system to provide tooth and suction, and shall be free from scale, excess form oil, laitance, curing compounds and foreign matter. Horizontal surfaces shall have a rough wood float or broom finish. Where a smooth trowel finish is required on horizontal surface, crystalline waterproofing material shall be applied by dry shake method at time of concrete finishing in accordance with manufacturer's product data.

B. Surface Preparation: Smooth surfaces (e.g. where steel forms are used) or surfaces covered with excess form oil or other contaminants shall be washed, lightly sand-blasted or water-blasted as necessary to provide a clean absorbent surface.

C. Repair of Defects: Surface defects shall be repaired in accordance with manufacturer's instructions as follows:

1. Form Tie Holes, Construction Joints, Cracks: Chip out defective areas in a "U" shaped slot one inch (25 mm) wide and a minimum of one inch (25 mm) deep. Clean slot of debris and dust. Soak area with water and remove excess surface water. Apply a slurry coat of waterproofing concentrated material at the rate of 1.5 lb./sq. yd. (0.8 kg/m2) to the slot. Allow slurry to reach an initial set, then fill cavity with the dry-pac, non- shrink grout. Compress tightly into cavity using pneumatic packer or block and hammer.

2. Rock Pockets, Honeycombing or Other Defective Concrete: Rout out defective areas to sound concrete. Remove loose materials and saturate with water. Remove excess surface water and apply a slurry coat of the approved concentrated waterproofing material to the area. After slurry has set, but while still “green”, fill cavity to surface level with non-shrink grout.

D. Wetting Concrete: Prior to application of waterproofing treatment, thoroughly saturate concrete surfaces with clean water as required to ensure migration of crystalline chemicals into voids and capillary tracts of the concrete. Remove free surface water before application.

3.04 APPLICATION

A. Construction Joints: Apply the approved concentrated waterproofing material in slurry form at a rate of 2.0 lb./sq. yd. (1.08 kg/m^2) to joint surfaces between concrete pours. Moisten surfaces prior to slurry application. Where joint surfaces are not accessible prior to pouring new concrete, consult manufacturer for application procedure.

B. Sealing Strips and Coves: Prepare concrete surfaces that will come into contact with sealing strips and coves by applying one coat of the concentrated waterproofing material in slurry form at a rate of 1.5 lb./sq. yd. (0.8 kg/m^2). Then apply the concentrate in the dry-pac form (sealing strip) or the modified material in mortar consistency (cove) after slurry coat has reached an initial set but is still “green”.

1. Sealing Strips: Where indicated on drawings, fill preformed grooves, one inch (25 mm) wide and minimum of 1.5 inch (37 mm) deep, located at construction joints with the concentrate in he dry-pac form. Compact the dry-pac material tightly into groove using a pneumatic packer or hammer and block.

2. Coves: Where indicated on drawings, trowel apply and pack the modified material in mortar consistency into a cove shape.

C. Surface Application: After repairs, surface preparation, treatment of construction joints and sealing strip placement have been completed in accordance with manufacturer’s product data and as specified herein, apply waterproofing treatment uniformly to concrete surfaces with semi-stiff bristle brush or broom, or suitable spray equipment. Application rates and locations shall be as indicated in the drawings and in accordance with manufacturer’s product data. When brushing, work slurry well into surface of the concrete, filling surface pores and hairline cracks. When spraying, hold nozzle close enough to ensure that slurry is forced into pores and hairline cracks.

1. First Coat (of one or two coat application): Apply concentrated waterproofing material as a slurry coat to locations indicated on drawings in accordance with manufacturer’s product data.

2. Second Coat (of two coat application): Where indicated on drawings or as required by manufacturer’s product data, apply the waterproofing modified material as a slurry coat while the first coat of the concentrated material is still “green” but after it has reached an initial set. Use light prewatering between coats when rapid drying conditions exist.

D. Sandwich (Topping) Application: When treated structural slabs are to receive a

concrete or other topping, place the topping while waterproofing material is still “green” but has reached an initial set. Lightly prewater when rapid drying conditions exist.

3.05 CURING

A. General: Begin curing as soon as the waterproofing coating has hardened sufficiently so as not to be damaged by a fine spray. Cure the waterproofing treatment with a mist fog spray of clean water three times a day for 3 days, or cover treated surfaces with damp burlap for the prescribed period. In warm climates, more than three sprayings per day may be necessary to prevent excessive drying of coating.

B. Air Circulation: Do not lay plastic sheeting directly on the waterproofing coating as air contact is required for proper curing. If poor circulation exists in treated areas, it may be necessary to provide fans or blown air to aid in curing of waterproofing treatment.

C. Holding Structures: For concrete holding structures such as reservoirs, water treatment tanks and wet wells, cure the waterproofing treatment for three (3) days and then allow treatment to set (air cure) for twelve (12) days before filling structure with liquid. For structures holding hot or corrosive liquids, cure waterproofing treatment for three (3) days and allow to set for eighteen (18) days before filling.

D. Protection: During the curing period, protect treated surfaces from damage by wind, sun, rain and temperatures below 36^{o}F (2^{o}C). If plastic sheeting is used for protection, it must be raised off of waterproofing coating to allow sufficient air circulation.

E. Curing Agent: If moist curing is not possible, use a chemical curing agent that is specifically designed for or compatible with the approved crystalline waterproofing treatment. Curing agent shall have at least two years of successful field use and shall be approved by waterproofing manufacturer in writing.

3.06 INTERFACE WITH OTHER MATERIALS

A. Backfilling: Do not backfill for 36 hours after application. If backfill takes place within seven days after application, then backfill material shall be moist so as not to draw moisture from waterproof coating.

B. Paint, Epoxy or Similar Coatings: Do not apply paint or other coatings until waterproofing treatment has cured and set for a minimum of 21 days. Before applying paint or coating, neutralize treated surface by dampening with water and then washing waterproofed surface with 15% muriatic acid, diluted in a ratio of one part acid to four parts water by volume. Flush acid off treated concrete surfaces.

C. Grout, Cement Parge Coat, Plaster or Stucco: Because the waterproof coating forms a relatively smooth surface and the resulting crystalline formation fills the concrete pores thereby reducing suction characteristics of the concrete, it may be necessary to use a suitable bonding agent for proper bonding of cementitious systems. Trial applications are recommended to ensure that adhesion requirements are satisfied.

D. Compatibility: Regarding the compatibility of the waterproofing treatment with coatings, plasters, stuccos, tiles or other surface-applied materials; it shall be the responsibility of the installer of the surface-applied material that is to be applied over

the waterproofing treatment, to take whatever measures are necessary, including testing, to ensure acceptance by or adhesion to the waterproofing treatment.

3.07 FIELD QUALITY CONTROL

A. Observation: Do not conceal installed waterproofing system before it has been observed by the Authority, waterproofing manufacturer's representative and other designated entities.

B. Flood Testing:

1. Perform flood test on completed waterproofing installation before placement of other construction.
2. Plug or dam drains and fill area with water to a depth of two inches (50 mm) or to within 0.5 inch (12.5 mm) of top of waterproofing treatment.
3. Let water stand for 24 hours.
4. If leaks are discovered, make repairs and repeat test until no leaks are observed.

3.08 CLEANING AND PROTECTION

A. Cleaning: Clean spillage and soiling from adjacent surfaces using appropriate cleaning agents and procedures.

B. Protection: Take measures to protect completed Xypex coating from damage after application. Do not permit traffic on unprotected coating.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 07 16 00, Crystalline Cementitious Waterproofing Coating shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 07 16 00, Crystalline Cementitious Waterproofing Coating shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 07 17 00.S

BENTONITE WATERPROOFING

PART 1 – GENERAL

1.01 DESCRIPTION

A. This Section specifies requirements for furnishing and applying a Bentonite waterproofing system, including furnishing all labor, materials, tools, equipment and incidentals necessary to install the system as indicated on the drawings, specified herein and as otherwise required and including the following components:

1. Bentonite panels.
2. Bentonite tubes.
3. Bentonite gel.
4. Bulk bentonite.
5. Protective cover material.
6. Protection board.

1.02 QUALITY ASSURANCE

A. Bentonite waterproofing system shall be installed by an applicator/installer skilled and experienced in the type of work involved. Applicator shall be licensed and approved by the Manufacturer who furnishes the materials.

B. The Contractor shall make necessary arrangements with the Manufacturer of the bentonite materials to be installed to provide on-site consultation and inspection service to assure the correct installation of the bentonite waterproofing.

C. The Manufacturer's representative shall be present at the time any phase of the work is performed. Bentonite waterproofing shall be installed only over substrate surfaces previously approved by the Manufacturer's representative.

D. Mockups: Build mockups to verify selections made under Sample submittals and to set quality standards for installation.

1. Build mockup for each typical waterproofing installation, to demonstrate surface preparation, crack and joint treatments, inside and outside corner treatments, and protection.

a. Size: 100 sq. ft. in area.
b. Description: Each type of wall, deck, floor, and ceiling installation.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless the CTA specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.03 SUBMITTALS

A. General: Refer to Section 01 33 00, Submittal Procedures, for submittal requirements and procedures.

B. Product Data: Submit Manufacturer's product data demonstrating compliance with specification requirements. Submit Manufacturer's installation instructions and details, separately for each condition of bentonite waterproofing installation.

C. Submit a copy of the system warranty for review and approval.

1.04 DELIVERY, STORAGE AND HANDLING

A. Store bentonite materials in a dry location, off the ground and protected from physical damage and moisture.

1.05 ENVIRONMENTAL CONDITIONS

A. Do not install bentonite products in standing or running water conditions, or during rain or damp weather.

1.06 WARRANTY

A. In addition to the one year general warranty, bentonite waterproofing system shall be warranted against leakage, defective materials and defective installation of the completed waterproofing system. Any such defects or leakage occurring during the period of the warranty shall be promptly and completely corrected, including all affected work, at no additional cost to the Authority.

B. Said guaranty shall be in effect for a period of five years from the date of the Certificate of Final Acceptance issued by the Authority. The warranty shall be signed by the bentonite waterproofing applicator or installer and countersigned by the Contractor and shall be submitted to the Authority as specified in Section 01 77 00, Closeout Procedures.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Requirements: Bentonite waterproofing system shall include bentonite panels, bentonite in tube, gel or mastic form and dry granular bentonite, all products of a single Manufacturer.

B. Bentonite: Specially selected natural Wyoming type granular bentonite, containing a minimum 90 percent montmorillonite clay, graded so that 90 percent will pass a 20 mesh sieve and less than 10 percent will pass a 200 mesh sieve.

C. Panels: Minimum one pound granular bentonite per square foot packed into flutes of corrugated biodegradable kraft board or between layers of porous polypropylene.

D. Tubes: Granular bentonite in 2-inch diameter water soluble tubes.

E. Gel: Trowelable grade of bentonite that has been hydrated to maximum gel strength.

F. Bulk Bentonite: Dry granular bentonite packaged in 50-pound bags.

G. Protective Cover Sheet: Minimum 4 mil thick polyethylene.

H. Protection Board: As recommended by the bentonite products' manufacturer.

PART 3 – EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Protect bentonite from premature hydration at all times. Where bentonite is installed directly against earth or wood lagging, place a layer of protective cover sheet under the bentonite. Where backfill or concrete is not placed against bentonite immediately after the bentonite is installed, cover the bentonite with protective cover sheet until backfill is placed. As an alternative to the foregoing, bentonite panels that have been coated with a water-repellent resin on the exposed face may be used.

B. When the presence of salt in the groundwater is indicated, use only bentonite that is certified by the Manufacturer for use under salt water conditions without freshwater pre-hydration. Obtain groundwater samples and have them tested by the Manufacturer if necessary to obtain this certification.

C. Apply two or more layers of bentonite panels wherever the indicated hydrostatic head exceeds the Manufacturer's rated depth for single-layer installation. Comply with the Manufacturer's special requirements for installation at such depths. When installing double layers, do not overlap joints; butt panels together and stagger joints in the two layers a minimum of 12 inches.

3.02 INSTALLATION ON FREE-STANDING WALLS

A. Preparation:

1. Concrete surfaces shall be free of large voids and projections (such as mortar fins) extending more than 1/16 inch from the surface. Grind off such projections. Fill voids with cement mortar or bentonite gel.
2. On concrete block masonry surfaces, apply a ½ inch thick parged coat of sand-cement and allow to cure three days before applying bentonite.
3. Do not commence installation until preparation is complete and has been inspected and approved by the Manufacturer's representative.

B. Attach panels with ¾ inch or 1 inch masonry washer-head nails. Lap adjoining panels a minimum of 1-1/2 inches. Stagger vertical joints in succeeding courses.

C. When cutting, trimming and folding, follow Manufacturer's instructions to prevent loss of bentonite granules.

D. Cut panels to fit around pipes and penetrations. Trowel a fillet of gel around the penetration and a minimum of 2 inches up the penetration just prior to backfilling.

E. Provide protection board when the backfill contains sharp stones (such as crushed rock) or any stones larger than 2 inches.

F. Refer to Earthwork Section of these specifications and Article 3.01 above regarding backfill requirements. Exercise care to avoid damage to bentonite waterproofing by backfilling operations.

3.03 INSTALLATION AGAINST SIDES OF SUPPORTIVE EXCAVATION

A. When bentonite panels are installed directly against the inside surface of soldier piles and lagging, diaphragm walls or other support system to be left in place, prepare the surface by filing voids greater than ½ inch with cement mortar or place a suitable geotextile over the entire surface.

B. If water is present on the surface of the excavation support, place protective cover sheet over the surface or use panels having a water-resistant coating.

C. Overlap panels a minimum of 1-1/2 inches and nail in place. Stagger joints in succeeding layers. Do not extend panels beyond finish grade.

3.04 FIELD QUALITY CONTROL

A. Verify that bentonite waterproofing is free from defects or damage before backfilling or concealing the waterproofing with subsequent construction and finishes. Damaged or defective waterproofing shall be corrected.

B. Testing Agency: Contractor to engage and pay for a qualified testing agency and a qualified inspector, both approved by the Authority, to perform tests and inspections:

1. Inspector to verify waterproofing during application for each 500 sq. ft. of installed waterproofing or part thereof.

C. Inspector to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components and to furnish daily reports to the Authority.

D. Waterproofing will be considered defective if it does not pass tests and inspections.

E. Prepare and submit test and inspection reports.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of BENTONITE WATERPROOFING shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of BENTONITE WATERPROOFING shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000.

END OF SECTION

SECTION 07 21 00
THERMAL INSULATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:

1. Extruded polystyrene foam-plastic board insulation.
2. Molded (expanded) polystyrene foam-plastic board insulation.
3. Graphite-polystyrene foam-plastic board insulation.
4. Polyisocyanurate foam-plastic board insulation.
5. Glass-fiber blanket insulation.
6. Glass-fiber board insulation.
7. Mineral-wool blanket insulation.
8. Mineral-wool board insulation.
9. Loose-fill insulation.
10. Spray-applied cellulosic insulation.
11. Cellular glass insulation.
12. Reflective insulation.

B. Related Requirements:

1. Section 04 20 00 "Unit Masonry" for insulation installed in masonry cells.
2. Section 07 14 16 "Cold Fluid-Applied Waterproofing" for insulated drainage panels installed with plaza deck insulation.
3. Section 07 52 60 "Modified Bituminous Membrane Roofing – Heat Welded".
4. Section 09 22 00 "Gypsum Board Assemblies" for sound attenuation blanket used as acoustic insulation.

1.03 ACTION SUBMITTALS

A. Product Data: For the following:

1. Extruded polystyrene foam-plastic board insulation.
2. Molded (expanded) polystyrene foam-plastic board insulation.
3. Graphite-polystyrene foam-plastic board insulation.
4. Polyisocyanurate foam-plastic board insulation.
5. Glass-fiber blanket insulation.
6. Glass-fiber board insulation.
7. Mineral-wool blanket insulation.
8. Mineral-wool board insulation.
9. Loose-fill insulation.
10. Spray-applied cellulosic insulation.
11. Cellular glass insulation.
12. Reflective insulation.

1.04 INFORMATIONAL SUBMITTALS

A. Installer's Certification: Listing type, manufacturer, and R-value of insulation installed in each element of the building thermal envelope.

1. For blown-in or sprayed fiberglass and cellulosic-fiber loose-fill insulation, indicate initial installed thickness, settled thickness, settled R-value, installed density, coverage area, and number of bags installed.
2. Sign, date, and post the certification in a conspicuous location on Project site.

B. Product Test Reports: For each product, for tests performed by a qualified testing agency.

C. Research Reports: For foam-plastic insulation, from ICC-ES.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect foam-plastic board insulation as follows:

1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site until just before installation time.
3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.01 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD INSULATION

A. Extruded Polystyrene Board Insulation, Type X : ASTM C578, Type X, 15-psi minimum compressive strength; unfaced.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. DiversiFoam Products.
b. Dow Chemical Company (The).
c. DuPont de Nemours, Inc.
d. MBCI.
e. Owens Corning.
f. Approved Equal.

2. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E84.
3. Smoke-Developed Index: Not more than 450 when tested in accordance with ASTM E84.
4. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

5. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

B. Extruded Polystyrene Board Insulation, Type IV: ASTM C578, Type IV, 25-psi minimum compressive strength; unfaced.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. DiversiFoam Products.
   b. Dow Chemical Company (The).
   c. DuPont de Nemours, Inc.
   d. Kingspan Insulation Limited.
   e. Owens Corning.
   f. Approved Equal.

2. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E84.
3. Smoke-Developed Index: Not more than 450 when tested in accordance with ASTM E84.
4. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
5. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

C. Extruded Polystyrene Board Insulation, Type IV, Drainage Panels: ASTM C578, Type IV, 25-psi minimum compressive strength; unfaced; fabricated with shiplap or channel edges and with one side having grooved drainage channels.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. DiversiFoam Products.
   b. Dow Chemical Company (The).
   c. DuPont de Nemours, Inc.
   d. Owens Corning
   e. Approved Equal.

2. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E84.
3. Smoke-Developed Index: Not more than 450 when tested in accordance with ASTM E84.
4. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

D. Extruded Polystyrene Board Insulation, Type VI: ASTM C578, Type VI, 40-psi minimum compressive strength.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. DiversiFoam Products.

b. Dow Chemical Company (The).
c. DuPont de Nemours, Inc.
d. Kingspan Insulation Limited.
e. Owens Corning.
f. Approved Equal.

2. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E84.
3. Smoke-Developed Index: Not more than 450 when tested in accordance with ASTM E84.
4. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

E. Extruded Polystyrene Board Insulation, Type VI, Drainage Panels: ASTM C578, Type VI, 40-psi minimum compressive strength; unfaced; fabricated with shiplap or channel edges and with one side having grooved drainage channels.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. DiversiFoam Products.
b. Dow Chemical Company (The).
c. DuPont de Nemours, Inc.
d. Kingspan Insulation Limited.
e. Owens Corning.
f. Approved Equal.

2. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E84.
3. Smoke-Developed Index: Not more than 450 when tested in accordance with ASTM E84.
4. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

F. Extruded Polystyrene Board Insulation, Type VII: ASTM C578, Type VII, 60-psi minimum compressive strength.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. DiversiFoam Products.
b. Dow Chemical Company (The).
c. DuPont de Nemours, Inc.
d. Kingspan Insulation Limited.
e. Owens Corning.
f. Approved Equal.

2. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E84.
3. Smoke-Developed Index: Not more than 450 when tested in accordance with ASTM E84.
4. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

G. Extruded Polystyrene Board Insulation, Type VII, Drainage Panels: ASTM C578, Type VII, 60-psi minimum compressive strength; fabricated with shiplap or channel edges and with one side having grooved drainage channels.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. DiversiFoam Products.
    b. Dow Chemical Company (The).
    c. DuPont de Nemours, Inc.
    d. Kingspan Insulation Limited.
    e. Owens Corning.
    f. Approved Equal.

2. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E84.
3. Smoke-Developed Index: Not more than 450 when tested in accordance with ASTM E84.
4. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

H. Extruded Polystyrene Board Insulation, Type V: ASTM C578, Type V, 100-psi minimum compressive strength.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Dow Chemical Company (The).
    b. DuPont de Nemours, Inc.
    c. Owens Corning.
    d. Approved Equal.

2. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E84.
3. Smoke-Developed Index: Not more than 450 when tested in accordance with ASTM E84.
4. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

2.02 MOLDED (EXPANDED) POLYSTYRENE FOAM-PLASTIC BOARD INSULATION

A. Molded (Expanded) Polystyrene Board Insulation, Type I: ASTM C578, Type I, 10-psi (69-kPa) minimum compressive strength.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Amvic Building System.
    b. Atlas Roofing Corporation - MPS.
    c. DiversiFoam Products.
    d. Insulfoam; Carlisle Construction Materials Company.
    e. Plymouth Foam, Inc.

f. Approved Equal.

2. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

B. Molded (Expanded) Polystyrene Board Insulation, Type VIII: ASTM C578, Type VIII, 13-psi minimum compressive strength.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Atlas Roofing Corporation - MPS.
b. DiversiFoam Products.
c. Plymouth Foam, Inc.
d. Approved Equal.

2. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

C. Molded (Expanded) Polystyrene Board Insulation, Type II: ASTM C578, Type II, 15-psi minimum compressive strength.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Amvic Building System.
b. Atlas Roofing Corporation - MPS.
c. DiversiFoam Products.
d. Insulfoam; Carlisle Construction Materials Company.
e. Plymouth Foam, Inc.
f. Approved Equal.

2. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

D. Molded (Expanded) Polystyrene Board Insulation, Type IX: ASTM C578, Type IX, 25-psi minimum compressive strength.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Atlas Roofing Corporation - MPS.
b. DiversiFoam Products.
c. Insulfoam; Carlisle Construction Materials Company.
d. Plymouth Foam, Inc.
e. Approved Equal.

2. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

E. Molded (Expanded) Polystyrene Board Insulation, Type XIV: ASTM C578, Type XIV, 40-psi minimum compressive strength.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Atlas Roofing Corporation - MPS.
    b. Insulfoam; Carlisle Construction Materials Company.
    c. Plymouth Foam, Inc.
    d. Approved Equal.

2. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

F. Molded (Expanded) Polystyrene Board Insulation, Type XV: ASTM C578, Type XV, 60-psi minimum compressive strength.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Atlas Roofing Corporation - MPS.
    b. Insulfoam; Carlisle Construction Materials Company.
    c. Plymouth Foam, Inc.
    d. Approved Equal.

2. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

2.03 GRAPHITE-POLYSTYRENE FOAM-PLASTIC BOARD

A. Graphite-Polystyrene Foam-Plastic Board, Type I: ASTM C578, Type I, 10-psi minimum compressive strength; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E84; 4-perm maximum vapor permeance at 1-inch thickness per ASTM E96; R4.7 minimum stable R-value at 1-inch thickness per ASTM C518.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Atlas Roofing Corporation - MPS.
    b. BASF Corporation.
    c. Insulfoam; Carlisle Construction Materials Company.
    d. Opco, Inc.
    e. StarRFoam.
    f. Approved Equal.

2. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

B. Graphite-Polystyrene Foam-Plastic Board, Type I, Faced: ASTM C578, Type I, 10-psi minimum compressive strength; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E84; 4-perm maximum vapor permeance at 1-inch thickness per ASTM E96; R4.7 minimum stable R-value at 1-inch thickness per ASTM C518.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Amvic Building System.
    b. Atlas Roofing Corporation - MPS.
    c. Insulfoam; Carlisle Construction Materials Company.
    d. LOGIX Brands Ltd.
    e. Progressive Foam Technologies, Inc.
    f. Approved Equal.

2. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

C. Graphite-Polystyrene Foam-Plastic Board, Type VIII: ASTM C578, Type VIII, 13-psi (90-kPa) minimum compressive strength; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E84; 3.1-perm (178-ng/Pa x s x sq. m) maximum vapor permeance at 1-inch thickness per ASTM E96; R4.7 minimum stable R-value at 1-inch thickness per ASTM C518.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. BASF Corporation.
    b. Insulfoam; Carlisle Construction Materials Company.
    c. Opco, Inc.
    d. Perma R Products, Inc.
    e. Polar Industries, Inc.
    f. StarRFoam.
    g. Approved Equal.

2. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

D. Graphite-Polystyrene Foam-Plastic Board, Type VIII, Faced: ASTM C578, Type VIII, 13-psi minimum compressive strength; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E84; 3.1-perm maximum vapor permeance at 1-inch thickness per ASTM E96; R4.7 minimum stable R-value at 1-inch thickness per ASTM C518.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Atlas Roofing Corporation - MPS.
    b. Perma R Products, Inc.
    c. Approved Equal.

2. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

E. Graphite-Polystyrene Foam-Plastic Board, Type II: ASTM C578, Type II, 15-psi minimum compressive strength; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E84; 3.1-perm maximum vapor permeance at 1-inch

thickness per ASTM E96; R4.7 minimum stable R-value at 1-inch thickness per ASTM C518.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Atlas Roofing Corporation - MPS.
    b. BASF Corporation.
    c. Insulfoam; Carlisle Construction Materials Company.
    d. Opco, Inc.
    e. Polar Industries, Inc.
    f. StarRFoam.
    g. Approved Equal.

2. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

F. Graphite-Polystyrene Foam-Plastic Board, Type IX: ASTM C578, Type IX, 25-psi minimum compressive strength; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E84; 2.5-perm maximum vapor permeance at 1-inch thickness per ASTM E96; R4.7 minimum stable R-value at 1-inch thickness per ASTM C518.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Atlas Roofing Corporation - MPS.
    b. BASF Corporation.
    c. Insulfoam; Carlisle Construction Materials Company.
    d. Perma R Products, Inc.
    e. Polar Industries, Inc.
    f. StarRFoam.
    g. Approved Equal.

2. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

G. Graphite-Polystyrene Foam-Plastic Board, Type IX, Faced: ASTM C578, Type IX, 25-psi minimum compressive strength; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E84; 2.5-perm maximum vapor permeance at 1-inch thickness per ASTM E96; R4.7 minimum stable R-value at 1-inch thickness per ASTM C518.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Amvic Building System.
    b. Atlas Roofing Corporation - MPS.
    c. LOGIX Brands Ltd.
    d. Perma R Products, Inc.
    e. Approved Equal.

2. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

H. Graphite-Polystyrene Foam-Plastic Board, Type XIV: ASTM C578, Type XIV, 40-psi minimum compressive strength; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E84; 2.5-perm maximum vapor permeance at 1-inch thickness per ASTM E96; R4.7 minimum stable R-value at 1-inch thickness per ASTM C518.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. BASF Corporation.
   b. Approved Equal.

2. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

I. Graphite-Polystyrene Foam-Plastic Board, Type XV; ASTM C578, Type XV, 60-psi minimum compressive strength; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E84; 2.5-perm maximum vapor permeance at 1-inch thickness per ASTM E96; R4.7 minimum stable R-value at 1-inch thickness per ASTM C518.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. BASF Corporation.
   b. Approved Equal.

2. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

J. Graphite-Polystyrene Foam-Plastic Board, Type X, Faced: ASTM C578, Type X, 15-psi minimum compressive strength; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E84; 1.1-perm maximum vapor permeance at 1-inch thickness per ASTM E96; R4.7 minimum stable R-value at 1-inch thickness per ASTM C518.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. Insulfoam; Carlisle Construction Materials Company.
   b. Approved Equal.
   c. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

K. Graphite-Polystyrene Foam-Plastic Board, Type IV, Faced: ASTM C578, Type IV, 25-psi minimum compressive strength; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E84; 1.1-perm maximum vapor permeance at 1-inch thickness per ASTM E96; R4.7 minimum stable R-value at 1-inch thickness per ASTM C518.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Insulfoam; Carlisle Construction Materials Company.
    b. Approved Equal.

2. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

2.04 POLYISOCYANURATE FOAM-PLASTIC BOARD INSULATION

A. Polyisocyanurate Board Insulation, Foil Faced: ASTM C1289, foil faced, Type I, Class 1 or 2.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Atlas Roofing Corporation - MPS.
    b. Atlas Roofing Corporation - Polyiso.
    c. Carlisle Coatings & Waterproofing Inc.
    d. Dow Chemical Company (The).
    e. DuPont de Nemours, Inc.
    f. Firestone Building Products.
    g. Hunter Panels.
    h. Johns Manville; a Berkshire Hathaway company.
    i. Rmax, Inc.
    j. Approved Equal.

2. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
3. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

B. Polyisocyanurate Board Insulation, Glass-Fiber-Mat Faced: ASTM C1289, glass-fiber-mat faced, Type II, Class 2.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Atlas Roofing Corporation - Polyiso.
    b. Carlisle Coatings & Waterproofing Inc.
    c. Firestone Building Products.
    d. Hunter Panels.
    e. Johns Manville; a Berkshire Hathaway company.
    f. Rmax, Inc.
    g. Approved Equal

2. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
3. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

2.05 GLASS-FIBER BLANKET INSULATION

A. Glass-Fiber Blanket Insulation, Unfaced: ASTM C665, Type I; passing ASTM E136 for combustion characteristics.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. CertainTeed Corporation; Saint-Gobain North America.
b. Johns Manville; a Berkshire Hathaway company.
c. Knauf Insulation.
d. Owens Corning.
e. Approved Equal.

2. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E84.
3. Smoke-Developed Index: Not more than 50 when tested in accordance with ASTM E84.
4. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

B. Glass-Fiber Blanket Insulation, Polypropylene-Scrim-Kraft Faced: ASTM C665, Type II (nonreflective faced), Class A (faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier).

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. CertainTeed Corporation; Saint-Gobain North America.
b. Johns Manville; a Berkshire Hathaway company.
c. Knauf Insulation.
d. Owens Corning.
e. Approved Equal.

2. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

C. Glass-Fiber Blanket Insulation, Kraft Faced: ASTM C665, Type II (nonreflective faced), Class C (faced surface not rated for flame propagation); Category 1 (membrane is a vapor barrier).

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. CertainTeed Corporation; Saint-Gobain North America.
b. Johns Manville; a Berkshire Hathaway company.
c. Knauf Insulation.
d. Owens Corning.
e. Approved Equal.

2. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

D. Glass-Fiber Blanket Insulation, Reinforced-Foil Faced: ASTM C665, Type III (reflective faced), Class A (faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier), faced with foil scrim, foil-scrim kraft, or foil-scrim polyethylene.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. CertainTeed Corporation; Saint-Gobain North America.
   b. Johns Manville; a Berkshire Hathaway company.
   c. Knauf Insulation.
   d. Owens Corning.
   e. Approved Equal.

2. 2. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

E. Glass-Fiber Blanket Insulation, Foil Faced: ASTM C665, Type III (reflective faced), Class B (faced surface with a flame-propagation resistance of 0.12 W/sq. cm); Category 1 (membrane is a vapor barrier), faced with foil scrim, foil-scrim kraft, or foil-scrim polyethylene.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. CertainTeed Corporation; Saint-Gobain North America.
   b. Johns Manville; a Berkshire Hathaway company.
   c. Knauf Insulation.
   d. Owens Corning.
   e. Approved Equal.

2. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

2.06 GLASS-FIBER BOARD INSULATION

A. Glass-Fiber Board Insulation, Unfaced: ASTM C612, Type IA; unfaced, passing ASTM E136 for combustion characteristics].

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. CertainTeed Corporation; Saint-Gobain North America.
   b. Johns Manville; a Berkshire Hathaway company.
   c. Knauf Insulation.
   d. Owens Corning.
   e. Approved Equal.

2. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E84.
3. Smoke-Developed Index: Not more than 50 when tested in accordance with ASTM E84.

4. Nominal Density: 2.25 lb/cu. ft ; 3 lb/cu. ft.; 4.25 lb/cu. ft.; or 6 lb/cu. ft.; as selected by CTA.
5. Thermal Resistivity: 4.3 deg F x h x sq. ft./Btu x in. at 75 deg F.
6. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

B. Glass-Fiber Board Insulation, Faced: ASTM C612, Type IA; faced on one side with foil-scrim-kraft or foil-scrim-polyethylene vapor retarder.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. CertainTeed Corporation; Saint-Gobain North America.
   b. Johns Manville; a Berkshire Hathaway company.
   c. Knauf Insulation.
   d. Owens Corning.
   e. Approved Equal.

2. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E84.
3. Smoke-Developed Index: Not more than 50 when tested in accordance with ASTM E84.
4. Nominal Density: 2.25 lb/cu. ft.; 3 lb/cu. ft.; 4.25 lb/cu. ft.; or 6 lb/cu. ft.; as selected by the CTA.
5. Thermal Resistivity: 4.3 deg F x h x sq. ft./Btu x in. at 75 deg F.
6. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

2.07 MINERAL-WOOL BLANKET INSULATION

A. Mineral-Wool Blanket Insulation, Unfaced: ASTM C665, Type I (blankets without membrane facing); consisting of fibers; passing ASTM E136 for combustion characteristics.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. Johns Manville; a Berkshire Hathaway company.
   b. Rockwool International.
   c. Thermafiber, Inc.; an Owens Corning company.
   d. Approved Equal.

2. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E84.
3. Smoke-Developed Index: Not more than 50 when tested in accordance with ASTM E84.
4. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

B. Mineral-Wool Blanket Insulation, Reinforced-Foil Faced: ASTM C665, Type III (reflective faced); Category 1 (membrane is a vapor barrier), faced with foil scrim, foil-scrim kraft, or foil-scrim polyethylene.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Thermafiber, Inc.; an Owens Corning company.
    b. Approved Equal.

2. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E84.
3. Smoke-Developed Index: Not more than 50 when tested in accordance with ASTM E84.
4. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

2.08 MINERAL-WOOL BOARD INSULATION

A. Mineral-Wool Board Insulation, Types IA and IB, Unfaced: ASTM C612, Types IA and IB; passing ASTM E136 for combustion characteristics.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Johns Manville; a Berkshire Hathaway company.
    b. Rockwool International.
    c. Thermafiber, Inc.; an Owens Corning company.
    d. Approved Equal.

2. Nominal Density: 4 lb/cu. ft.
3. Flame-Spread Index: Not more than 15 when tested in accordance with ASTM E84.
4. Smoke-Developed Index: Not more than zero when tested in accordance with ASTM E84.
5. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

B. Mineral-Wool Board Insulation, Types IA and IB, Faced: ASTM C612, Types IA and IB; faced on one side with foil-scrim or foil-scrim-polyethylene vapor retarder.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Johns Manville; a Berkshire Hathaway company.
    b. Thermafiber, Inc.; an Owens Corning company.
    c. Approved Equal.

2. Nominal Density: 4 lb/cu. ft.
3. Flame-Spread Index: Not more than 15 when tested in accordance with ASTM E84.
4. Smoke-Developed Index: Not more than zero when tested in accordance with ASTM E84.
5. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

C. Mineral-Wool Board Insulation, Type II, Unfaced: ASTM C612, Type II; passing ASTM E136 for combustion characteristics.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Johns Manville; a Berkshire Hathaway company.
    b. Rockwool International.
    c. Thermafiber, Inc.; an Owens Corning company.
    d. Approved Equal.

2. Nominal Density: 6 lb/cu. ft.
3. Flame-Spread Index: Not more than 15 when tested in accordance with ASTM E84.
4. Smoke-Developed Index: Not more than zero when tested in accordance with ASTM E84.
5. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

D. Mineral-Wool Board Insulation, Type II, Faced: ASTM C612, Type II; faced on one side with foil-scrim or foil-scrim-polyethylene vapor retarder.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    a. Johns Manville; a Berkshire Hathaway company.
    b. SPI, LLC dba, SPI – Specialty Products & Insulation.
    c. Thermafiber, Inc.; an Owens Corning company.
    d. Approved Equal.

2. Nominal Density: 6 lb/cu. ft.
3. Flame-Spread Index: Not more than 15 when tested in accordance with ASTM E84.
4. Smoke-Developed Index: Not more than zero when tested in accordance with ASTM E84.
5. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

E. Mineral-Wool Board Insulation, Type III, Unfaced: ASTM C612, Type III; passing ASTM E136 for combustion characteristics.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Johns Manville; a Berkshire Hathaway company.
    b. Rockwool International.
    c. Thermafiber, Inc.; an Owens Corning company.
    d. Approved Equal.

2. Nominal Density: 8 lb/cu. ft.
3. Flame-Spread Index: Not more than 15 when tested in accordance with ASTM E84.

4. Smoke-Developed Index: Not more than zero when tested in accordance with ASTM E84.
5. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

F. Mineral-Wool Board Insulation, Type III, Faced: ASTM C612, Type III; faced on one side with foil-scrim or foil-scrim-polyethylene vapor retarder.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. Johns Manville; a Berkshire Hathaway company.
   b. Rockwool International.
   c. SPI, LLC dba, SPI – Specialty Products & Insulation.
   d. Thermafiber, Inc.; an Owens Corning company.
   e. Approved Equal.

2. Nominal Density: 8 lb/cu. ft.
3. Flame-Spread Index: Not more than 15 when tested in accordance with ASTM E84.
4. Smoke-Developed Index: Not more than zero when tested in accordance with ASTM E84.
5. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

2.09 LOOSE-FILL INSULATION

A. Cellulosic-Fiber Loose-Fill Insulation: ASTM C739, chemically treated for flame-resistance, processing, and handling characteristics.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. GreenFiber.
   b. Hamilton Manufacturing Inc.
   c. Nu-Wool Co., Inc.
   d. Approved Equal.

B. Glass-Fiber Loose-Fill Insulation: ASTM C764, Type I for pneumatic application or Type II for poured application.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. CertainTeed Corporation; Saint-Gobain North America.
   b. Johns Manville; a Berkshire Hathaway company.
   c. Knauf Insulation.
   d. Approved Equal.

2. Flame-Spread Index: Not more than 5 when tested in accordance with ASTM E84.

3. Smoke-Developed Index: Not more than 5 when tested in accordance with ASTM E84.

2.10 SPRAY-APPLIED CELLULOSIC INSULATION

A. Self-Supported, Spray-Applied Cellulosic Insulation: ASTM C1149, Type I (materials applied with liquid adhesive; suitable for either exposed or enclosed applications), Type II (materials containing a dry adhesive activated by water during installation; intended only for enclosed or covered applications), Type III (materials containing an adhesive mixed with water during application; intended for application on attic floors), chemically treated for flame-resistance, processing, and handling characteristics.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. GreenFiber.
b. Hamilton Manufacturing Inc.
c. International Cellulose Corp.
d. Approved Equal.

2.11 CELLULAR GLASS INSULATION

A. Cellular Glass Insulation: ASTM C552, Type I (flat block); Type IV (board); faced on both sides with manufacturer's special kraft-paper sheets laminated to glass block with asphalt.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Pittsburgh Corning Corporation.
b. Approved Equal.

2. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

2.12 REFLECTIVE INSULATION

A. Reflective Insulation: ASTM C1224, with one or more low-emittance surfaces with emittance value of 0.1 or less as measured per ASTM C1371.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Covertech Fabricating Inc.
b. Fi-Foil Company, Inc.
c. Innovative Energy, Inc.
d. Innovative Insulation, Inc.
e. ISI Building Products.
f. Reflectix Inc.
g. TVM Building Products.
h. Approved Equal.

2. Construction: Surfaces separated with internal expanders; Surfaces separated by single-layer polyethylene bubble film; Surfaces separated by double-layer polyethylene bubble film.
3. Surface-Burning Characteristics: Maximum flame spread and smoke developed indexes of 25 and 50 or 25 and 450 as required, respectively when tested in accordance with ASTM E84.
4. Water-Vapor Transmission: 1 perm, maximum or 5 perms or greater; as specified by CTA.

B. Sheet Radiant Barrier: ASTM C1313 with at least one surface with emittance value of 0.1 or less as measured per ASTM C1371.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Covertech Fabricating Inc.
b. Fi-Foil Company, Inc.
c. Innovative Energy, Inc.
d. Innovative Insulation, Inc.
e. ISI Building Products.
f. Reflectix Inc.
g. TVM Building Products.
h. Approved Equal.

2. Construction: Foil on one side of substrate; Foil on both sides of substrate or Vacuum metallizing on substrate; as applicable.
3. Surface-Burning Characteristics: Maximum flame spread and smoke developed indexes of 5 and 10 as required, respectively when tested in accordance with ASTM E84.
4. Tear Resistance: As specified by CTA.
5. Water-Vapor Transmission: 1 perm, maximum or 5 perms or greater; as specified by CTA.
6. Sheet Width: as shown on drawings or selected by CTA.

C. Interior Radiation Control Coating System: Silver-colored, low-emissivity, solvent or water-based coating; with a surface emittance value of 0.25 or less as measured per ASTM C1371.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. SOLEC Corporation.
b. STS Coatings, Inc.
c. Approved Equal.

2.13 INSULATION FASTENERS

A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. AGM Industries, Inc.
    b. Gemco.
    c. Approved Equal.

2. Plate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
3. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation.

B. Adhesively Attached, Angle-Shaped, Spindle-Type Anchors: Angle welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Gemco.
    b. Approved Equal.

2. Angle: Formed from 0.030-inch-thick, perforated, galvanized carbon-steel sheet with each leg 2 inches square.
3. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation.

C. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick galvanized-steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches square or in diameter.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. AGM Industries, Inc.
    b. Gemco.
    c. Approved Equal.

2. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in the following locations:

    a. Crawl spaces.
    b. Ceiling plenums.
    c. Attic spaces.

D. Insulation Standoff: Spacer fabricated from galvanized mild-steel sheet for fitting over spindle of insulation anchor to maintain air space of 1 inch, 2 inches or 3 inches (as selected by CTA) between face of insulation and substrate to which anchor is attached.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Gemco.
b. Approved Equal.

E. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates without damaging insulation, fasteners, or substrates.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. AGM Industries, Inc.
b. Gemco.
c. Approved Equal.

2.14 ACCESSORIES

A. Insulation for Miscellaneous Voids:

1. Glass-Fiber Insulation: ASTM C764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E84.
2. Spray Polyurethane Foam Insulation: ASTM C1029, Type II, closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E84.
3. Polyurethane Pour-In-Place Insulation: Closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E84, specifically formulated for pour-in-place applications.

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1) Demilec (USA) LLC.
2) Approved Equal.

4. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.
5. Asphalt Coating for Cellular-Glass Block Insulation: Cutback asphalt or asphalt emulsion of type recommended by manufacturer of cellular-glass block insulation.
6. Eave Ventilation Troughs: Preformed, rigid fiberboard or plastic sheets designed and sized to fit between roof framing members and to provide ventilation between insulated attic spaces and vented eaves.

PART 3 - EXECUTION

3.01 PREPARATION

A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

3.02 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Install insulation with manufacturer's R-value label exposed after insulation is installed.

D. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

E. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.03 INSTALLATION OF SLAB INSULATION

A. On vertical slab edge and foundation surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.

1. If not otherwise indicated, extend insulation a minimum of 24 inches or 36 inches below exterior grade line.

B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

1. If not otherwise indicated, extend insulation a minimum of 24 inches or 36 inches in from exterior walls.

3.04 INSTALLATION OF FOUNDATION WALL INSULATION

A. Butt panels together for tight fit.

B. Anchor Installation: Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:

1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions.
2. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application.
3. Apply insulation standoffs to each spindle to create cavity width indicated on Drawings between concrete substrate and insulation.
4. After adhesive has dried, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation.
5. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.

C. Adhesive Installation: Install with adhesive or press into tacky waterproofing or dampproofing according to manufacturer's written instructions.

3.05 INSTALLATION OF CAVITY-WALL INSULATION

A. Foam-Plastic Board Insulation: Install pads of adhesive spaced approximately 24 inches

1. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both directions, and with faces flush.
2. Press units firmly against inside substrates.

3. Supplement adhesive attachment of insulation by securing boards with two-piece wall ties designed for this purpose and specified in Section 04 80 00 "Unit Masonry."

B. Cellular-Glass Board Insulation: Install with closely fitting joints using adhesive pad or serrated trowel attachment method according to manufacturer's written instructions.

C. Mineral-Wool Board Insulation: Install insulation fasteners 4 inches from each corner of board insulation, at center of board, and as recommended by manufacturer.

1. Fit courses of insulation between masonry wall ties and other obstructions, with edges butted tightly in both directions, and with faces flush.
2. Press units firmly against inside substrates.

3.06 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

A. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
4. Attics: Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.
5. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
6. For wood-framed construction, install blankets according to ASTM C1320 and as follows:

a. With faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to maintain continuity of vapor retarder once finish material is installed over it.

7. Vapor-Retarder-Faced Blankets: Tape joints and ruptures in vapor-retarder facings, and seal each continuous area of insulation to ensure airtight installation.

a. Exterior Walls: Set units with facing placed toward exterior of construction or interior of construction; as indicated on Drawings.
b. Interior Walls: Set units with facing placed as indicated on Drawings or toward areas of high humidity.

B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:

1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft.
2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

C. Loose-Fill Insulation: Apply according to ASTM C1015 and manufacturer's written

instructions.

1. Level horizontal applications to uniform thickness as indicated, lightly settle to uniform density, but do not compact excessively.
2. For cellulosic-fiber loose-fill insulation, comply with CIMA's Bulletin #2,"Standard Practice for Installing Cellulose Insulation."

D. Spray-Applied Cellulosic Insulation: Apply spray-applied insulation according to manufacturer's written instructions.

1. Do not apply insulation until installation of pipes, ducts, conduits, wiring, and electrical outlets in walls is completed and windows, electrical boxes, and other items not indicated to receive insulation are masked.
2. After insulation is applied, make flush with face of studs by using method recommended by insulation manufacturer.

3.07 INSTALLATION OF CURTAIN-WALL INSULATION

A. Install board insulation in curtain-wall construction according to curtain-wall manufacturer's written instructions.

1. Hold insulation in place by securing metal clips and straps or integral pockets within window frames, spaced at intervals recommended in writing by insulation manufacturer to hold insulation securely in place without touching spandrel glass.
2. Maintain cavity width of dimension indicated on Drawings between insulation and glass.
3. Install insulation to fit snugly without bowing.

3.08 INSTALLATION OF REFLECTIVE INSULATION

A. Install sheet reflective insulation according to ASTM C727.

B. Install sheet radiant barriers according to ASTM C1744.

C. Install interior radiation control coating system according to ASTM C1321.

3.09 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.

B. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 07 21 00, Thermal Insulation shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the

work of Section 07 21 00, Thermal Insulation shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 07 27 00
AIR AND WATER BARRIER

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this section.

1.02 SUMMARY

A. Section Includes the Following:

1. AWB-01: Fluid-applied membrane air barrier located in the non-accessible part of opaque wall assemblies.
2. Materials to bridge and seal the following air leakage pathways and gaps.

a. Connections of the walls to the roof air barrier.
b. Connections of the walls to the foundation air barrier.
c. Expansion joints.
d. Openings and penetrations of window frames, storefront, curtain wall.
e. Barrier precast concrete and other envelope systems.
f. Door frames.
g. Piping, conduit, duct and similar penetrations.
h. Penetrations of the air barrier and paths of air infiltration / exfiltration shall be sealed.
i. Masonry ties, screws, bolts and similar penetrations.
j. All other air leakage pathways in the building envelope.

3. Air and Water Barrier Assembly Testing: Air and water barrier assembly shall be listed on the ABAA website to ensure an ASTM E2357 test has been completed and to verify the air and water barrier assembly leakage rate and details which includes the methods in which the assembly test mock-ups shall be assembled.

B. Related Requirements:

1. Section 07 42 13, “Metal Wall Panels” for cladding support system brackets and post installed fasteners.

1.03 SYSTEM PERFORMANCE REQUIREMENTS

A. Air and Water Barrier Assembly, General: To perform as a continuous vapor permeable air and water barrier and as a liquid water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air and water barrier assemblies shall accommodate substrate movement and seal substrate expansion and control joints, construction material changes, penetrations, tie-ins to installed dampproofing, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

B. Material Performance: Provide materials which have an air permeance not to exceed 0.004 cubic feet per minute per square foot under a pressure differential of 0.3 inch water when tested according to ASTM E2178.

C. Water Vapor Transmission: Shall be determined in accordance with ASTM E96

Procedure B, Water Method and shall be declared as follows.

1. Minimum of 5 Perms.

D. Assembly Performance: Provide a continuous air and water barrier assembly with a maximum air leakage 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft. when tested according to ASTM E2357.

1. Air and water barrier assembly shall withstand combined design wind, fan and stack pressures, both positive and negative on the envelope without damage or displacement, and shall transfer the load to the structure.
2. Fluid applied air and water barriers shall not displace adjacent materials in the air and water barrier assembly under full load.
3. The air and water barrier assembly shall be joined in an airtight and flexible manner to the air and water barrier materials of adjacent assemblies, allowing for the relative movement of assemblies due to thermal and moisture variations, creep, and anticipated seismic movement.

E. Water Infiltration Performance: Provide a Type I continuous air and water barrier assembly with no water penetration, when tested according to ASTM E331.

1. Water Resistance (AATCC TM127): Pass.

F. Fire Propagation: Comply with NFPA 285.

G. UV Resistance: Can be exposed to sunlight for 180 days according to manufacturer's written instructions.

H. Application Temperature: 25 deg F to 120 deg F.

I. Damp Surface Tolerant: Can be applied to damp-to-touch surfaces that are free of liquid water.

1.04 PREINSTALLATION MEETINGS

A. Preconstruction Meeting: Convene a minimum of two weeks prior to commencing Work of this Section. Agenda shall include, at a minimum, construction and testing of mock-up, sequence of construction, coordination with substrate preparation, materials approved for use, compatibility of materials, coordination with installation of adjacent and covering materials, and special details of construction. Attendance is required by representatives of related trades including covering materials, substrate materials and adjacent materials.

1. Review air and water barrier requirements and installation, special details, mockups, air leakage and bond testing, air barrier protection, and work scheduling that covers air and water barriers.

B. Contractor's Additional Site Education Requirements: Through the CTA and at regular attendance at Project Meetings, be aware of all Contract work that interfaces with wall assemblies as they are being erected. Participate in various trade preconstruction

1.05 SUBMITTALS

A. Product Data: Furnish material manufacturer's instructions for evaluating, preparing, and treating substrate, temperature and other limitations of installation conditions, Technical Data, and tested physical and performance properties. Include the following.

1. Submit letter from primary air and water barrier material manufacturer indicating approval of materials that are proposed to be used that are not currently listed in the accessories section of this specification for that manufacturer's material.
2. Include statement from the primary air and water barrier material manufacturer that the materials used in their air and water barrier assembly which will be used to adhere to the underlying substrate are chemically compatible to the substrate material.

B. Shop Drawings: Furnish Shop Drawings showing locations and extent of air and water barrier assemblies and details of all typical conditions, intersections and terminations with other envelope assemblies and materials, membrane counter-flashings, details showing how gaps in the construction will be bridged, details showing how inside and outside corners are negotiated, details showing how materials that cover the materials are secured with air-tight condition maintained, and details showing how miscellaneous penetrations such as conduits, pipes, electric boxes and similar items are sealed.

C. Shop Drawings of Mock-Up: Submit Shop Drawings of proposed mock-ups showing plans, elevations, large-scale details, and air and water barrier transitions and terminations.

D. Field Test Results of Mock-Up: Submit test results of air leakage test and water leakage test of mock-up in accordance with specified standards, including retesting if initial results are not satisfactory.

E. Certifications: Submit the following.

1. Quality Assurance Program: Submit evidence of current Contractor accreditation and Installer certification under the Air Barrier Association of America's (ABAA) Quality Assurance Program (QAP). Submit accreditation number of the Contractor and certification number(s) of the ABAA Certified Installer(s).
2. Manufacturer's Certification: Furnish a project list with certification signed by the proposed installer of the air and water barrier materials, stipulating that the Installer meets the specified qualifications.
3. Installer's Certification: Furnish a project list with certification signed by the proposed installer of the air and water barrier materials, stipulating that the Installer meets the specified qualifications.
4. Product Certificates: From air and water barrier manufacturer, certifying compatibility of air and water barriers and accessory materials with Project materials that connect to or that come in contact with the air and water barrier, and compliance with NFPA 285.

F. Quality Control Submittals: Submit the following.

1. Test Reports: Furnish certified test report that air leakage and vapor permeance rates of the air and water barrier, including primary membrane and transition sheets.
2. Field Reports: Furnish manufacturer's field representative reports for each site visit.

G. Closeout Submittals: Submit the following.

1. Furnish specified warranties.
2. Furnish specified maintenance data.

1.06 QUALITY ASSURANCE

A. Contractor's Quality Control Responsibilities: Contractor is solely responsible for quality control of the Work.

1. Field Quality Assurance: Implement the site Quality Assurance Program requirements used by ABAA. Cooperate with ABAA auditors and any independent testing and inspection agencies engaged by the CTA. Do not cover the air and water barrier assembly until it has been inspected tested and accepted.
2. Contractor's Testing Laboratory: The Contractor shall employ, at his own expense, a qualified independent testing laboratory to conduct tests and submit reports for specified testing.

B. Contractor Qualifications: Shall be accredited during the complete installation period by the Air Barrier Association of America (ABAA) whose Installer(s) are certified in accordance with the site Quality Assurance Program used by ABAA.

1. Installers: Shall be certified by BPQI (Building Performance Quality Institute) for the ABAA Quality Assurance Program in accordance with the requirements outlined in the QAP program used by ABAA. Installers shall have their photo identification air and water barrier certification cards in their possession and available on the project site, for inspection upon request.

C. Mock-Up: Build mock-up representative of primary air and water barrier assemblies and glazing assemblies including backup wall and typical penetrations as acceptable to the Commissioner. Mock-up shall be dimensioned no less than eight feet wide by eight feet high and include the air and water barrier materials and air and water barrier accessories proposed for use in the exterior wall assembly. Mock-ups shall be suitable for testing as specified in the following paragraph.

1. Mock-Up Tests for Air and Water Infiltration: The third party testing agency shall test the mock-up for air and water infiltration in accordance with ASTM E1186 (air leakage location), ASTM E783 (air leakage quantification) at a pressure differential of 1.57 lb/sq. ft. and ASTM E1105 (water penetration). Use smoke tracer to locate sources of air leakage. If deficiencies are found, the air and water barrier Contractor shall reconstruct mock-up at their cost for retesting until satisfactory results are obtained. Deficiencies include air leakage beyond values specified, uncontrolled water leakage, unsatisfactory workmanship.

a. Mock-Up Tests for Fluid-Applied Membrane Adhesion: The third party testing agency shall test the mock-up for membrane adhesion in accordance with ASTM D4541 (modified), using a type II pull tester except that the membrane shall be cut

D. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances and regulations of authorities having jurisdiction. Obtain necessary approvals from all such authorities.

1.07 DELIVERY, STORAGE, AND HANDLING

A. General: Deliver and store materials in manufacturer's original packaging with labels to show name, brand, type, and grade. Store materials in protected dry location off ground in accordance with manufacturer's instructions. Do not open packaging nor remove labels until time for installation.

1.08 PROJECT / SITE CONDITIONS

A. Temperature: Install fluid applied air and water barrier material within range of ambient and substrate temperatures recommended by material manufacturer. Do not apply air and water barrier to a damp or wet substrate.

B. Field Conditions: Do not install air and water barrier in snow, rain, fog, or mist. Do not install air and water barrier when the temperature of substrate surfaces and surrounding air temperatures are below those recommended by the manufacturer.

1. Sequencing: Do not install air and water barrier material before the roof assembly has been sufficiently installed to prevent a buildup of water in the interior of the building.
2. Compatibility: Do not allow air and water barrier materials to come in contact with chemically incompatible materials.
3. Ultra-Violet Exposure: Do not expose air and water barrier materials to sunlight longer than recommended by the material manufacturer.

1.09 WARRANTY

A. Material Warranty: Provide air and water barrier manufacturer's standard product warranty, for a minimum three years from date of Substantial Completion.

B. Contractor (approved by ABAA and Manufacturer) Installation Warranty: Provide a two year installation warranty from date of Substantial Completion, including all accessories and materials of the air and water barrier assembly, against failures including loss of air tight seal, loss of watertight seal, loss of attachment, loss of adhesion and failure to cure properly.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Fluid Applied, Vapor Permeable Membrane Air and Water Barrier (AWB-01): Use regular, high temperature or low-temperature formulation depending on site conditions, within temperature ranges specified by manufacturer. Subject to compliance with requirements, provide one of the following:

1. DuPont “Tyvek Fluid Applied WB
2. GCP Applied Technologies “Perm-A-Barrier VPL 50
3. Henry Company “Air-Bloc All Weather STPE”
4. Polyguard Products Inc. “AirLok STPE Spray-N-Roll”
5. Soprema “Sopraseal LM 204 VP
6. Carlisle “Fire-Resist Barrithane VP

B. Primer: Liquid waterborne primer recommended for substrate by manufacturer.

C. Joint Reinforcing Fabric and Strip: Manufacturer's standard reinforcement fabric or glass fiber mesh tape.

D. Substrate Patching Material: Manufacturer's standard trowel-grade substrate filler.

E. Adhesive and Tape: Manufacturer's standard adhesive and pressure sensitive adhesive tape.

F. Stainless Steel Sheet: ASTM A666, Type 304, 0.0187 inc) thick, and Series 300 stainless steel fasteners.

G. Preformed Silicone-Sealant Extrusion: Manufacturer's standard system consisting of cured low-modulus silicone extrusion, sized to fit opening widths, with a single-component, neutral-curing, Class 100/50 (low-modulus) silicone sealant for bonding extrusions to substrates.

H. Transition Membrane: Manufacturer's standard vapor permeable, self adhering strip consisting of an adhesive coating over a permeable laminate.

I. Detailing Membrane: Manufacturer's standard peel and stick membrane for installation between brackets for cladding support system. Membrane shall provide self healing properties for post installed fasteners.

J. Closed-Cell Polyurethane Foam Insulation: ASTM C1029, Type II, minimum density of 1.5 lb/cu. ft. ASTM C518, thermal conductivity of “k" = 0.23 Btu in/hr/sq. ft./deg F at 75 deg F when fully aged.

1. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency. Flame spread 25 or less, smoke developed 450 or less.
2. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
3. Termination Mastic: Manufacturer's standard cold fluid applied elastomeric liquid, trowel grade

K. Sealant: Manufacturer's standard single component, neutral curing silicone; Class 100/50, as applicable to joint substrates and for sealing post installed fasteners. Comply with requirements Section 07 92 00, “Joint Sealants”.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine the areas to receive the Work and the conditions under which the Work would be performed. Remedy conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.

B. Moisture Test: Verify substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D4263 and take suitable measures until substrate passes moisture test.

3.02 COORDINATION

A. General: Coordinate installation of work of this Section with adjacent and related work to ensure provision of continuous, unbroken, durable air and water barrier system.

3.03 PREPARATION

A. Surface Preparation: Clean, prepare, treat, and seal substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air and water barrier application. Mask off adjoining surfaces not covered by air and water barrier to prevent spillage and overspray affecting other construction. At changes in substrate plane, apply

sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless steel sheet mechanically fastened to structural framing to provide continuous support for air and water barrier.

3.04 INSTALLATION

A. General: Install the entire air and water barrier system in accordance with the manufacturers' instructions, except where more stringent requirements are shown or specified. Do not cover air and water barrier until it has been tested and inspected by testing agency. Provide all products for a complete system.

B. Primer: Apply to substrates and allow to dry. Limit priming to areas that will be covered by air and water barrier in same day. Reprime areas exposed for more than 24 hours.

C. Joint Treatment: Seal joints between gypsum board panels with a strip of self adhered vapor permeable transition membrane lapped a minimum of 3 inch on both sides of the joint.

D. Application: Apply air and water barrier membrane at required rate within manufacturer's recommended application temperature range. Total dry film thickness as recommended in writing by manufacturer to meet performance requirements, but not less than 40 mil dry film thickness, applied in one or more equal coats.

E. Transition Membrane Installation: Install transition membrane, and auxiliary materials onto cured membrane according to air and water barrier manufacturer's written instructions to form a seal with adjacent construction and maintain a continuous air and water barrier. Connect and seal air and water barrier membrane continuously to floor-to floor construction, exterior glazing and window systems, glazed curtainwall systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings or

1. Roofing Membrane: Coordinate the installation of air and water barrier with installation of roofing membrane and base flashing to ensure continuity of air and water barrier with roofing membrane. Install strip transition membrane on roofing membrane or base flashing for a minimum of 3 inch of coverage is achieved over both substrates.
2. Wall Openings: Prime concealed perimeter frame surfaces of windows, curtain walls, louvers, storefronts, and doors. Apply transition membrane strip so that a minimum of 3 inch of coverage is achieved over both substrates. Maintain 3 inch of full contact over firm bearing to perimeter frames with not less than 1 inch of full contact.
3. Penetrations: Apply silicone sealant, apply preformed silicone sealant extrusion so that a minimum of 3 inch of coverage is achieved over both substrates.

F. Detailing Membrane Installation: Install detailing membrane, and auxiliary materials onto cured membrane according to air and water barrier manufacturer's written instructions to form a seal with adjacent construction and maintain a continuous air and water barrier. Membrane shall extend past base of bracket 1/2 inch and sealed to air and water barrier. Post installed fasteners shall be sealed covering head of fastener and on to base of bracket, using sealant or accessory materials as required by manufacturer for a continuous air and water barrier installation.

3.05 FIELD QUALITY CONTROL

A. Inspection and Testing: Cooperate with CTA's testing agency. Allow access to work

areas and staging. Notify CTA's testing agency in writing of schedule for Work of this Section to allow sufficient time for testing and inspection. Do not cover Work of this Section until testing and inspection is accepted. CTA's testing agency will perform the following tests.

B. Air Barrier Association of America Installer Audits: Cooperate with ABAA's testing agency. Allow access to work areas and staging. Notify ABAA in writing of schedule for Work of this Section to allow sufficient time for testing and inspection. Do not cover Work of this Section until testing and inspection is accepted. Arrange and pay for site audits by ABAA to verify conformance with the material manufacturer's instructions, the site Quality Assurance Program used by ABAA, and this section of the project specification.

1. Audits and subsequent testing shall be carried out at the following rate.

   a. 0 - 10,000 sq. ft. one audits.
   b. 10,001 - 35,000 sq. ft. two audits.
   c. 35,001 - 75,000 sq. ft. three audits.
   d. 75,001 - 125,000 sq. ft. four audits.
   e. 125,001 - 200,000 sq. ft. five audits.
   f. 200,001 sq. ft. and over requires 6 audits.

2. Forward written inspection reports to the Commissioner within 10 working days of the inspection and test being performed.
3. If the inspections reveal any defects, promptly remove and replace defective work at no additional cost to the Owner.

C. Field Tests:

1. Qualitative Air Leakage Testing: Air and water barrier assemblies tested for evidence of air leakage according to ASTM E1186, chamber pressurization or depressurization with smoke tracers.
2. Quantitative Air Leakage Testing: Air and water barrier assemblies tested for air leakage according to ASTM E783.
3. Adhesion Testing: Air and water barrier assemblies tested for minimum air and water barrier adhesion of 30 lbf/sq. in. according to ASTM D4541 for each 600 sq. ft. of installed air and water barrier or part thereof.

D. Manufacturer's Field Service: At the start of the installation, periodically as the Work progresses, and after completion, furnish the services of the air and water barrier manufacturer's technical representative at the job site as necessary to advise on every phase of the Work.

3.06 CLEANING

A. Upon completion of the Work, remove unused materials, debris, containers and equipment from the project site.

3.07 PROTECTION

A. Protect the Work during the construction period so that it will be without any indication of use or damage at the time of acceptance.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 07 27 00, Air and Water Barrier shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 07 27 00, Air and Water Barrier shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 07 41 00
METAL ROOF PANELS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this section.

1.02 SUMMARY

A. This Section includes providing all labor, materials, and equipment to provide metal roof panels and accessories of the following types:

1. New preformed pre-finished galvanized metal 1-1/2” profile standing seam roof panels.
2. Gutters, downspouts, and other accessories.
3. Snow Guards
4. Roof Vents.

B. Related Sections: The following sections contain requirements that relate to this Section:

1. Section 05 10 30 “Structural Steel.
2. Section 05 31 00 “Steel Deck” Section for metal roof deck.
3. Section 07 62 00 "Sheet Metal Flashing and Trim".
4. Section 07 90 00 "Joint Sealers”.

1.03 REFERENCES

A. American Iron and Steel Institute (AISC): "Specification for the Design of Cold-Formed Steel Structural Members".

B. Sheet Metal and Air Conditioning Contractors National Association (SMACNA): "Architectural Sheet Metal Manual".

C. Steel Deck Institute Inc. (SDI): "SDI Design Manual for Composite Decks, Form Decks and Roof Decks".

D. ASTM A653: Standard Specification for Steel Sheet, Zinc-Coated (galvanized) or Zinc- Iron Alloy-Coated (galvanealed) by the Hot-Dip Process.

E. ASTM A924: Standard Specification for General Requirements for Steel Sheet, Metallic- Coated by the Hot-Dip Process.

1.04 SYSTEM PERFORMANCE REQUIREMENTS

A. Design Load and Deflection: Design, fabricate and install component parts so that the completed Work shall withstand inward and outward loading applied normal to the

plane of metal roofing panels with deflection not exceeding 1/240 of the clear span between supports.

1. Wind Load: As indicated on Drawings, per building code or 30 PSF whichever is greater shall apply.
2. Snow Load: Per building code or 25 PSF whichever is greater shall apply.
3. Point Load: Per building code or 200 pounds whichever is greater shall apply.

B. Design Factor of Safety: Design, fabricate and install component parts of Work, includingroofing panels and connections, with a factor of safety not less than 1.5, such that failure of any component shall not occur at less than 1.5 times the maximum design load, except where more stringent requirements are specified. Failure is defined as breakage, component disengagement, or permanent distortion in excess of 0.2% of the span of each member.

C. Building Movement: Design, fabricate and install the Work to withstand building movements including thermal movements, loading deflections and similar movements. Engineer will furnish specific data on anticipated building movements as may be requested by Contractor.

D. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) when tested according to ASTM E 283 at the following test-pressure difference:

1. Test-Pressure Difference: 1.57 lbf/sq. ft. (75 Pa).

E. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:

1. Test-Pressure Difference: 2.86 lbf/sq. ft. (137 Pa).

F. Thermal Movement: Design, fabricate and install the Work to withstand expansion and contraction forces resulting from a 120°F ambient temperature range of -20 deg F to +100 deg F, which may result in exterior metal surface temperature exceeding 180 deg F.

1.05 SUBMITTALS

A. Product data including manufacturer's product specifications, standard details, certified product test results, installation instructions, and general recommendations, as applicable to materials and finishes for each component and for total panel system.

1. Provide product data and specifications for underlayment and ice and water shield.
2. Provide product data, specifications and finishes for snow guards.
3. Provide product data, specifications, installation details and finish for roof vents.

B. Samples for initial selection purposes in form of manufacturer's color charts or chips showing full range of colors, textures, and patterns available for panels with factory-applied finishes.

C. Samples for verification purposes of roof panels. Provide sample panels 12 inches long by actual panel width, in the profile, style, color, and texture indicated. Including

but not limited to trim, sills, ridge pieces, gutters, flashing, clips, fasteners, fillers, closures, and other panel accessories.

D. Furnish shop drawings for the fabrication and installation of the metal roof panel system. Prepare details at not less than 3" = 1'-0" minimum scale. Include layout plan showing roof panel lengths locations of lap joints between panels. Indicate radius required of panels. Provide shop drawings for all accessories including closure strips, supports, trim, flashing, gutters, downspouts, etc. Indicate field verified dimensions, conditions, and support for new panels. Indicate materials and finishes. Show typical details of the conditions for every member, joint, anchorage and support in the system.

E. Structural Calculations: Furnish engineering calculations to show that maximum stresses and deflections do not exceed specified performance requirements under full design loading.

F. Maintenance Manuals: Furnish complete manuals describing the materials, devices, and procedures to be followed in cleaning and maintaining the Work. Include manufacturer's brochures and parts lists describing the actual materials used in the work, including metal alloys, finishes, and major components. Assemble manuals for component parts into single binders identified for each system.

1.06 QUALITY ASSURANCE

A. Standards: Comply with applicable requirements and details of AISC "Specification for the Design of Cold-Formed Steel Structural Members", SMACNA "Architectural Sheet Metal Manual" and SDI "SDI Design Manual for Composite Decks, Form Decks and Roof Decks".

B. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals from all such authorities.

C. Wind Uplift: Provide roof panel system including supports meeting requirements of Underwriters Laboratories, Inc. for Class 90 wind uplift resistance.

D. Field Measurements: Where possible, prior to fabrication of panels, take field measurements of structure or substrates to receive panel system. Allow for trimming panel units where final dimensions cannot be established prior to fabrication.

E. Structural Design: Panels must be designed to support snow and wind loads as defined by the local building code for the supports spaced as shown on the Drawings. Deck profile, type, depth, and thickness to be selected to provide superimposed design loads required and as determined using SDI Design Manual No. 30 construction loading criteria. Provide test data or calculations signed by a Structural Engineer, licensed in the state of Illinois.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver panels and other components so they will not be damaged or deformed. Package roof panels for protection against transportation damage including damage to the surface.

B. Handling: Exercise care in unloading, storing, and erecting roof panels to prevent bending, warping, twisting, and surface damage.

C. Stack materials on platforms or pallets, covered with tarpaulins or other suitable weather- tight ventilated covering. Store metal roof panels so that they will not accumulate water. Do not store panels in contact with other materials that might cause staining, denting, or other surface damage.

1.08 WARRANTY

A. Warranty: Furnish 10 year written warranty from date of final acceptance, signed by the Contractor and Installer, agreeing to repair or replace Work which has leaked or otherwise failed as a result of defects in materials or workmanship. Upon notification of such defects, within the warranty period, make necessary repairs of replacement at the convenience of the Authority.

B. Factory Finish Warranty: Furnish manufacturer's 20 year written warranty, stating that the factory applied finishes will not develop excessive fading or excessive non-uniformity of color or shade, and will not crack, peel, pit, corrode, or otherwise fail as a result of defects in materials or workmanship within the following defined limits. This warranty shall be in addition to and not a limitation of other rights the Authority may have against the Contractor under the Contract Documents. Upon notification of such defects, within the warranty period, make necessary repairs of replacement at the convenience of the Authority.

1. "Excessive Fading": A change in appearance which is perceptible and objectionable as determined by the Engineer when visually compared with the original color range standards.
2. "Excessive Non-Uniformity": Non-uniform fading to the extent that adjacent panels have a color difference greater than the original acceptable range of color.
3. "Will Not Pit or Otherwise Corrode": No pitting or other type of corrosion, discernible from a distance of 10', resulting from the natural elements in the atmosphere at the project site.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering metal roof panel systems that may be incorporated in the work include but are not limited to the following:

1. Steel Roof Panels:

a. AEP-SpanBerridge Manufacturing Co.
b. American Building Components
c. Centria Architectural Systems
d. Englert
e. Epic Metals
f. Fabral
g. Kingspan
h. McElroy Metal
i. Metal Building Components Inc.

j. Metal Sales Manufacturing Corp.
k. Morin
l. Petersen Aluminum Corp
m. Or Approved Equal.

2.02 SHEET MATERIALS

A. Structural Quality Galvanized Steel Sheet: Hot-dip zinc-coated steel sheet complying with ASTM A 653 with G90 coating complying with ASTM A 924, Grade C or to suit manufacturer's standards. Factory formed to profile indicated pre-finished.

2.03 ROOF PANELS

A. Standing-seam roof panels: Manufacturer’s standard factory-formed narrow batten seam panel system designed for mechanical attachment of panels to steel deck using concealed fasteners. Comply with ASTM E 1514. Form panels of 20- gage zinc-coated steel sheets factory finished after fabrication. Roof panels shall be continuous lengths without lap seams. Provide 1” deep profile with rib spacing at 16” o.c. or as approved by the Authority.

1. Galvanized and Shop Primed Steel Sheet: ASTM A 653, Structural Steel Grade 33 minimum; ASTM A 924 G90 zinc coating; cleaned, pretreated, and painted in accordance with deck and coating manufacturers’ recommendations.
2. Design Uncoated Steel Thickness: 20 gauge or as required for design loading.
3. Span Condition: Single Span.
4. Side laps: Deck shall have full-depth side laps that can be mechanically fastened together.
5. Edges must be able to receive trim pieces; trim pieces by panel manufacturer.
6. Rating: UL 580 Class 90 rated (wind uplift) panel assembly.
7. Flashing and Trim: 22 ga, galvanized and finished to match panels.
8. Fasteners: Manufacturer’s standard to obtain the required performance, stainless steel.
9. All fasteners shall be fully concealed.

B. Provide all related and required matching trim, closure pieces, ridge pieces, cap pieces, flashing, gutter, downspout and other accessories for a complete roof system. Finish to match roof panels.

2.04 METAL FINISHES

A. General: Apply coatings either before or after forming and fabricating panels, as required by coating process and as required for maximum coating performance capability. Panels to be pre-finished in the factory.

B. Protect coating either by application of strippable film or by packing plastic film or other suitable material between panels in a manner to properly protect the finish.

C. Coating system for metal roof panels:

1. Galvanized Sheet Steel, ASTM A 924.
2. Fluoropolymer Finish, three coat system, Duragard Plus or approved equal by the Authority:

a. Pretreatment: Caustic etch and conversion coating, each followed by water rinse.

b. Primer: 0.8 ± 0.05 mil thick.
c. Color coat: 0.8 ± 0.05 mil 70 percent "Kynar 500" or 70 percent "Hylar 5000" polyvinylidene fluoride coat (color coat).
d. Finish coat: 0.8 ± 0.05 mil 70 percent "Kynar 500" or 70 percent "Hylar 5000" polyvinylidene fluoride (clear coat).

D. All surfaces to be galvanized. All surfaces exposed to view (top, bottom, and edges) for all panels and accessories to be finished with above specified finish and finish coat over galvanizing. Color(s) for each surface as selected by Authority.

2.05 MISCELLANEOUS MATERIALS

A. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets, self-locking bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Type 300 series stainless steel fasteners.

1. Provide exposed fasteners with heads matching color of roof panel by means of plastic caps or factory-applied coating.

B. Accessories: Except as indicated as work of another specification section, provide pre-finished components required for a complete roof panel system, including trim, sills, ridge pieces, clips, flashing, gutters, , sealants, gaskets, fillers, closure strips, gutters, downspouts, snow guards, roof vents and similar items. Accessories as required by manufacturer of roof panel system and as shown on approved shop drawings. Match materials and finishes of panels.

1. Provide metal flashing, closure pieces, trim and other pieces to match panels to provide for water runoff and prevent leakage at changes of direction, angles, joints between panels, where panels meet walls, where panels meet gutters, and other surfaces, and other locations. Detail system and provide accessories for a water tight installation.
2. Flexible Closure Strips: Closed-cell, self-extinguishing, expanded cellular rubber or cross-linked polyolefin foam flexible closure strips. Cut or pre-mold to match configuration of roofing panels. Provide closure strips where indicated or necessary to ensure weather-tight construction.
2. Sealing Tape: Pressure-sensitive 100 percent solids polyisobutylene compound sealing tape with release paper backing. Provide permanently elastic, non-sag, nontoxic, non-staining tape.
3. Joint Sealant: One-part elastomeric polyurethane, polysulfide, or silicone rubber sealant as specified by the building manufacturer. Installation shall comply with requirements of Division 07, Section "Joint Sealers" of these specifications.
4. Concealed sealants and gaskets: Manufacturer's standard.
5. Provide snow guards if shown on the drawings or required otherwise. Snow guards to be of same material and of same finish as the metal roof panels unless approved otherwise.
6. Provide roof vents as shown on the drawings or as required by code. Roof vents to be of same material and finish as metal roof panels unless shown or approved otherwise. Size of roof vents as shown or required by code. Provide screening at roof vent openings. Design of roof vent and installation location and details to prevent intrusion of rain and snow and avoid leaks.

C. Felt underlayment: Asphalt saturated organic felt underlayment, Type I. Meets or exceeds the physical requirements of ASTM D4869 and D226. Meets UL Class A fire rating when used with UL Class A rated roof coverings. Minimum 30 lb. weight.

D. Ice and Water Shield: Self-sealing, ice and water shield of rubberized asphalt adhesive sheet membrane backed by a layer of high density cross laminated polyethylene. Meets UL Class A fire rating when used with UL Class A rated roof coverings. Minimum 40 mil thickness.

2.06 GUTTERS AND DOWNSPOUTS

A. Fabricate from pre-finished galvanized steel with same type of finish and color as roof panels.

B. Form sheet metal to profile dimensions indicated, free from distortions and defects detrimental to water-tight system.

1. Seam and seal metal joints except for joints indicated by SMACNA to be welded.

C. Provide removable debris screens for gutters as indicated, fabricated from frame and 1/4 inch mesh wire cloth of same material used for gutters or approved compatible material. Provide formed sheet metal frame on 4 sides of each screen unit. Length of screen units not to exceed 10 feet.

D. Provide wire basket type strainers at downspouts as indicated, fabricated from wire and sheet metal of same material used for downspouts or approved compatible material.

E. Gutter Supports: Straps of same material and finish.

F. Downspout Supports: Straps of same material and finish.

2.07 PANEL FABRICATION

A. General: Fabricate and finish roof system panels and accessories at the factory as required to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and dimensional requirements and with structural requirements.

B. Curved roof panels shall be pre-formed to required radius in single piece full length panels with no seams as indicated on the Drawings. Verify radius in field for each site.

1. Coat all exposed and cut or drilled edges with rust-inhibitive coating system to match existing including galvanizing touch up repair paint and finish paint touch up.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine the areas to receive the Work and the conditions under which the Work would be performed. Contractor shall remedy conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.

B. Steel deck to be securely installed and clean, ready to receive new metal canopy panels.

3.02 UNDERLAYMENT

A. Provide and install ice and water shield where indicated or required 24” upward from roof edge. Overlap edges. Secure according to manufacturer’s recommendations and instructions.

B. Provide and install asphalt saturated felt underlayment over roof deck. Overlap edges downward in direction of roof slope. Secure according to manufacturer’s recommendations and instructions.

3.03 INSTALLATION

A. General: Comply with manufacturers' instructions and specifications to achieve a watertight installation, as applicable to project conditions and supporting substrates. Anchor panels and other components of the work securely in place, with provisions for thermal and structural movement. Coordinate work with substrate installation.

1. Field cutting of exterior panels by torch is not permitted.
2. For panels installed with exposed fasteners, the fasteners are to be pre-finished to match panel finishes.
3. Provide for drainage by sloping panels as indicated on drawings or as otherwise required.

C. Align all panel edges for a straight, even line at gutter and roof edge. Fasten trim around openings and similar elements with self-tapping screws.

D. Fastening: Fasten through material laps. Secure roof panels to metal deck according to fastening schedule, as shown on shop drawings, as recommended by manufacturer, and as required to meet code and wind requirements. Use approved fasteners of type and of sufficient length to penetrate the roof panels and secure the metal roof panels to the structure to meet all requirements.

E. Install screw fasteners with power tools having controlled torque adjusted to compress neoprene washer tightly without damage to washer, screw, threads, or roof panels.

1. Spacing of fasteners per manufacturer’s recommendations for actual conditions and design criteria. Provide fastening along perimeters.

F. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1 1/2 inches. Lap joints to be lapped 2 inches minimum.

G. Provide weatherproof escutcheons for pipe and conduit penetrating material, if any.

H. Accessories: Install components as required in manufacturers' instructions for a complete roof panel system.

1. Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to roof panel manufacturer’s written instructions, mechanically fastened to roof panels.

I. Coordinate installation of sheet metal fascia and other items at roof and as a part of the metal roof system.

J. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of roof panels, and support of other work.

K. Joint Sealers: Install gaskets, joint fillers, and sealants for weatherproof performance of panel systems. Provide types of gaskets, sealants, and fillers indicated or, if not otherwise indicated, types specified by panel manufacturer.

1. Provide weatherseal under ridge cap. Flash and seal roof panels at eave and rake with rubber, neoprene, or other closures to exclude weather.
2. Installation shall comply with requirements of Division 07, Section "Joint Sealers" of these specifications.

L. Provide sealant tape at lapped joints of ribbed or fluted roof sheets and between roof sheets and protruding equipment, vents, and accessories.

M. Apply a continuous ribbon of sealant tape to clean, dry surface of the weather side of fastenings on end laps, side laps, at lapped joints of corrugated nesting-type, ribbed or fluted roof panels and elsewhere as needed to make roof sheets weatherproof to driving rains.

N. Installation Tolerances: Shim and align panel units within installed tolerance of 1/4 inch in 20'-0" on level/plumb/slope and location/line as indicated, and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

O. Provide and install snow guards where shown on the drawings. Install as recommended by the metal roof panel system manufacturer. Use non corrosive fasteners finished to match the snow guard material unless approved otherwise. Snow guards shall be secured to the standing seems and without compromising the integrity or water resistance of the metal roof panel system.

P. Provide and install roof vents as shown on the drawings and/or as required by code. Vents to be installed on curbs, flashed and otherwise installed to avoid roof leaks and intrusion of snow and rain. Secure using recommended fasteners and without compromising the integrity of the roofing system.

3.04 CLEANING AND PROTECTION

A. Damaged Units: Touch-up marred or abraded surfaces. Replace roof panels or accessories and other components of the work that are bent, dented or otherwise have been damaged or have deteriorated beyond successful repair by means of minor repair procedures. Re-solder loose, thin, or leaking joints or connections.

B. Cleaning: Remove temporary protective coverings and strippable films (if any) as soon as each panel is installed. Upon completion of panel installation, clean finished surfaces as specified by panel manufacturer, and maintain in a clean condition during construction.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 07 41 00, Metal Roof Panels shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 07 41 00, Metal Roof Panels shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 07 41 00.S
METAL ROOF PANELS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this section.

1.02 SUMMARY

A. This Section includes providing all labor, materials, and equipment to provide metal roof panels and accessories of the following types:

1. New preformed pre-finished galvanized base metal 1-1/2” profile standing seam roof panels.
2. Gutters, downspouts, and other accessories.
3. Snow Guards.
4. Roof Vents.

B. Related Sections: The following sections contain requirements that relate to this Section:

1. Division 05 Section for “Structural Steel”.
2. Division 05 Section for “Steel Deck”.
3. Division 05 Section for “Cold-Formed Metal Framing”.
4. Division 06 Section “Rough Carpentry”.
5. Division 07 Section “EPDM Roof System”.
6. Division 07 Section "Sheet Metal Flashing and Trim".
7. Division 07 Section “Snow Guards”.
8. Division 07 Section "Joint Sealants”.

1.03 REFERENCES

A. American Iron and Steel Institute (AISC): "Specification for the Design of Cold-Formed Steel Structural Members".

B. Sheet Metal and Air Conditioning Contractors National Association (SMACNA): "Architectural Sheet Metal Manual".

C. Steel Deck Institute Inc. (SDI): "SDI Design Manual for Composite Decks, Form Decks and Roof Decks".

D. ASTM A653: Standard Specification for Steel Sheet, Zinc-Coated (galvanized) or Zinc Iron Alloy-Coated (galvannealed) by the Hot-Dip Process.

E. ASTM A924: Standard Specification for General Requirements for Steel Sheet, Metallic Coated by the Hot-Dip Process.

1.04 SYSTEM PERFORMANCE REQUIREMENTS

A. Design Load and Deflection: Design, fabricate and install component parts so that the completed Work shall withstand inward and outward loading applied normal to the plane

of metal roofing panels with deflection not exceeding 1/240 of the clear span between supports.

1. Wind Load 30 PSF.
2. Snow Load 25 PSF.
3. Point Load 200 Pounds.

B. Design Factor of Safety: Design, fabricate and install component parts of Work, including roofing panels and connections, with a factor of safety not less than 1.5, such that failure of any component shall not occur at less than 1.5 times the maximum design load, except where more stringent requirements are specified. Failure is defined as breakage, component disengagement, or permanent distortion in excess of 0.2% of the span of each member.

C. Building Movement: Design, fabricate and install the Work to withstand building movements including thermal movements, loading deflections and similar movements. Engineer will furnish specific data on anticipated building movements as may be requested by Contractor.

D. Thermal Movement: Design, fabricate and install the Work to withstand expansion and contraction forces resulting from a 120°F ambient temperature range of -20°F to +100°F, which may result in exterior metal surface temperature exceeding 180°F.

1.05 SUBMITTALS

A. Product data including manufacturer's product specifications, standard details, certified product test results, installation instructions, and general recommendations, as applicable to materials and finishes for each component and for total panel system.

1. Provide product data and specifications for underlayment and ice and water shield.
2. Provide product data, specifications and finishes for snow guards.
3. Provide product data, specifications, installation details and finish for roof vents.

B. Samples for initial selection purposes in form of manufacturer's color charts or chips showing full range of colors, textures, and patterns available for panels with factory-applied finishes.

C. Samples for verification purposes of roof panels. Provide sample panels 12 inches long by actual panel width, in the profile, style, color, and texture indicated. Including but not limited to trim, sills, ridge pieces, gutters, flashing, clips, fasteners, fillers, closures, and other panel accessories.

D. Furnish shop drawings for the fabrication and installation of the metal roof panel system. Prepare details at not less than 3" = 1'-0" minimum scale. Include layout plan showing roof panel lengths locations of lap joints between panels. Indicate radius required of panels. Provide shop drawings for all accessories including closure strips, supports, trim, flashing, gutters, downspouts, etc. Indicate field verified dimensions, conditions, and support for new panels. Indicate materials and finishes. Show typical details of the conditions for every member, joint, anchorage and support in the system.

E. Structural Calculations: Furnish engineering calculations to show that maximum stresses and deflections do not exceed specified performance requirements under full design loading.

F. Maintenance Manuals: Furnish complete manuals describing the materials, devices, and procedures to be followed in cleaning and maintaining the Work. Include manufacturer's brochures and parts lists describing the actual materials used in the work, including metal alloys, finishes, and major components. Assemble manuals for component parts into single binders identified for each system.

1.06 QUALITY ASSURANCE

A. Standards: Comply with applicable requirements and details of AISC "Specification for the Design of Cold-Formed Steel Structural Members", SMACNA "Architectural Sheet Metal Manual" and SDI "SDI Design Manual for Composite Decks, Form Decks and Roof Decks".

B. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals from all such authorities.

C. Wind Uplift: Provide roof panel system including supports meeting requirements of Underwriters Laboratories, Inc. for Class 90 wind uplift resistance.

D. Field Measurements: Where possible, prior to fabrication of panels, take field measurements of structure or substrates to receive panel system. Allow for trimming panel units where final dimensions cannot be established prior to fabrication.

E. Structural Design: Panels must be designed to support snow and wind loads as defined by the local building code for the supports spaced as shown on the Drawings. Deck profile, type, depth, and thickness to be selected to provide superimposed design loads required and as determined using SDI Design Manual No. 30 construction loading criteria. Provide test data or calculations signed by a Structural Engineer, licensed in the state of Illinois.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver panels and other components so they will not be damaged or deformed. Package roof panels for protection against transportation damage including damage to the surface.

B. Handling: Exercise care in unloading, storing, and erecting roof panels to prevent bending, warping, twisting, and surface damage.

C. Stack materials on platforms or pallets, covered with tarpaulins or other suitable weather-tight ventilated covering. Store metal roof panels so that they will not accumulate water. Do not store panels in contact with other materials that might cause staining, denting, or other surface damage.

1.08 WARRANTY

A. Warranty: Furnish 10 year written warranty from date of final acceptance, signed by the Contractor and Installer, agreeing to repair or replace Work which has leaked or otherwise failed as a result of defects in materials or workmanship. Upon notification of such defects, within the warranty period, make necessary repairs of replacement at the convenience of the Authority.

B. Factory Finish Warranty: Furnish manufacturer's 20 year written warranty, stating that the factory applied finishes will not develop excessive fading or excessive non-uniformity of color or shade, and will not crack, peel, pit, corrode, or otherwise fail as a result of defects

in materials or workmanship within the following defined limits. This warranty shall be in addition to and not a limitation of other rights the Authority may have against the Contractor under the Contract Documents. Upon notification of such defects, within the warranty period, make necessary repairs of replacement at the convenience of the Authority.

1. "Excessive Fading": A change in appearance which is perceptible and objectionable as determined by the Engineer when visually compared with the original color range standards.
2. "Excessive Non-Uniformity": Non-uniform fading to the extent that adjacent panels have a color difference greater than the original acceptable range of color.
3. "Will Not Pit or Otherwise Corrode": No pitting or other type of corrosion, discernible from a distance of 10', resulting from the natural elements in the atmosphere at the project site.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering metal roof panel systems that may be incorporated in the work include but are not limited to the following:

1. Steel Roof Panels:

a. AEP-Span.
b. Allied Roof System.
c. Architectural Sheet Metal and Panels, Inc.
d. ASC Pacific, Inc.
e. ATAS Aluminum Corp.
f. Berridge Manufacturing Co.
g. Building Components, Inc.
h. Butler Manufacturing Co.
i. Centria Architectural Systems.
j. Consolidated Systems, Inc.
k. McElroy Metal.
l. Metal Building Components, Inc. (MBCI).
m. Merchant & Evans, Inc.
n. Or Approved Equal.

2.02 SHEET MATERIALS

A. Structural Quality Galvanized Steel Sheet: Hot-dip zinc-coated steel sheet complying with ASTM A 653 with G90 coating complying with ASTM A 924, Grade C or to suit manufacturer's standards. Factory formed to profile indicated, and pre-finished.

2.03 ROOF PANELS

A. Standing-seam roof panels: Manufacturer’s standard factory-formed lap-seam panel system designed for mechanical attachment of panels to steel deck using concealed fasteners to greatest extent possible. Comply with ASTM E 1514. Form panels of 22 gage zinc-coated steel sheets factory finished after fabrication. Roof panels shall be continuous lengths without lap seams. Provide flat panels with 1-½” high, 180 degree

mechanically locked standing seam profile with rib spacing at 12” O.C. or as indicated on documents.

1. Galvanized and Shop Primed Steel Sheet: ASTM A 653, Structural Steel Grade 33 minimum; ASTM A 924 G90 zinc coating; cleaned, pretreated, and painted in accordance with deck and coating manufacturers’ recommendations.
2. Design Uncoated Steel Thickness: 22 gauge or as required for design loading.
3. Texture: Smooth, flat panels.
4. Span Condition: Single Span.
5. Side laps: Deck shall have full-depth side laps that can be mechanically fastened together.
6. Edges must be able to receive trim pieces; trim pieces by panel manufacturer.
7. Rating: UL Classified 90 rated (wind uplift) panel assembly.
8. Flashing and Trim: 24 gauge, G90 galvanized and finished to match panels.
9. Fasteners: Manufacturer’s standard to obtain the required performance, stainless steel, finish to match panels.

B. Provide all related and required matching trim, closure pieces, ridge pieces, cap pieces, flashing, gutter, downspout and other accessories for a complete roof system, with finish to match roof panels.

2.04 METAL FINISHES

A. General: Apply coatings either before or after forming and fabricating panels, as required by coating process and as required for maximum coating performance capability. Panels to be pre-finished in the factory.

B. Protect coating either by application of strippable film or by packing plastic film or other suitable material between panels in a manner to properly protect the finish.

C. Coating system for metal roof panels:

1. Galvanized Sheet Steel, ASTM A 924.
2. Fluoropolymer Finish, three coat system, Duragard Plus or approved equal by the Authority:
   a. Pretreatment: Caustic etch and conversion coating, each followed by water rinse.
   b. Primer: 0.8 $\pm$ 0.05 mil thick.
   c. Color coat: 0.8 $\pm$ 0.05 mil 70 percent "Kynar 500" or 70 percent "Hylar 5000" polyvinylidene fluoride coat (color coat).
   d. Finish coat: 0.8 $\pm$ 0.05 mil 70 percent "Kynar 500" or 70 percent "Hylar 5000" polyvinylidene fluoride (clear coat).

C. All surfaces to be galvanized. All surfaces exposed to view (top, bottom, and edges) for all panels and accessories to be finished with above specified finish and finish coat over galvanizing. Color(s) for each surface as selected by Architect or the Authority.

2.05 MISCELLANEOUS MATERIALS

A. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets, self-locking bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Type 300 series stainless steel fasteners.

1. Provide exposed fasteners with heads matching color of roof panel by means of plastic caps or factory-applied coating.

    a. Provide metal-backed neoprene washers under heads of exposed fasteners bearing on weather side of panels.
    b. Locate and space exposed fasteners in true vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of neoprene washer.

B. Accessories: Except as indicated as work of another specification section, provide prefinished components required for a complete roof panel system, including trim, sills, ridge pieces, clips, flashing, gutters, , sealants, gaskets, fillers, closure strips, gutters, downspouts, snow guards, roof vents and similar items. Accessories as required by manufacturer of roof panel system and as shown on approved shop drawings. Match materials and finishes of panels.

1. Provide metal flashing, closure pieces, trim and other pieces to match panels to provide for water runoff and prevent leakage at changes of direction, angles, joints between panels, where panels meet walls, where panels meet gutters, and other surfaces, and other locations. Detail system and provide accessories for a water tight installation.
2. Flexible Closure Strips: Closed-cell, self-extinguishing, expanded cellular rubber or cross-linked polyolefin foam flexible closure strips. Cut or pre-mold to match configuration of roofing panels. Provide closure strips where indicated or necessary to ensure weather-tight construction.
2. Sealing Tape: Pressure-sensitive 100 percent solids polyisobutylene compound sealing tape with release paper backing. Provide permanently elastic, non-sag, nontoxic, non-staining tape.
3. Joint Sealant: One-part elastomeric polyurethane, polysulfide, or silicone rubber sealant as specified by the building manufacturer. Installation shall comply with requirements of Division 07, Section "Joint Sealers" of these specifications.
4. Concealed sealants and gaskets: Manufacturer’s standard.
5. Provide snow guards if shown on the drawings or required otherwise. Snow guards to be of same material and of same finish as the metal roof panels unless specified otherwise.
6. Provide roof vents as shown on the drawings or as required by code. Roof vents to be of same material and finish as metal roof panels unless shown or approved otherwise. Size of roof vents as shown or required by code. Provide screening at roof vent openings. Design of roof vent and installation location and details to prevent intrusion of rain and snow and avoid leaks.

C. Slip Sheet:
1. Felt underlayment of asphalt saturated organic felt, Type I. Meets or exceeds the physical requirements of ASTM D4869 and D226. Meets UL Class A fire rating when used with UL Class A rated roof coverings. Minimum 30 lb. weight.
2. Other slip sheet material as provided by metal panel system, and approved by Architect and Authority.

D. Water Resistant Barrier (WRB) / Ice and Water Shield:
    1. Provide EPDM roofing system, fully adhered, 0.060” thickness, as a continuous application over entirety of deck at sloping, vertical, and horizontal / low-slope locations, and as indicated on drawings.
    2. Alternative to EPDM, as approved by architect and authority: Provide continuous application over entirety of deck, of self-adhering, self-sealing, ice and water shield of rubberized asphalt adhesive sheet membrane backed by a layer of high

density cross laminated polyethylene. Apply horizontally; lap all joints a minimum of 2 inches. Material shall meet UL Class A fire rating when used with UL Class A rated roof coverings. Minimum 40 mil thickness.

E. Deck: Provide continuous solid wood based sheathing deck beneath entirety of metal roof application. Attach with countersunk head screws.

2.06 GUTTERS AND DOWNSPOUTS

A. Fabricate from pre-finished galvanized steel with same type of finish and color as roof panels.

B. Form sheet metal to profile dimensions indicated, free from distortions and defects detrimental to water-tight system.

1. Seam and seal metal joints except for joints indicated by SMACNA to be welded or soldered.

C. Provide removable debris screens for gutters as indicated, fabricated from frame and 1/4 inch mesh wire cloth of same material used for gutters or approved compatible material. Provide formed sheet metal frame on 4 sides of each screen unit. Length of screen units not to exceed 10 feet.

D. Provide wire basket type strainers at downspouts as indicated, fabricated from wire and sheet metal of same material used for downspouts or approved compatible material.

E. Gutter Supports: Straps of same material and finish.

F. Downspout Supports: Straps of same material and finish.

2.07 PANEL FABRICATION

A. General: Fabricate and finish roof system panels and accessories at the factory as required to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and dimensional requirements and with structural requirements.

B. Curved roof panels shall be pre-formed to required radius in single piece full length panels with no seams as indicated on the Drawings. Verify radius in field for each site.

1. Coat all exposed and cut or drilled edges with rust-inhibitive coating system to match existing including galvanizing touch up repair paint and finish paint touch up.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine the areas to receive the Work and the conditions under which the Work would be performed. Contractor shall remedy conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.

B. Steel deck to be securely installed and clean, ready to receive new metal canopy panels.

3.02 UNDERLAYMENT

A. Provide and install WRB / ice and water shield where indicated onto entirety of roof deck and secure according to manufacturer's recommendations and instructions, with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps and edges with roller. Cover underlayment within 14 days.

B. Provide and install slip sheet over water-proofed roof deck. Overlap edges downward in direction of roof slope. Secure according to manufacturer's recommendations and instructions.

3.03 INSTALLATION

A. General: Comply with manufacturers' instructions and specifications to achieve a watertight installation, as applicable to project conditions and supporting substrates. Anchor panels and other components of the work securely in place, with provisions for thermal and structural movement. Coordinate work with substrate installation.

1. Field cutting of exterior panels by torch is not permitted.
2. For panels installed with exposed fasteners, the fasteners are to be pre-finished to match panel finishes.
3. Provide for drainage by sloping panels as indicated on drawings or as otherwise required.

B. Align all panel edges for a straight, even line at gutter and roof edge. Fasten trim around openings and similar elements with self-tapping screws.

C. Fastening: Fasten through material laps. Secure roof panels to metal deck according to fastening schedule, as shown on shop drawings, as recommended by manufacturer, and as required to meet code and wind requirements. Use approved fasteners of type and of sufficient length to penetrate the roof panels and secure the metal roof panels to the structure to meet all requirements.

D. Install screw fasteners with power tools having controlled torque adjusted to compress neoprene washer tightly without damage to washer, screw, threads, or roof panels.

1. Spacing of fasteners per manufacturer's recommendations for actual conditions and design criteria. Provide fastening along perimeters.

E. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1 ½ inches. Lap joints to be lapped 2 inches minimum.

F. Provide weatherproof escutcheons for pipe and conduit penetrating material, if any.

G. Accessories: Install components as required in manufacturers' instructions for a complete roof panel system.

1. Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to roof panel manufacturer's written instructions, mechanically fastened to roof panels.

H. Coordinate installation of sheet metal fascia and other items at roof and as a part of the metal roof system.

I. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of roof panels, and support of other work.

J. Joint Sealers: Install gaskets, joint fillers, and sealants for weatherproof performance of panel systems. Provide types of gaskets, sealants, and fillers indicated or, if not otherwise indicated, types specified by panel manufacturer.

1. Provide weatherseal under ridge cap. Flash and seal roof panels at eave and rake with rubber, neoprene, or other closures to exclude weather.
2. Installation shall comply with requirements of Division 07, Section "Joint Sealers" of these specifications.

K. Provide sealant tape at lapped joints of ribbed or fluted roof sheets and between roof sheets and protruding equipment, vents, and accessories.

L. Apply a continuous ribbon of sealant tape to clean, dry surface of the weather side of fastenings on end laps, side laps, at lapped joints of corrugated nesting-type, ribbed or fluted roof panels and elsewhere as needed to make roof sheets weatherproof to driving rains.

M. Installation Tolerances: Shim and align panel units within installed tolerance of 1/4 inch in 20'-0" on level/plumb/slope and location/line as indicated, and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

N. Provide and install snow guards where shown on the drawings. Install as recommended by the metal roof panel system manufacturer. Use non-corrosive fasteners finished to match the snow guard material unless approved otherwise. Snow guards shall be secured to the standing seems without penetrating or compromising the integrity or water resistance of the metal roof panel system.

O. Provide and install roof vents as shown on the drawings and/or as required by code. Vents to be installed on curbs, flashed and otherwise installed to avoid roof leaks and intrusion of snow and rain. Secure using recommended fasteners and without compromising the integrity of the roofing system.

3.04 CLEANING AND PROTECTION

A. Damaged Units: Touch-up marred or abraded surfaces. Replace roof panels or accessories and other components of the work that are bent, dented or otherwise have been damaged or have deteriorated beyond successful repair by means of minor repair procedures. Re-solder loose, thin, or leaking joints or connections.

B. Cleaning: Remove temporary protective coverings and strippable films (if any) as soon as each panel is installed. Upon completion of panel installation, clean finished surfaces as specified by panel manufacturer, and maintain in a clean condition during construction.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of METAL ROOF PANELS shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of METAL ROOF PANELS shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000.

END OF SECTION

SECTION 07 42 13
METAL WALL PANELS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this section.

1.02 SUMMARY

A. Section includes metal plate wall panels.

B. Related Requirements:

1. Section 07 27 00, “Air and Water Barrier” for attachment detailing required for post application of attachments on applied membrane.

1.03 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference.

1. Meet with metal panel Installer, metal panel manufacturer's representative, structural support Installer, and installers whose work interfaces with or affects metal panels, including installers of doors.
2. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.

1.04 SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. Shop Drawings:

1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment assembly, trim, flashings, closures, and accessories; and special details.
2. Accessories: Include details of the flashing, trim, and anchorage, at a scale of not less than 1-1/2 inches per 12 inches.

C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.

1. Metal Panels: 12 inches long by actual panel width. Include fasteners, closures, and other metal panel accessories.

D. Qualification Data: For Installer.

E. Product Test Reports: For each product, tests performed by a qualified testing agency.

F. Maintenance Data: For metal panels to include in maintenance manuals.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockup of typical metal panel assembly as shown on Drawings, including corner, door jamb, supports, attachments, sheathing, air barrier, insulation and accessories.
2. Water-Spray Test: Conduct water-spray test of mockup of metal panel assembly, testing for water penetration according to AAMA 501.2.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Commissioner specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on metal panels during installation.

1.07 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.08 COORDINATION

A. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.09 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Structural failures including rupturing, cracking, or puncturing.
   b. Deterioration of metals and other materials beyond normal weathering.
2. Warranty Period: Two years from date of Substantial Completion.

B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Deterioration includes, but is not limited to, the following:
   a. Color fading more than 5 Hunter units when tested according to ASTMD2244.
   b. Chalking more than a No. 8 rating when tested according to ASTMD4214.
   c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
2. Warranty Period: Twenty years from date of Substantial Completion.

PART 2 - RODUCTS

2.01 METAL PLATE WALL PANELS

A. Metal Plate Wall Panels: Provide factory-formed, metal plate wall panels fabricated from single sheets of metal formed into profile for installation method indicated. Include attachment assembly components, panel stiffeners, and accessories required for weathertight system.

B. Metal: Material type as indicated on Drawings.

1. Aluminum Sheet, ASTM B209, Aluminum Association specification, 0.125 inch (1/8”) thick.
2. Stainless Steel Finish: ASTM A240/A 240M or ASTM A666, Type 316, 0.125 inch (11 ga.) thick.

C. Attachment Assembly: Rainscreen-principle system. AAMA 509-09, Voluntary test and classification method for drained and back ventilated rain screen wall cladding systems

D. Manufacturers: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to the following:

1. Americlad, AC-3200BV Aluminum Plate Panel System (Dry Joint).
2. Protean, AP-2500RS Aluminum Plate Rain Screen (Dry Joint).
3. Sobotec, SL-2000P Aluminum Plate Panel System (Dry Joint).

2.02 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 330:

1. Wind Loads: As indicated on Drawings.
2. Deflection Limits: For wind loads, no greater than 1/180 of the span.

B. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. when tested according to ASTM E 283 at the following test-pressure difference:

1. Test-Pressure Difference: 1.57 lbf/sq. ft.

C. Water:

1. Test-Pressure Difference: 2.86 lbf/sq. ft.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

2.03 MISCELLANEOUS MATERIALS

A. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to provide finished appearance. Locations include, but are not limited to sills, jambs, corners, endwalls, framed openings, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

2.04 FABRICATION

A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. All fasteners shall be stainless steel.

C. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that prevent metal-to-metal contact, and that minimize noise from movements.

D. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
3. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.

2.05 FINISHES

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

D. PVDF Finish Coating: AAMA 2605. Polyvinylidene fluoride finish coating, containing not less than 70% of Arkema Inc. “Kynar 500” or Solvay Solexis “Hylar 5000” fluorocarbon resin. Shop-applied and heat-cured by licensed applicator. Remove die markings, scratches, abrasions, dents and other blemishes before applying finish.

1. Standard Two−Coat PVDF Finish: Minimum 1.0 mil total dry film thickness. Manufacturers include but are not limited to the following:
   a. Akzo Nobel Coatings “Trinar”
   b. PPG Industries “Duranar”
   c. Valspar Corp. “Fluropon”

E. Air-Dry PVDF Touch-Up: Polyvinylidene fluoride finish coating, containing Arkema Inc. “Kynar ADS” or Solvay Solexis “Hylar ADS” fluorocarbon resin and formulated for air-drying at ambient temperature. Provide for field touch-up and furnish in color to match shop-applied finishes.

F. Stainless Steel: Non-directional satin finish to match approved sample.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.

1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal wall panel manufacturer.
2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal wall panel manufacturer.
   a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

3.03 INSTALLATION

A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated.

1. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.

2. Shim or otherwise plumb substrates receiving metal panels per manufacturer’s instructions.
3. Flash and seal metal panels at perimeter of all openings.
4. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
5. Install screw fasteners in predrilled holes.
6. Exposed fasteners are not acceptable.

B. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.

C. Attachment Assembly, General: Install attachment assembly required to support metal plate wall panels and to provide a complete weathertight wall system, including sub-girts, perimeter extrusions, tracks, drainage channels, panel clips, and anchor channels.

1. Include attachment to supports, panel-to-panel joinery, panel-to-dissimilar-material joinery, and panel-system joint seals.

D. Installation: Attach metal plate wall panels to supports at locations, spacings, and with fasteners recommended by manufacturer to achieve performance requirements specified.

1. Rainscreen Systems: Do not apply sealants to joints unless otherwise indicated.

E. Rainscreen-Principle Installation: Install using manufacturer's standard assembly with vertical channel that provides support and secondary drainage assembly, draining at base of wall. Notch vertical channel to receive support pins. Install vertical channels supported by channel brackets or adjuster angles and at locations, spacings, and with fasteners recommended by manufacturer. Attach metal plate wall panels by inserting horizontal support pins into notches in vertical channels and into flanges of panels. Leave horizontal and vertical joints with open reveal.

1. Install metal plate wall panels to allow individual panels to be installed and removed without disturbing adjacent panels.
2. Do not apply sealants to joints unless otherwise indicated.

F. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal panel manufacturer; or, if not indicated, provide types recommended in writing by metal panel manufacturer.

G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.

1. Install exposed flashing and trim that is without buckling and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24

inches of corner or intersection. Where lapped expansion provisions cannot be used, or would not be sufficiently waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

3.04 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align metal plate wall panel units within installed tolerance of 1/4 inch in 20 feet, non-accumulative, on level, plumb, and location lines as indicated, and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.05 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing agency to perform field tests and inspections.

B. Water-Spray Test: After installation, test area of assembly shown on Drawings as directed by Commissioner for water penetration according to AAMA 501.2.

C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect completed metal wall panel installation, including accessories.

D. Remove and replace metal wall panels where tests and inspections indicate that they do not comply with specified requirements.

E. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.

F. Prepare test and inspection reports.

3.06 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

B. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

C. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 07 42 13, Metal Wall Panels shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 07 42 13, Metal Wall Panels shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 07 52 60
MODIFIED BITUMINOUS SHEET ROOFING - HEAT WELDED

PART 1 - GENERAL

1.01 RELATED WORK

A. Drawings and general provisions of Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Provide and install new roofing system consisting of three (3) ply bituminous (two (2) plies of Type I Felt and one (1) ply SBS Type Granular Surfaced Modified Bitumen Membrane top sheet) Heat Welded roofing over new recover board and over new insulation laid over the roof deck.

B. Provide and install new two (2) ply flashing where required (one (1) ply of Type I Felt and one (1) ply SBS Type Modified Bitumen) Heat Welded.

C. Any other equipment, material, labor to complete the entire roof system installation as shown on the Drawings and required for a complete, water tight and warrantied installation.

D. Related Sections:

1. Section 07 62 00, Sheet Metal Flashing, Fascia and Trim.
2. Section 07 71 00, Roof Specialties.
3. Section 07 72 00, Roof Accessories.
4. Section 08 31 00, Access Doors and Frames.
5. Section 11 81 29, Facility Fall Protection.
6. Division 22 Section for Roof Drains.

1.03 REFERENCES

A. ASTM D6506 - Standard Specification for Asphalt Based Protection for Below-Grade Waterproofing.

B. ASTM: American Society for Testing and Materials

1. ASTM C 728: Standard Specification for Perlite Thermal Insulation Board.
2. ASTM C 1289: Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
3. ASTM D 6163: Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fiber Reinforcements.
4. ASTM D 6164: Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Polyester Reinforcements.
5. ASTM E 108: Standard Test Methods for Fire Tests of Roof Coverings.

C. Chicago Building Code.

D. NRCA: National Roofing Contractors Association.

1.04 SUBMITTALS

A. Submit the following according to Division 1 Section, Submittals, for the Authority's review and approval prior to fabrication, delivery and installation:

B. Certificate stating that roof applicator is an approved roofing contractor of the manufacturer of the roofing system.

C. Latest edition of manufacturer's literature and specifications for roofing felts, base flashing and bitumen specification, which covers materials and installation instructions.

D. Latest edition of manufacturer's literature and specifications for insulation and recover boards and anchorage materials for insulation and recover boards, which covers materials and installation instructions. Certify that proposed insulation type and thickness meets City of Chicago Energy Code or provide a signed waiver or exception from the city; including for roofs over unconditioned spaces.

E. List of materials proposed for use and certificates that materials comply with ASTM Specifications, required fire ratings, applicable codes, energy code, and other requirements. Products include insulation, cover board, felts, SBS top membrane, flashing, primer, adhesive, and fasteners.

F. Manufacturer's description and details for entire roofing system. Provide installation recommendations and instructions for roofing system.

G. Certification that proposed installation complies with all requirements and codes, including wind requirements.

1. Provide wind uplift resistance calculations prepared by an engineer licensed in the State of Illinois demonstrating that the materials and installation of the roof system meets or exceeds the calculated uplift pressures according to ASCE 7.

H. Product data, equipment, procedures, instructions and recommendations for heat weld operations to be used.

I. Process plan, staging plan, fall protection and weight estimates for equipment and materials to be stored and used on the roof.

J. Shop drawings for the roof installation including a plan of the roof showing slopes, drains, dimensions, obstructions, roof mounted equipment, expansion joints, walkways, vents, skylights, hatches, openings and other items; details for installation and flashing; details for roof mounted accessories; curb details; parapet and roof edge details; and other details and sections. Show a plan for the insulation board and recover board installation; fastening spacing for each layer and indicating the location of joints for each layer of insulation and recover board. Provide shop drawing show plan, section, slopes, sizes, locations and thickness when using tapered insulation.

K. A copy of the manufacturer's warranty.

L. One foot square samples of insulation, recover board, felt, membrane, membrane flashing.

M. Shop drawings and product data for any new roof drains or replacement parts for roof drains.

N. Product data for fiber cant and wood blocking and nailers.

O. Product data for walkway pads, installation instructions and a drawing indicating layout of the walkway pads.

P. Product data and installation instructions for liquid flashing material, if used. Indicate specific locations, applications and details for the use of liquid flashing.

Q. Roof system materials, installation and details that conform to manufacturer's recommended practices and that will maintain the warranty of the roof system.

R. Product data, specifications and installation instructions for liquid flashing.

S. Product data, specifications and recommendations for all fasteners used at the roof for insulation, cover board, roofing felts, flashing, sheet metal, roof accessories, blocking and other items at the roof. Provide samples if requested by the Authority.

1.05 QUALITY ASSURANCE

A. Manufacturer: Modified bituminous sheet roofing manufacturer specializing in manufacturing the products specified in this Section with minimum twenty (20) years' experience.

B. Applicator: Company specializing in applying modified bituminous sheet roofing with minimum ten (10) years documented experience of projects of similar size and complexity and approved by materials manufacturer.

C. Applicator shall have applied accepted roofing system on two or more projects, similar size or larger, which have performed satisfactorily for at least ten (10) years.

D. All materials of roofing system (insulation, cover board, membranes, flashing, etc.) must be of the same manufacturer and/or approved by the roof membrane manufacturer for a complete warrantied system.

E. Apply roofing system (insulation, roofing membranes, and flashing) in strict accordance with this and approved manufacturer's written specifications.

F. Provide roofing system (materials and installation) that comply with the fire rating complying with ASTM E 108, Class A fire performance and the wind uplift resistance for the calculated wind-lift pressures and specific building conditions as determined by calculations using ASCE 7. Materials shall be identified with appropriate markings of applicable testing and inspecting agency.

1. Verification of uplift resistance must be executed through independent testing following testing procedures listed in FM 4450, FM 4470, ANSI/FM 4474, UL 580 or UL 1895.

G. Provide Modified Bitumen Roof Membrane that meets City of Chicago Energy Code.

H. Pre-Installation Conference: Approximately 2 weeks prior to scheduled start of roofing removal, hold a meeting at the project site with all parties relating to the roof system: Contractor, all subcontractors, the Authority, Architect, roofing manufacturer representatives, insurers, testing agents, and governing authorities.

1. Tour representative areas of the roof and discuss known conditions of the substrate.
2. Review structural loading limitations of the deck.
3. Review the drawings, specifications and other contract documents.

4. Review and finalize schedule related to roofing removal and verify personnel, equipment and facilities needed to make progress and avoid delays.
5. Review weather and forecasted weather conditions and procedures for coping with unfavorable conditions, including the possibility of temporary roofing, if it is not a mandatory requirement.
6. Review actual conditions regarding the work including access to the roof, obstructions and limitations. Review other buildings, pedestrians and vehicles in close proximity that would be impacted while performing the work.
7. Record discussions of the conference, including decisions and agreements reached, and furnish a copy for each attendee. If substantial disagreements exist at the conclusion of the conference, determine how the disagreements will be resolved and set a date for reconvening the conference. Submit minutes of Pre-Installation Conference with disagreements resolved prior to commencing the work.
8. Review that roof has proper slope for positive drainage.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's original, unopened containers and rolls with labels intact and legible.

B. Handle rolled goods so as to prevent damage to edge or ends.

C. Store felts, base flashing and insulation on clean raised platforms with weather protective covering when stored outdoors.

D. Store rolled goods on end.

E. Select and operate material handling equipment so as not to damage applied roofing. Verify weight of equipment and materials stored and used at the roof does not exceed the maximum allowable weight.

F. Do not store materials on roof overnight unprotected.

G. Protect materials and installed roofing against damage by construction traffic.

H. Remove wet or damaged materials from project site.

I. Comply with local fire and safety regulations.

J. Comply with OSHA safety regulations.

K. Store emulsions at temperatures above 40 deg. F.

L. Do not store materials on roof decks, nor position roofing installation equipment on roof decks, in concentrations exceeding design live loading (25 lbs. per sq. ft.)

1.07 PROJECT CONDITIONS

A. Perform construction operations to minimize inconvenience to the Authority's operations. The Authority will recommend the locations where the materials and equipment may be stored.

B. Environmental Requirements

1. Proceed with roofing system installation only when existing and forecasted

weather conditions are favorable and will allow work to proceed in accordance with requirements and specifications of manufacturers roofing system materials.

2. Coordinate work in such a way that no roofing work is done when temperature is below 45 deg. F. In the event that minor remaining roofing work must be done below 45 deg. F but above deg. F, the manufacturer's recommendations for cold weather application and/or the following conditions, whichever is the most stringent, shall be met:

    a. Keep felts, membrane and other materials in a heated area, at 70 deg. F.
    b. Maintain at recommended application temperature by using insulated carrier or insulated pipes or by other means.

1.08 WARRANTY

A. Prior to acceptance of work, furnish manufacturer's standard written warranty which covers repairs required to maintain roof in watertight condition including:

    1. Premature deterioration of membrane.
    2. Premature deterioration of base flashing.
    3. Premature deterioration of the roof insulation, recover board, cants, curbs or blocking.
    4. Bare spots.
    5. Blisters.
    6. Fishmouths.
    7. Ridges.
    8. Splits.
    9. Buckles and wrinkles.
    10. Workmanship in application of roofing membrane.
    11. Workmanship in application of base flashings.
    12. Workmanship in application of insulation, recover board, cants, curbs or blocking.
    13. Slippage of roofing membrane.
    14. Slippage of base flashing.
    15. Leaks.
    16. Delamination of the insulation, recover board, top sheet felts or flashing.
    17. Delamination or opening of joints or seams.
    18. Improper installation of the system or any component of the system.

B. Warranty from the manufacturer of roofing system materials shall be for twenty-five (25) years after Substantial Completion.

C. The warranty shall require the manufacturer to provide for repairs or replacements, including all materials and labor, for failure of any materials or workmanship of the roof system at no expense to the Authority during the entire warranty period (No Dollar Limit).

D. Warranty shall be signed by the manufacturer of the roofing materials and include all components of the system including insulation and flashing. Warranty shall certify that the manufacturer's representative has inspected the installation of the roofing system and determines that it is complete, proper and as specified. The warranty shall fully cover all materials and installation of the roof system.

E. The manufacturer shall warranty the installer's work and the installation of all materials of the roofing system.

F. There shall be no exclusions to the warranty for the conditions under which the roof is installed, such as the presence of the nearby tracks or the presence of or tracking of

grease and oil.

PART 2 - PRODUCTS

2.01 ROOFING SYSTEM

A. Roof: Three (3) total layers consisting of two (2) Plies Fiberglass Type I Felt roofing capped with an additional top ply of SBS type, Granular Surfaced Modified Bitumen Membrane. Flashing: Two (2) total layers of base flashing consisting of one (1) ply of Fiberglass Type I Felt and topped with one (1) ply SBS Modified Bitumen base sheet.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or an approved equal. All manufacturers, roof system specifications and products must be submitted for review and approval.

1. Johns Manville: Spec No. 3FID-HW:

2-plies of DynaWeld base felt:
1-ply DynaWeld Cap FR, granular surfaced Base Flashing.
1-ply DynaWeld Cap FR over one ply of DynaWeld base felt.

2. GAF:

1-ply of base felts
1-ply Energy Cap SBS FR, granular surfaced. Base flashing.
1-ply Energy Cap SBS FR, over 1 ply of base felts.

3. Approved equal.

2.02 MATERIALS

A. Base Felts: ASTM D 6163, Type I, Grade S.; 120 mil thickness; recommended by manufacturer for heat weld application system.

B. Modified Bitumen Membranes: ASTM D 6164, Type I, Grade G, fire resistant, fiber glass mat reinforced, mineral surfaced SBS modified bitumen membrane, white granular surfaced and coated in the factory to meet City of Chicago Energy Code; designed for use as a cap sheet for heat weld applications.

C. Flashing Sheet: ASTM D 6164, Type I, Grade G, fire resistant, fiber glass mat reinforced, mineral surfaced SBS modified bitumen cap sheet; white granular surfaced and coated in the factory to meet City of Chicago Energy Code, designed for heat weld applications. Use with base felt ASTM D 6164, Type I, Grade S; minimum 120 mil thickness; recommended by manufacturer for heat weld application system.

D. Liquid Flashing: UltraFlash by Firestone or approved equal.

E. Polyisocyanurate Board Insulation: ASTM C 1289, Type II. Rigid foam boards with minimum density of 1.7 pcf polyisocyanurate-based foam core, permanently bonded to roofing felt facer sheets both sides; 1.5-inch-thick, minimum aged R value of 9.00, when conditioned according to TIMA Bulletin No. 101-1 (TIMA 281-1). Provide factory-tapered insulation boards where indicated or required for slope; provide minimum 1/4 inch per foot slope to drains. Insulation to be mechanically fastened to a metal roof deck or secured with cold applied adhesive to a concrete deck. Subsequent layers of insulation boards to be mechanically fastened thru previous layer of insulation and to a metal deck or secured with cold applied adhesive to the previous layer of insulation. Installation of insulation boards to meet FM Class 1, FMRC 90 psf uplift.

1. Manufacturers (same as roof ply manufacturer unless approved otherwise):
    a. GAF Materials Corporation.
    b. Johns Manville International. Inc.
    c. Approved equal.
2. Insulation type and thickness must provide an R value for the roofing system that meets or exceeds the requirements of the City of Chicago Energy Code; unless the requirements have been waived or adjusted in writing by the city for this project including for roofs over unconditioned spaces; or unless shown and approved otherwise on the Drawings. Any deviation from code or the Drawings must be approved in writing by the Authority. Adjust the type and/or thickness of the insulation as required and as approved in writing by the Authority.

F. Cants: Fiber, Perilite or approved equal, as recommended by manufacturer.

G. Roof Curbs: Provide galvanized metal roof curbs capable of supporting live loads and dead loads including equipment loads. Fabricate with welded or sealed corners and integral formed mounting flange at perimeter. Coordinate dimensions with shop drawings for size of opening, size of equipment, mounting conditions at roof, and mounting conditions of equipment.

1. Factory insulate curbs with 1.5-inch thick Polyisocyanurate Board Insulation. Wood nailers at tops of curbs shall be of fire treated wood for exterior applications as specified elsewhere in this specification section.
2. Height of curb to be 8 inches minimum above finished roof unless otherwise indicated.

H. Cover Board or Perlite Board Insulation: Rigid, mineral-aggregate, fire resistant, thermal insulation board consisting of expanded perlite, cellulosic fiber, binders and water-proofing agents, complying with ASTM C 728. Aged R-Value of 2.78 R per inch. Thickness 1/2 inch to 1-inch as indicated. Cover board top surface sealed with a polymerized asphalt emulsion to allow direct application of roof membranes by heat welding.

1. Secure fire resistant cover board to roof deck with cold applied adhesive or mechanically fastened thru the insulation to the roof deck.
2. Installation of cover board to meet FM Class 1, FMRC 90 psf uplift.
3. Thickness: 1/2-inch, unless noted otherwise.
4. Product: Subject to compliance with requirements, provide cover board by the following (same as roof ply manufacturer unless approved otherwise):
    a. Dura Board as manufactured by Johns Manville.
    b. Cover Board as manufactured by GAF.
    c. Approved equal.

I. Adhesive: Two-part urethane insulation adhesive as recommended by the manufacturer of the insulation boards and the roof manufacturer for use with the actual substrate.

1. Adhesive recommended to secure insulation to concrete decks.
2. Adhesive recommended to secure cover board to insulation.

J. Fasteners: Fasteners and plates to be stainless steel or galvanized metal. Fasteners

to be designed and of proper length to mechanically fasten new recover board and/or insulation boards through to metal deck. Fasteners and accessories to be acceptable and approved by recover board, insulation board and membrane manufacturers. Provide either 1 inch diameter nail heads or 1 3/8-inch diameter by 0.012-inch metal caps for nails, stainless steel or galvanized metal, used to mechanically fasten recover and insulation boards to deck. Use 3-inch diameter plates.

1. Fasteners for roof accessories, wood blocking and other items at the roof shall be stainless steel or galvanized steel unless approved otherwise. Fasteners to secure blocking to structural steel should be as recommended by fastener manufacture to be of sufficient strength to be drilled into the steel. All fasteners must be of size and length sufficient to secure the item to its substrate. Type of fastener, head and diameter as recommended by the fastener manufacturer for its intended use.

K. Termination Bar: 0.1875-inch-thick, 1.75 inches long extruded aluminum bar. 0.375-inch-long section at each end is bent at 45 degrees. Pre-punched, elongated holes at 6 inches on center to receive 1/4-inch diameter anchor bolts. New Era “CB-175” or equal.

L. Walkway Pads: Preformed, skid-resistant boards consisting of modified asphalt, reinforcements and fillers with a ceramic granular surface on both sides; produced by same manufacturer as Modified Bituminous Sheet Roofing, such as Dyna Tred Plus as manufactured by Johns Manville or approved equal. Walkway boards to be approximately 32-inch x 32-inch x 3/8-inch thick. Color of walkway pad to contrast with field of roof and as selected and approved by CTA to conform to City of Chicago Energy Code.

M. Patching Mortar for Concrete Decks: Portland cement, ASTM C 150, Type I and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

N. Liquid Flashing: Liquid flashing shall be two-part urethane rubber flashing and coating product. Liquid flashing to be fast-curing, low VOC coating that forms a flexible elastomeric seal around roof penetrations and other areas difficult to flash using elastomeric or sheet metal flashing. The liquid flashing shall form a watertight chemical bond, shall not separate from adjacent vertical or horizontal substrate surfaces, shall not crack and shall not become brittle with age. The liquid flashing shall be compatible with the roofing system.

1. Liquid flashing material shall be UltraFlash Liquid Flashing as manufactured by Firestone Building Products or approved equal.

2.03 WOOD BLOCKING AND NAILERS

A. All wood at roof level and at parapets to be fire retardant treated wood for exterior application

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
2. Fire retardant treated wood for exterior applications shall be FRX Fire Retardant Treated Outdoor Wood or approved equal.

B. Wood to be Southern Pine or as approved otherwise. Kiln-dry lumber before and after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat items indicated on the Drawings, including wood adjacent to roofing or wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing or fascia.

E. Shape and size of blocking as required.

F. Fasteners: Attach treated wood nailers or blocking to roof deck or other substrate with hot dip galvanized or stainless steel washers, bolts and screws. Wood to be secured according to recognized practice and to meet FM 1-90 requirements.

G. Apply minimum 1/16-inch coating of bituminous paint to contact surface of steel, galvanized steel and aluminum to ensure separation from contact with preservative treated lumber and wood products.

PART 3 - EXECUTION

3.01 PRE-CONSTRUCTION CONFERENCE

A. Before starting roof work, conduct conference at the project site. Comply with requirements for pre-installation conferences in other Division 01 Sections of these Specifications. Review methods and procedures and proposed roofing system including, but not limited to, the following:

1. Meet with owner's representative, roofing system manufacturer(s), roofing system installer(s) and other involved parties.
2. Review methods and procedures related to roofing system installation.
3. Review and finalize construction schedule.
4. Review special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.

B. Examine substrate surface to receive roofing system and associated work and conditions under which roofing will be installed. Prepare substrate as recommended and directed by the installer. Do not proceed with roofing until unsatisfactory conditions have been corrected in a manner acceptable to Installer. Installer is responsible for acceptance of the substrate.

C. Applicator shall verify that roof curbs, nailers, cants, equipment supports, vents, roof drains and other roof penetrations are properly secured and prepared to receive new roofing materials. Curbs and vents shall be 8-inches minimum high to receive flashing. Existing curbs and vents shall be replaced or extended as required.

D. Applicator shall verify that all surfaces are smooth and free of dirt, debris, and incompatible materials. All substrate surfaces shall be free of water, ice, and snow.

E. Arrange to have any mechanical, electrical or other equipment removed temporarily during the work and re-installed upon completion of the new roof by tradesmen experienced with the particular equipment. In a similar manner, ductwork, vents, conduit, lightning protection equipment and other items should be carefully removed if required for installation of the new roof and be re-installed upon completion. Remove any abandoned equipment.

F. Manufacturers and installers of all components of the roof system shall certify that all installation details for the complete roof system installation conform with and meet their requirements and will maintain the warranty for the roof system. If there is a conflict between the Drawings or a lack of information, the manufacturer's recommended installation requirements and details take precedence.

3.02 GENERAL INSTALLATION REQUIREMENTS

A. Install roofing system according to manufacturer's instructions and to comply with all governing codes and regulations.

B. Fastening Methods: Including type of fastening, type of fasteners, number of fasteners and spacing of fasteners; indicated below for base sheets, insulation and cover boards are minimum requirements. The installation of the roofing system must meet the requirements necessary to provide the required uplift resistance to withstand the uplift pressures for the specific building conditions as determined by calculations using ASCE 7.

3.03 PREPARATION OF ROOF

A. Clean roof deck to provide a smooth and clean substrate. Clean substrate of dust, debris, moisture and other substances detrimental to roofing installation and according to roofing system manufacturer's recommendations. Remove sharp projections. Deck to be dry.

3.04 ROOF ACCESSORIES

A. Prior to installation, verify conditions and dimensions in the field for installation of cants and curbs. Verify that substrate is sound, dry, smooth, and clean.

B. Install roof accessories including cants, curbs, nailers and blocking according to manufacturer's instructions. Anchor roof accessories securely in place and capable of resisting specified forces, using approved fasteners. Install roof accessories to resist exposure to weather without failing, rattling, leaking, and fastener disengagement.

C. Install cants, curbs, nailers and blocking where shown or required; firmly anchored in place with sufficient number of anchors to resist a minimum force of 300 pounds per lineal foot in any direction. Wood items at the roof shall be treated and shall be free of rot, excess moisture or deterioration.

D. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, or buckling.

E. Blocking and curbs shall be minimum eight inches above finished roof surface to facilitate the installation of flashing.

3.05 PRIMER APPLICATION

A. Prime roof deck if recommended by manufacturer of roof system, using materials and installation approved by the manufacturer of the roof system.

1. Prime surface of deck with primer at a rate of one gallon per 100 square feet of deck and allow primer to dry or as recommended by manufacturer.
2. Seal holes, openings, cracks and joints to prevent bituminous material from penetrating into the building.
3. Allow primer to dry.

3.06 BASE SHEET OVER DECK

A. Install one ply of fiberglass base sheet over the deck when recommended by the manufacturer of the roof system as follows:

B. Nailable Deck:

1. Sheet laps: 3 inches, end and side.
2. Lap fastening: On 8 inch centers in roof field, along perimeter and in corners.
3. Intermediate fastening: Two parallel rows, 12 inches in from each side.
4. Intermediate fastening: Fastening in each row:

a. On 16 inch centers with staggered pattern in roof field.
b. On 8 inch centers within 6 feet of roof perimeters.
c. On 8 inch centers in each 6 foot by 6-foot roof corner.

C. Concrete Deck:

1. Sheet Laps: 3 inches, end and side.
2. Adhere with cold applied adhesive recommended by the manufacturer for the application.
3. Mop laps solid.

3.07 INSTALLATION OF POLYISOCYANURATE BOARD INSULATION

A. Over the clean and dry deck, install new polyisocyanurate insulation boards with long joints continuous. Lay with edges in moderate contact but do not force into place. The thickness of the insulation boards shall be 1 1/2 inch, except provide factory-tapered insulation boards fabricated to slope at 1/4 inch per 12 inches to roof drains, unless otherwise indicated. Provide saddles as shown or required.

B. Use insulation to create required roof slope. Where multi-layer installation is required and at saddles, stagger joints with second layer covering joints of previous layer. At drain areas, new insulation to be omitted (approximately 2 sq. ft. area) to facilitate better drainage.

C. Cut insulation boards to fit neatly to perimeter blocking and around projections through roof. Trim surface of boards where necessary at roof drains so completed surface is flush with drain ring.

D. For concrete decks, secure insulation with cold applied adhesive recommended for the application. Mix and prepare adhesive as directed by manufacturer. Apply adhesive only when it will be within the manufacturer’s temperature range and there will be no moisture. Apply adhesive as directed by the manufacturer so that all surfaces are coated. Press down insulation for full contact with deck. Subsequent layers of insulation shall be similarly secured.

E. Adhere cover board saddles with adhesive between drains and other locations as shown or required.

3.10 INSTALLATION OF COVER BOARD OR PERILITE INSULATION BOARD

A. Where indicated, install cover boards or Perlite Insulation Boards over the polyisocyanurate insulation. Cover joints between the polyisocyanurate insulation with

cover boards or Perilite. Lay with edges in moderate contact but do not force into place. The thickness of the cover board or Perilite shall be 1/2 inch to 1 inch (as indicated) except at roof drain locations, an area of approximately 3 foot by 3 foot shall be 1/4-inch-thick to provide proper slope.

B. Secure cover board or Perlite board to steel deck using approved mechanical fasteners specifically designed and sized for attaching specified board through any additional insulation and secure to the metal deck. Field verify fastener sizes and required lengths. Cover board or Perlite board can also be secured to the insulation board using cold applied adhesive as directed by the manufacturer. Run long joints for board in continuous straight lines, perpendicular to roof slope with end joints staggered between rows. Secure cover boards or Perlite board over entire area of roofing with fasteners spaced as required by FM I-90 requirements or adhesive meeting the FM 1-90 requirements.

C. Cut cover board to fit neatly to perimeter blocking and around projections through roof. Trim surface of board where necessary at roof drains so completed surface is flush with drain ring. Adhere cover board saddles, 1/2 inch slope, with approved adhesive between drains.

3.11 MODIFIED BITUMEN ROOF - "HEAT WELDED"

A. Install first base ply over cover board or Perlite by heat welding base sheet to top of cover board. Follow manufacturer's recommendations and directions. Provide overlaps as recommended, minimum 6 inches at ends and 4 inches at sides. Base sheet to be fully adhered to cover board.

B. Install second base ply to first base ply by heat welding the plies to each other. Overlap and cover joints of first base sheet. Follow manufacturer's recommendations and directions. Provide overlaps as recommended, minimum 6 inches at ends and 4 inches at sides. Second base sheet to be fully adhered to first base sheet.

1. Lay felts parallel to long dimension of roof.
2. Install courses beginning at lowest elevations of roof.
3. Install felt courses in shingled fashion immediately over and on the same day as underlying insulation.

C. Install top ply SBS type modified bitumen with granular surface heat welded to base sheets. Follow manufacturer's recommendations and directions. Provide overlaps as recommended, minimum 6 inches at ends and 4 inches at sides. Top sheet to be fully adhered to base sheets and all seams to be fully sealed. A 20 pound roller no wider than 12 inches shall be used on all side and end laps, following immediately behind the propane welder.

1. Install final cap sheet immediately over and on the same day as membrane system.
2. Adhere felts to cants and cut off at top of cants before flashings are installed.
3. Repair fishmouths, blisters, wrinkles, voids, ridges, holidays and other anomalies immediately.

3.12 MEMBRANE FLASHING

A. Prepare surfaces to receive new flashings. Remove any materials such as dried asphalt particles or protruding mortar particles that will affect the proper installation of new flashing.
B. Prime the surfaces if required, and let them dry.

C. Follow manufacturer's application instructions where not exceeded in this specification.

D. Flashings shall have one (1) separately applied fiberglass base sheet backer ply fully adhered to substrate surfaces with cold applied adhesive as directed and fully heat welded to top sheets of roof. Press base sheet against surfaces for a smooth wrinkle free installation.

1. Provide 4-inch-wide laps.
2. Lap 6 inches onto roof membrane.

E. Over flashing base sheet, apply one (1) ply granular surfaced SBS type modified bitumen flashing fully adhered to flashing base sheet by heat welding. Stagger joints between flashing and flashing base sheet. All joints and connections to be fully heat welded. Provide laps at flashings 4 inches minimum. Weld and provide ½ inch adhesive flow past edges. Embed granules at all laps where selvedge edge is not present. The entire installation shall be smooth, wrinkle free and adhered to base and roof surfaces at all areas.

1. Provide 4-inch-wide laps.
2. Lap 6 inches onto roof membrane.

F. The height of flashing shall be minimum 8 inches and maximum 24 inches above finished roof surface.

G. Over wood surfaces, flashings with separately applied backer sheets shall be fully adhered to a fiberglass base sheet mechanically attached at a rate of one nail per 8 inches on center across its face.

H. Flashing pieces shall not be longer or wider than 40 inches.

I. Terminations:

1. Walls where coping is scheduled: Extend across nailer and down outside vertical face of nailer. Fasten along outside nailer face, 6 inches on center.
2. Surfaces where counterflashing scheduled: Extend up to ¼ inch below scheduled detail fixation line. Fasten membrane in a line 1 inch below termination edge and on 6 inch centers.
3. Edge details: Adhere to primed flange, extend to outside break and seal with roof cement.
4. Box Penetrations: Extend to top outside edge of nailer. Fasten in line 1 inch below termination edge and on 6 inch centers.
5. Mechanical equipment support curbs, control joints, roof dividers: Extend up, across top and 2 inches down far side. Fasten along far side, 6 inches on center. Install and fasten sheet from opposing side in same manner.
6. Expansion joint: Extend to top edges on both joint sides. Fasten in line 1 inch below termination edge and on 6 inch centers.
7. At wall coverings: Extend a maximum of 24 inches above the finished roof surface. Fasten in line 2 inches below termination and on 6 inch centers. Seal top edge. Install flange mounted offset counterflashing.

3.13 LIQUID FLASHING

A. Liquid flashing may be used as a supplement in areas difficult to be completely protected with sheet flashing, metal flashing or other means; but only with the prior

approval of the Authority for each specific application. The preparation of the surfaces to receive liquid flashing, the preparation of the liquid flashing material and the installation of the liquid flashing shall be according to the liquid flashing manufacturer's directions and also be approved by the manufacturer of the roofing system.

3.14 VENT STACKS

A. Extend stacks to a minimum height of 8 inches above membrane system.

1. Follow requirements specified in Plumbing Section of these specifications.

B. Provide and install new four (4) pound lead flashing at vent or soil stacks. Strip-in with one ply of membrane.

1. Embed flanges in roof cement.
2. Extend flanges 6 inches onto roof surface.
3. Extend sleeves to top of pipe and turn back inside at least 2 inches.
4. Prime flange.
5. Install tie-in with flashing membrane.

a. Cover flange and extend 18 inches onto membrane surface.

3.15 ROOF DRAINS

A. Protect roof drain openings during the course of the work. Inspect and clean roof drainage systems. Clean roof drain systems of all debris. Repair roof drains as required. Repair or replace any broken or missing parts including receptors, strainers, clamping ring, deck clamp and other components of the roof drain. Replace the existing roof drains with new cast iron roof drains as required. Install new roof drains including receptors, strainers, clamping ring, deck clamp and other components of the roof drain. Provide and install new four (4) pound lead flashing at roof drains and strip-in with one ply of membrane.

B. Construct 48-inch-wide sump area at drains with tapered insulation at its minimum thickness around the perimeter of drain sump. Fully adhere tapered edge strips to first layer of sump insulation.

1. Embed fabric in roof cement over sump.
2. Install membrane system.
3. Install lead flashing sheet.
4. Cover sump.
5. Embed in roof cement.
6. Prime top surface.
7. Provide tie-in:

a. Roofing membrane, 1 ply.
b. Extend to bowl and 8 inches minimum on membrane roof surface.

8. Install system surface membrane.
9. Install clamping ring over membrane.

C. Accessories:

1. Saddles: Locate where designated. Place over top layer of flat insulation. Install as specified herein for insulation.

2. Crickets: Locate where designated. Proportion of width to length to be one foot out for every 3 feet long. Install as specified herein for insulation.

D. Rod out all down spouts from the roof drains to nearest manhole upon completion of the work.

3.16 UTILITY AND SUPPORT PENETRATIONS

A. Verify conditions and at pipe, cable and utility penetrations.

1. Vertical penetrations:

a. Provide adjustments for minimal acceptable clearance above finished roof surface: 8 inches.
b. Provide service interruption and reconnection.

2. Horizontal penetrations.

a. Provide rerouting where less than 8 inches above finished roof and where flashing penetrated.
b. Provide rain visor and seal penetration.
c. Provide rigid flashing sleeve on flexible cables and electrical connections.

B. Provide hooded sealant pans on single pipes, rods, tubes and supports.

1. Seal penetrations at membrane with roof cement.
2. Set pan flanges in bed of roof cement.
3. Prime flanges.
4. Install 1 ply of flashing membrane over flanges and roof surfaces within 12 inches of flange edges.
5. Fill pan with sealant.
6. Install sheet metal hood and drawband.
7. Caulk.

C. Provide pipe chase around each multiple pipe penetration:

1. Attach enclosure to deck.
2. Install flashings.
3. Provide pipe chase hood.
4. Seal where pipes protrude.

D. Curbed Penetrations.

1. Remove units or fixtures to provide access for installation of blocking, flashings and counterflashings.
2. Provide blocking to achieve specified elevations.
3. Mechanically attach curb-wall insulation.
4. Lap 4 inches minimum.
5. Fasten counterflashing at 12 inches on center behind cap; fasten cap 24 inches on center on both sides.

E. Expansion Joints.

1. Provide nailer attachment through deck at 18 inches on center. Provide vertical

element attachment to nailer at 12 inches on center.

2. Provide attached cant strip, flashings and dry batt insulation suspended in sealed membrane between joint elements.
3. Provide a 3/4 inch CDX plywood joint cover, fastened 8 inches on center on one side of joint.
4. Provide new metal caps with a separate end cap with wall flanges. Fasten metal cap at 24 inches on center on both sides.
5. Caulk top edge of wall flange and in and over metal cap laps.

3.17 WALKWAY PADS

A. Walkway Pad Installation: Layout as shown on roof plan or as directed and approved otherwise. Install as directed by manufacturer. Over mineral-surfaced roofs, install walkway pad by heat welding to top membrane or secured with MBR Utility Cement. All four corners of each piece should be firmly and fully set prior to walking on the board.

B. Leave a minimum of one inch open space in all directions between walkway pads to provide for drainage of the roofing system.

3.18 JOINTS

A. Caulk and seal all joints.

3.19 TEMPORARY COVER

A. Schedule the work so that there is no need for temporary cover. If unforeseen conditions require a temporary cover:

1. Cover shall be properly installed to protect the deck and installation.
2. Install cover at no cost to the Authority.
3. Remove cover and discard before starting permanent work.

3.20 FIELD TESTS

A. Contractor shall arrange for and pay for testing of roofing system, including all components, flashing, adhesives and seams. Testing shall be performed by an independent testing agency approved by the Authority. Contractor shall patch at any areas of the roof where test samples are taken; patch according to manufacturer's directions to maintain integrity and warrantability of the roofing system.

3.21 CLEANING

A. Protect paving and building walls adjacent to hoist prior to starting work.

B. Repair or replace with new any damaged materials and remove asphalt and stains from surfaces other than those requiring bituminous roof coatings.

C. Remove all trash, debris, equipment and parts from job site. Dispose of waste legally.

D. All paved areas, landscaped areas, and other exterior and interior areas and surfaces damaged or otherwise affected by roofing activities shall be repaired and restored to its original condition at no cost to the owner. All areas to be cleaned of debris and left broom clean.

E. All roofing, flashings, scraps, wrappings, empty cans, metal work and other debris to be

removed during and after construction and disposed of legally.

F. Recoat membrane roofing if surface is dirty from foot traffic or other condition as determined by the Authority.

3.22 WARRANTY

A. Upon completion of the roofing system installation, an inspection shall be made by the Authority or Authority's Representative, the installer and the manufacturer's representative to certify and approve of the installation.

B. Upon approval of the installation, provide the Authority with the installer's and manufacturer's warranties in the approved form, signed by all installers and manufacturers involved, to warranty all components of the roofing system, their installation, as well as the roofing system as a whole.

3.23 PROTECTION

A. Provide special protection or avoid traffic on completed work when ambient temperature is above 80 deg. F.

B. Restore to original condition or replace work or materials damaged during handling bitumen and roofing materials.

C. Leave protective covering securely in place for duration of roofing work.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 07 52 60, Modified Bituminous Sheet Roofing shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 07 52 60, Modified Bituminous Sheet Roofing shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 07 62 00

SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and SupplementaryConditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes providing all labor, materials and equipment required to provide thefollowing as shown on the drawings, specified herein and as otherwise required:

1. Formed roof sheet metal fabrications.
2. Formed wall sheet metal fabrications.
3. Formed overhead-piping safety pans.
4. Lead sleeve flashing at roof vents.
5. Fasteners, attachment devices, trim and accessories.

B. Related Requirements:

1. Section 07 52 70 - EPDM Roof System
2. Section 07 62 00 - Sheet Metal Flashing and Trim
3. Section 07 72 00 - Roof Accessories
4. Section 07 90 00 - Joint Sealers

1.03 REFERENCES

A. Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractor's NationalAssociation, Inc. (SMACNA).

B. ASTM A 653: Standard Specification for Steel Sheet, Zinc-coated (Galvanized) by theHot-Dip Process, and Lock-Forming Quality.

C. FS TT-C-494B: Coating Compound, Bituminous, Solvent Type, Acid Resistant.

1.04 COORDINATION

A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.05 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project Site.

1. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review special roof details, roof drainage, roof-penetration flashing, and condition of other construction that affect sheet metal flashing and trim.

3. Review requirements for insurance and certificates if applicable.
4. Review sheet metal flashing observation and repair procedures after flashing installation.

1.06 SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

B. Shop Drawings: For sheet metal flashing and trim.

1. Include plans, elevations, sections, and attachment details.
2. Include identification of material, thickness, weight, and finish for each item and location in Project.
3. Include details for forming, including profiles, shapes, seams, and dimensions.
4. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
5. Include details of termination points and assemblies.
6. Include details of roof-penetration flashing.
7. Include details of edge conditions as applicable.
8. Include details of special conditions.
9. Detail formed flashing and trim at scale of not less than 1-1/2 inches per 12 inches.

C. Samples for Initial Selection: For each type of sheet metal and accessory indicated with factory-applied finishes.

D. Samples for Verification: For each type of exposed finish.

1. Sheet Metal Flashing: 12 inches long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
2. Trim, Metal Closures, Joint Intersections, and Miscellaneous Fabrications: 12 inches long and in required profile. Include fasteners and other exposed accessories.
3. Unit-Type Accessories and Miscellaneous Materials: Full-size Sample.

E. Qualification Data:

1. For fabricator.
2. For Installer.

F. Product Certificates: For each type of roof edge flashing that is FM Approvals approved.

G. Product Test Reports: For each product, for tests performed by a qualified testing agency.

H. Warranties: Submit a copy of the warranties for materials, workmanship and finish; signedby the manufacturer and installer of the fabrications.

I. Sample Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

1.07 QUALITY ASSURANCE

A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet

metal flashing and trim similar to that required for this Project and whose products have a recordof successful in-service performance.

1. For roof edge flashings that are FM Approvals approved, shop shall be listed as ableto fabricate required details as tested and approved.

B. Installer Qualifications: Installer who employs skilled workers experienced in the installation of sheet metal flashing and trim similar to that required for this Project and whose installations similar to that of this project have a record of successful in-service performance.

1. Installer must be approved by the fabricator to install his products and maintain thewarranty.

C. Quality Standard: Fabricate and install sheet metal in accordance with Sheet Metal and Air Conditioning Contractors' National Association, Inc. (SMACNA) "Architectural Sheet Metal Manual," unless specifically indicated otherwise.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing andtrim installation.

1.09 PROJECT CONDITIONS

A. Coordinate work of this section with interfacing and adjoining work for proper sequencing of each installation. Ensure best possible weather resistance and durability of work and protection of materials and finishes.

B. Field Conditions and Measurements: Verify actual locations of flashing and fabrications, conditions for installation and actual field verified measurements before fabrication and indicate measurements on Shop Drawings.

1.10 WARRANTIES

A. The materials and installation for the products of this section shall be warrantied against failures such as leaks, delamination, buckling, becoming unattached, windblown damage, corrosion, or other failure in materials, workmanship or installation for the same amount as time as the roof system warranty, or 25 years after the date of final acceptance, minimum.

B. The sheet metal flashing and other components of this section that fall within the warranty period shall be repaired or replaced to the satisfaction of the Authority and at no cost to theAuthority.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in

construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensionsand profiles shown unless more stringent requirements are indicated.

C. FM Approvals Listing: Manufacture and install copings and roof edge flashings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-90. Identifymaterials with name of fabricator and design approved by FM Approvals.

D. SPRI Wind Design Standard: Manufacture and install copings and roof edge flashings tested according to SPRI ES-1 and capable of resisting the following design pressure:

1. Design Pressure: As indicated on Drawings.

E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
2. Provide clips that resist rotation and avoid shear stress as a result of sheet metal and trim thermal movements. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

2.02 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Stainless-Steel Sheet: ASTM A 240 or ASTM A 666, Type 316, dead soft, fully annealed; with smooth, flat surface.

1. Finish: No. 4 (polished directional satin).

2.03 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unlessotherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommendedby manufacturer of primary sheet metal or manufactured item.

1. General: Blind fasteners or self-drilling screws, gasketed with hex-washer head.

a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
b. Blind Fasteners: High-strength stainless-steel rivets suitable for metal being fastened.

2. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.

C. Solder:

1. For Stainless Steel: ASTM B 32, Grade Sn96, with acid flux of type recommendedby stainless-steel sheet manufacturer.

D. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, non- staining tape 1/2 inch wide and 1/8 inch thick.

E. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane, polysulfide or silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metalflashing and trim and remain watertight.

F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized.

G. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.

H. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

I. Slip Sheet: Five (5) pound red rosin-sized paper.

J. Lead Flashing: ASTM B 29, Four pounds per square feet.

2.04 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashingand trim in shop to greatest extent possible.

1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application andmetal.
2. Obtain field measurements for accurate fit before shop fabrication.
3. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edgesfolded back to form hems.
4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified in MCA's "Guide Specification for Residential Metal Roofing". Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset ofadjoining faces and of alignment of matching profiles.

C. General Metal Fabrication: Comply with details shown and with applicable requirements of SMACNA "Architectural Sheet Metal Manual" and other recognized industry practices. Fabricate for waterproof and weather resistant performance, with expansion provisions for running work, sufficient to permanently prevent leakage, damage, or deterioration of the work. Form work to fit substrates. Comply with material manufacturer instructions and specifications for forming material. Form exposed sheet metal to match profiles indicated free of oil canning, fish-mouths, buckling, tool marks, and other defects; true to line and levels indicated. Form a 1/2 inch hem, folded back, on underside of exposed edges.

D. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.

E. Expansion Provisions: Provide for thermal expansion of exposed metal sheet flashing and trim work exceeding ten (10) foot running length. For flashing and trim, provide movement joints at maximum spacing of ten (10) feet; no joints allowed within two (2) feet of corner or intersection. Where lapped or bayonet type expansion provisions in work cannot be used or would not be sufficiently water/weatherproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep,filled with butyl sealant concealed within joints.

F. Fabricate cleats and attachment devices from same material as metal sheet component being anchored or from compatible, noncorrosive metal recommended by metal sheet manufacturer.

1. Gauge: As specified or as recommended by SMACNA or metal manufacturer forapplication, but in no case less than gauge of metal being secured.

G. Sealant Joints: Where movable, nonexpansion type joints are indicated or required for proper performance of work, form metal to provide for proper installation of elastomeric sealant, in compliance with SMACNA standards.

H. Separations: Provide for separation of metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with bituminous coating slip sheets to isolate sheet metal from dissimilar materials, or other permanent separation as specified by manufacturer/fabricator.

I. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.

J. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.

K. Do not use graphite pencils to mark metal surfaces.

2.05 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Roof Edge Flashing (Gravel Stop) and Fascia Cap: Fabricate in minimum 96-inch- long, but not exceeding 12-foot- long sections. Furnish with 6-inch- wide, joint cover plates. Shop fabricate interior and exterior corners.

1. Joint Style: Butted with expansion space and 6-inch- wide, exposed cover plate.
2. Fabricate with scuppers spaced 10 feet apart, to dimensions required with 4-inch- wide flanges and base extending 4 inches beyond cant or tapered strip into field ofroof. Fasten gravel guard angles to base of scupper.
3. Fabricate from the Following Materials:

a. Stainless Steel: 0.019 inch thick.

B. Base Flashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:

1. Stainless Steel: 0.019 inch thick.

C. Roof-Penetration Flashing: Fabricate from the following materials:

1. Stainless Steel: 0.019 inch thick.

2.06 WALL SHEET METAL FABRICATIONS

A. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch- long, but not exceeding 12-foot- long, sections, under copings, and at shelf angles. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches beyond each side of wall openings; and form with 2-inch- high, end dams. Fabricate from the following materials:

1. Stainless Steel: 0.016 inch thick.

B. Opening Flashings in Frame Construction: Fabricate head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings. Form head and sill flashing with 2-inch- high, end dams. Fabricate from the following materials:

1. Stainless Steel: 0.016 inch thick.

2.10 MISCELLANEOUS SHEET METAL FABRICATIONS

A. Overhead-Piping Safety Pans: Fabricate from the following materials:

1. Stainless Steel: 0.025 inch thick.

B. Sealant Pans, Hoods for Pans and Pipe Chases:

1. Gauge: 24.
2. Minimum Pan Depth: 4 inches.
3. Fabricate in accord with Sealant Pan Detail and Pipe Chase Detail.

C. Metal Drip Edge:

1. Gauge: 24.

D. Lead Sleeve at Vent Pipes

1. One piece No. 4 lead sleeve lapped inside vent.

2.11 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Touch up finish as required after fabrication, forming, drilling or cutting.

2.12 MANUFACTURERS

A. Provide products complying with requirements of the contract documents and made by oneof the following:

1. Atas Aluminum Corporation.
2. Copper Sales, Inc.
3. MM Systems Corporation.
4. Petersen Aluminum Corporation.
5. Vincent Metals Division/Rio Algom, Inc.
6. Approved equal.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.

1. Verify compliance with requirements for installation tolerances of substrates.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

A. General: Except as otherwise indicated, comply with manufacturer's installation instructions and specifications and with SMACNA "Architectural Sheet Metal Manual". Anchor units of work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated. Install work to fit substrates and with laps, joints, and seams that will be permanently watertight and weatherproof.

1. Bed flanges in thick coat of asphalt roofing cement where required for waterproofperformance.

B. Fastening: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
3. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
4. Install exposed sheet metal flashing and trim with limited oil canning, and free ofbuckling and tool marks.
5. Torch cutting of sheet metal flashing and trim is not permitted.
6. Do not use graphite pencils to mark metal surfaces.

C. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.

1. Coat concealed side of uncoated-stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or

cementitious construction.

2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.

D. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep,filled with sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

E. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws or not less than recommended by fastener manufacturer to achieve maximum pull-out resistance, for the actual substrate.

F. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tightinstallation.

G. Seal joints as required for watertight construction.

1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
2. Prepare joints and apply sealants to comply with requirements in Section 07 92 00"Joint Sealants."

H. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets with solder to width of 1-1/2 inches; however, reduce pre-tinning where pre-tinned surface would show in completed Work.

1. Stainless-Steel Soldering: Tin edges of uncoated sheets, using solder for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning and soldering. Comply with solder manufacturer's recommended methods for cleaningand neutralization.

3.03 ROOF FLASHING INSTALLATION

A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer’s written installation instructions, and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

B. General: Install sheet metal roof flashing and trim to comply with performance requirements, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight.

C. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at

staggered 3-inch centers. Anchor to resist uplift and outward forces according to recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for FM Approvals' listing for required windstorm classification.

D. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.

3.04 VENT STACK FLASHING

A. Extend existing vent stacks as required for new roof using material to match existing.

B. Provide and install new lead flashing at vent stacks. Set flange in softened compound or hot asphalt. Extend lead flashing upward at vent stack and roll lead flashing one inch minimumdown into vent pipe.

3.05 UTILITY AND SUPPORT PENETRATIONS

A. Provide hooded sealant pans at pipes, rods, tubes and supports.

B. Seal penetrations at membrane with sealant. Set pan flanges in bed of sealant. Prime flanges. Install one (1) ply of flashing membrane over flanges and roof surfaces within 12 inches of flange edges.

C. Fill pan with sealant. Install sheet metal hood and drawband. Provide sealant at all joints and terminations.

3.06 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, andlouvers.

B. Through-Wall Flashing: Installation of through-wall flashing is specified in Masonry Sections.

3.10 MISCELLANEOUS FLASHING INSTALLATION

A. Overhead-Piping Safety Pans: Suspend pans from structure above, independent of other overhead items such as equipment, piping, and conduit, unless otherwise indicated on Drawings. Pipe and install drain line to plumbing waste or drainage system.

3.11 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.12 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder.

C. Clean off excess sealants.

D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.

E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

F. Protect sheet metal and fabrications as recommended by the installer so that completed work will be clean, secured, and without damage at substantial completion.

G. Upon completion of the flashing, roof vent, gutter, downspout and trim installation, clean finished surfaces and remove all excess materials, fasteners and debris immediately so as to avoid damage to the translucent panels.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 07 62 00, Sheet Metal Flashing and Trim shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 07 62 00, Sheet Metal Flashing and Trim shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 07 71 00
ROOF SPECIALTIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and SupplementaryConditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:

1. Copings.
2. Facias.
3. Roof-edge specialties.
4. Roof-edge drainage systems.

B. Related Sections:

1. Section 06 05 73 – Fire Retardant Treated Wood for Exterior Applications
2. Section 07 52 60 – Modified Bituminous Sheet Roofing – Heat Welded
3. Section 07 62 00 – Sheet Metal Flashing and Trim
4. Section 07 72 00 – Roof Accessories
5. Section 07 90 00 – Joint Sealers
6. Section 22 14 23 – Storm Drainage Piping Specialties.

C. Preinstallation Conference: Conduct conference at Project Site.

1. Meet with Authority, roofing-system testing and inspecting agency representative,roofing Installer, roofing-system manufacturer's representative, Installer, and installers whose work interfaces with or affects roof specialties, including installers of roofing materials and accessories.
2. Examine substrate conditions for compliance with requirements, includingflatness and attachment to structural members.
3. Review special roof details, roof drainage, and condition of other constructionthat will affect roof specialties.

1.03 SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For roof specialties.

1. Include plans, elevations, expansion-joint locations, keyed details, and attachments to other work. Distinguish between plant- and field-assembled work.
2. Include details for expansion and contraction; locations of expansion joints,including direction of expansion and contraction.

3. Indicate profile and pattern of seams and layout of fasteners, cleats, clips, andother attachments.
4. Detail termination points and assemblies, including fixed points.
5. Include details of special conditions.
6. Include details for attachment to substrates.

C. Calculations for roof water drainage:

1. Provide calculations for roof water drainage for building roofs, canopy roofs and other surfaces determining size requirements for gutters, downspouts and piping.Calculations to be based upon code requirements, historical data and other factors and be certified by a licensed civil engineer. Sizing calculations shall exceed code requirements by accommodating 200% of the actual roof or canopy areas served by each gutter and downspout.

D. Samples: For each type of roof specialty and for each color and texture specified.

E. Samples for Initial Selection: For each type of roof specialty indicated with factory-applied color finishes.

F. Samples for Verification:

1. Include Samples of each type of roof specialty to verify finish and color selection, in manufacturer's standard sizes.
2. Include copings, facias, roof-edge specialties, roof-edge drainage systems, reglets and counterflashings made from 12-inch lengths of full-size componentsin specified material, and including fasteners, cover joints, accessories, and attachments.

G. Qualification Data: For manufacturer, installer and testing agency. Submit qualificationsand experience to the CTA for review and approval.

H. Product Certificates: For each type of roof specialty.

I. Product Test Reports: For copings, facias, roof-edge flashings and roof edge drainage,for factory tests performed by a qualified testing agency.

J. Sample Warranty: For manufacturer's special warranty.

K. Maintenance Data: For roofing specialties to include in maintenance manuals at closeout.

1.04 QUALITY ASSURANCE

A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metalflashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

1. For copings, facias, and roof edge specialities that are FM Approvals approved,shop shall be listed as able to fabricate required details as tested and approved.

B. Installer Qualifications: Installer who employs skilled workers experienced in theinstallation of roof specialties similar to that required for this Project and whose installations similar to that of this project have a record of successful

in-service performance.

1. Installer must be approved by the fabricator to install his products and maintainthe warranty.

C. Testing Agency Qualifications: Employs personnel experienced in field inspecting andtesting of roof specialties similar to the type and scope of products specified herein. Testing agency to be hired by and paid by the Contractor and approved by the CTA.

D. Quality Standard:

1. Fabricate and install roof specialties in accordance with Sheet Metal and Air Conditioning Contractors' National Association, Inc. (SMACNA) "ArchitecturalSheet Metal Manual," unless specifically indicated otherwise.
2. Additionally, follow recommendations for the fabrication and installation of roofspecialties specified within the “National Roofing Contractors’ Association (NRCA) Roofing and Waterproofing Manual”.
3. Roof specialties to be designed to meet code requirements including anticipatedone-hundred-year rainfall accumulation and rainfall amount incident.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Do not store roof specialties in contact with other materials that might cause staining, denting, or other surface damage. Store roof specialties away from uncured concrete andmasonry.

B. Protect strippable protective covering on roof specialties from exposure to sunlight andhigh humidity, except to extent necessary for the period of roof-specialty installation.

1.06 FIELD CONDITIONS

A. Field Measurements: Verify profiles and tolerances of roof-specialty substrates by field measurements before fabrication, and indicate measurements on Shop Drawings.

B. Coordination: Coordinate roof specialties with flashing, trim, and construction of parapets,roof deck, roof and wall panels, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.07 WARRANTY

A. The materials and installation for the products of this section shall be warrantied against failures such as leaks, delamination, buckling, becoming unattached, wind-blown damage, corrosion, or other failure in materials, workmanship or installation for a period of one (1) year minimum or manufacturer’s standard warranty from the date of substantial completion. Products integral with the roof or canopy system such as flashing, copings or facias to be warranted for the same duration as the roof or canopy system warranty (typically for 25 years for roofs), from the date of substantial completion.

B. Special Warranty on Painted Finishes: Manufacturer agrees to repair finish or replaceroof specialties that show evidence of deterioration of factory-applied

finishes within specified warranty period.

1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:

   a. Color fading more than 5 Hunter units when tested according toASTM D 2244.
   b. Chalking in excess of a No. 8 rating when tested according toASTM D 4214.
   c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of substantial completion.

C. The roof specialties and other components of this section that fall within the warranty period shall be repaired or replaced to the satisfaction of the Authority and at no cost tothe Authority.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. General Performance: Roof specialties shall withstand exposure to weather and resistthermally induced movement and vibration without failure, rattling, leaking, or fastenerdisengagement due to defective manufacture, fabrication, installation, connections or other defects in construction.

B. FM Approvals' Listing: Manufacture and install copings, facias and roof-edge specialtiesthat are listed in FM Approvals and approved for windstorm classification, Class 1-90. Identify materials with FM Approvals' markings.

C. SPRI Wind Design Standard: Manufacture and install copings, facias and roof-edge specialties tested according to SPRI ES-1 and capable of resisting the following designpressures:

1. Design Pressure: As indicated on Drawings.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result ofthermal movements. Base calculations on surface temperatures of materials due to bothsolar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, materialsurfaces.

E. Roof drainage fabricated items such as gutters, downspouts, scuppers, etc. for roofs andcanopies to be designed in accordance with the rainfall calculations that are required to be performed and submitted herein.

1. Oversize the gutters, downspouts and scuppers to 150% the required size andcapacity.
2. If approved by the CTA, the number and spacing of downspouts may also beincreased to satisfy, totally or partially, the additional capacity requirement.

2.02 FABRICATED UNITS

A. General Metal Fabrication: Shop-fabricate work to greatest extent possible. Comply with details shown and with applicable requirements of SMACNA "Architectural Sheet Metal Manual" and other recognized industry practices. Fabricate for waterproof and weather-resistant performance, with expansion provisions for running work, sufficient to permanently prevent leakage, damage, or deterioration of the work. Form work to fit substrates.Comply with material manufacturer instructions and specifications for forming material. Form exposed sheet metal to match profiles indicated free of oil-canning, fish-mouths, buckling, tool marks, and other defects; true to line and levels indicated. Form a 1/2 inchhem, folded back, on underside of exposed edges.

B. Fabricate sheet metal in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.

C. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. Tin edges shallbe seamed and solder.

D. Expansion Provisions: Where lapped or bayonet-type expansion provisions in work can-not be used or would not be sufficiently water/weatherproof, form expansion joints of in-termeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

E. Conceal fasteners and expansion provisions wherever possible. Exposed fasteners arenot allowed on faces of sheet metal exposed to public view.

F. Fabricate cleats and attachment devices from same material as sheet metal component being anchored or from compatible, noncorrosive metal recommended by sheet metal manufacturer.

1. Gage: As recommended by SMACNA or metal manufacturer for application, butin no case less than gage of metal being secured.

G. Sealant Joints: Where movable, nonexpansion type joints are indicated or required for proper performance of work, form metal to provide for proper installation of elastomericsealant, in compliance with SMACNA standards.

H. Separations: Provide for separation of metal from noncompatible metal or corrosive sub- strates by coating concealed surfaces at locations of contact, with bituminous coating slipsheets to isolate sheet metal from dissimilar materials, or other permanent separation as specified by manufacturer.

I. Thicknesses, gauge or weight of materials specified below are minimums and additionalthickness, gauge or weight may be required to meet performance requirements as veri- fied by the manufacturer of the fabricated units.

2.03 COPINGS

A. Metal Copings: Manufactured coping system consisting of metal coping cap in section lengths minimum 96-inch-long, but not exceeding 12 feet, concealed anchorage; with corner units, end cap units, and concealed splice plates with finish matching coping caps.Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and drill elongated holes for fasteners on interior

leg. Miter corners, fasten and seal solder or weld watertight. Shop fabricate interior and exterior corners.

1. Manufacturers: Subject to compliance with requirements, provide products byone of the following:

    a. Architectural Products Company.
    b. ATAS International, Inc.
    c. Castle Metal Products.
    d. Cheney Flashing Company.
    e. Hickman Company, W. P.
    f. Merchant & Evans Inc.
    g. Metal-Era, Inc.
    h. Metal-Fab Manufacturing, LLC.
    i. Perimeter Systems; a division of SAF.
    j. Petersen Aluminum Corporation.
    k. Approved equal.

2. Coping Profile: According to SMACNA's "Architectural Sheet Metal Manual"
3. Joint Style: Butted with expansion space and 6-inch-wide, exposed cover plate.
4. Fabricate from the following materials:

    a. Copper: 24 oz./sq. ft. thickness.
    b. Formed Aluminum: 0.063 inch thick;
    c. Extruded Aluminum: 0.125 inch thick.
    d. Stainless Steel: 0.031 inch thick.
    e. Zinc-Tin Alloy-Coated Stainless Steel: 0.024 inch thick.
    f. Zinc-Tin Alloy-Coated Copper: 24 oz./sq. ft. thickness.
    g. Galvanized Steel: 0.034 inch thick.
    h. Metallic-Coated Steel; Zinc-Coated (galvanized) steel: 0.034-inchthickness.
    i. Aluminum-Zinc Alloy-Coated Steel: 0.040 inch thick.
    j. Zinc: 0.059 inch thick.
    k. Copper-Clad Stainless Steel: 0.027 inch thick.

5. Corners: Factory mitered and soldered or continuously welded as required by theAuthority.
6. Special Fabrications: Two-way sloped coping cap as shown on the drawings.
7. Coping-Cap Attachment Method: Snap-on or face leg hooked to continuous cleatwith back leg fastener exposed, as shown on the drawings; fabricated from coping-cap material.

    a. Snap-on Coping Anchor Plates: Concealed, galvanized-steel sheet, 12inches wide, with integral cleats.
    b. Face-Leg Cleats: Concealed, continuous galvanized-steel sheet orstainless steel for stainless steel copings.

2.04 ROOF-EDGE SPECIALTIES

A. Canted Roof-Edge Fascia and Gravel Stop: Manufactured, two-piece, roof-edge fascia consisting of snap-on metal fascia cover in section lengths not exceeding 12 feet and a continuous formed galvanized-steel sheet cant, 0.028 inch thick, minimum, with extendedvertical leg terminating in a drip-edge cleat. Provide matching corner units.

1. Manufacturers: Subject to compliance with requirements, provide products byone of the following:

a. Architectural Products Company.
b. ATAS International, Inc.
c. Castle Metal Products.
d. Cheney Flashing Company.
e. Hickman Company, W. P.
f. Merchant & Evans Inc.
g. Metal-Era, Inc.
h. Metal-Fab Manufacturing, LLC.
i. Petersen Aluminum Corporation.
j. Approved equal.

2. Metallic-Coated Steel Sheet Fascia Covers: Zinc-coated (galvanized) steel,nominal 0.034-inch thickness.

   a. Surface: Smooth, flat finish.
   b. Finish: Three-coat fluoropolymer.
   c. Color: As selected by the Authority from manufacturer's standard colors.

3. Formed Aluminum Sheet Fascia Covers: Aluminum sheet, 0.063 inch thick.

   a. Surface: Smooth, flat finish.
   b. Finish: Three-coat fluoropolymer.
   c. Color: As selected by the Authority from manufacturer's standard colors.

4. Extruded-Aluminum Fascia Covers: Extruded aluminum, 0.125 inch thick.

   a. Finish: Three-coat fluoropolymer or color anodic as selected by theAuthority.
   b. Color: As selected by the Authority from manufacturer's standard colors.

5. Corners: Factory mitered and soldered or continuously welded as required by theAuthority.
6. Splice Plates: Concealed or exposed, as required by the Authority; of samematerial, finish, and shape as fascia cover.
7. Special Fabrications: Bullnose fascia cover, cornice fascia cover, cove fasciacover as shown on the drawings.
8. Fascia Accessories: As shown on the drawings. Fascia extenders with continuous hold-down cleats, wall cap, soffit trim, overflow scuppers, overflowscuppers with perforated screens, spillout scuppers, downspout scuppers with integral conductor head and downspout adapters, Downspout scuppers with integral conductor head and downspout adapters and perforated screens.

B. Roof-Edge Fascia: Manufactured, two-piece, roof-edge fascia consisting of snap-on metal fascia cover in section lengths not exceeding 12 feet and a continuous metal receiver with integral drip-edge cleat to engage fascia cover. Provide matching cornerunits.

   1. Manufacturers: Subject to compliance with requirements, provide products byone of the following:

      a. Hickman Company, W. P.
      b. Metal-Era, Inc.

c. Metal-Fab Manufacturing, LLC.
d. Perimeter Systems; a division of SAF.
e. Approved equal.

2. Metallic-Coated Steel Sheet Fascia Covers: Zinc-coated (galvanized) steel,nominal 0.034-inch thickness.

a. Surface: Smooth, flat finish.
b. Finish: Three-coat fluoropolymer.
c. Color: As selected by the Authority from manufacturer's standard colors.

3. Formed Aluminum Sheet Fascia Covers: Aluminum sheet, 0.063 inch thick.

a. Surface: Smooth, flat finish.
b. Finish: Three-coat fluoropolymer or color anodic as selected by theAuthority.
c. Color: As selected by the Authority from manufacturer's standard colors.

4. Corners: Factory mitered and soldered or continuously welded as required by theAuthority.
5. Splice Plates: Concealed or exposed, as required by the Authority; of samematerial, finish, and shape as fascia cover.
6. Receiver: Galvanized-steel sheet, nominal 0.040-inch thickness; Aluminum sheet, 0.050 inch thick; extruded aluminum, 0.080 inch thick; to match fascia.
7. Special Fabrications: Bullnose fascia cover, cornice fascia cover, cove fasciacover as shown on the Drawings.
8. Fascia Accessories: As shown on the drawings. Fascia extenders with continuous hold-down cleats, wall cap, soffit trim, overflow scuppers, overflowscuppers with perforated screens, spillout scuppers, downspout scuppers with integral conductor head and downspout adapters, downspout scuppers with integral conductor head and downspout adapters and perforated screens.

C. One-Piece Gravel Stops: Manufactured, one-piece, metal gravel stop in section lengths not exceeding 12 feet, with a horizontal flange and vertical leg fascia terminating in a drip edge, and concealed splice plates of same material, finish, and shape as gravel stop. Provide matching corner units.

1. Manufacturers: Subject to compliance with requirements, provide products byone of the following:

a. Architectural Products Company.
b. Castle Metal Products.
c. Cheney Flashing Company.
d. Hickman Company, W. P.
e. Metal-Era, Inc.
f. Metal-Fab Manufacturing, LLC.
g. Perimeter Systems; a division of SAF.
h. Petersen Aluminum Corporation.
i. Approved equal.

2. Metallic-Coated Steel Sheet Gravel Stops: Zinc-coated (galvanized) steel,nominal 0.034-inch thickness.

a. Surface: Smooth, flat finish.
b. Finish: Three-coat fluoropolymer.
c. Color: As selected by the Authority from manufacturer's standard colors.

3. Formed Aluminum Sheet Gravel Stops: Aluminum sheet, 0.063 inch thick.

a. Surface: Smooth, flat finish.
b. Finish: Three-coat fluoropolymer or color anodic as selected by theAuthority.
c. Color: As selected by the Authority from manufacturer's standard colors.

4. Extruded-Aluminum Gravel Stops: Extruded aluminum, 0.125 inch thick.

a. Finish: Three-coat fluoropolymer or color anodic as selected by theAuthority.
b. Color: As selected by the Authority from manufacturer's standard colors.

5. Formed Stainless-Steel Sheet Gravel Stops: Stainless-steel sheet, nominal0.031-inch thickness.

a. Finish: No. 4 directional satin.

6. Corners: Factory mitered and soldered or continuously welded as required by theAuthority.
7. Accessories: Fascia extenders with continuous hold-down cleats, Wall cap, Soffittrim.

2.05 ROOF-EDGE DRAINAGE SYSTEMS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Architectural Products Company.
2. ATAS International, Inc.
3. Berger Building Products, Inc.
4. Castle Metal Products.
5. Cheney Flashing Company.
6. CopperCraft by FABRAL.
7. Hickman Company, W. P.
8. Merchant & Evans Inc.
9. Metal-Era, Inc.
10. Metal-Fab Manufacturing, LLC.
11. Perimeter Systems; a division of SAF.
12. Approved equal.

B. Hanging Gutters: Fabricate to cross section required, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch- long and maximum 12 foot long sections. Elevate back edge at least one inch above the front edge. Furnish flat-stock gutter brackets and flat-stock gutter spacers and straps fabricated from same metal as gutters, of size recommended by cited sheet metal standard but with thickness not less than twice the gutter thickness. Fabricate expansionjoints, expansion-joint covers, gutter bead reinforcing bars, and gutter

accessories from same metal as gutters. Shop fabricate interior and exterior corners.

1. Gutter Profile: As shown on drawings or selected by the Authority and according to SMACNA's "Architectural Sheet Metal Maunal."
2. Seam and seal joints except for joint indicated by SMACNA to be welded.
3. Expansion Joints: Butt type with cover plate. Provide expansion joints in gutters at spacing not to exceed 30 feet.
4. Accessories: Continuous, removable leaf screen with sheet metal frame and hardware cloth screen; 1/4" mesh of same material used for gutter or approved compatible material - length of screen units not to exceed 10 feet; Wire-ball downspout strainer; Valley baffles, as indicated.
5. Corners: Factory mitered and soldered or continuously welded as shown orrequired by the Authority.
6. Provide straps of same material and same finish and color for attachment of gutters and downspouts.
7. Back-paint concealed metal surfaces with bituminous coating to a minimum of 15mils dry film thickness
8. Fabricate gutters from the following materials:

    a. Copper: 24 oz./sq. ft. thickness.
    b. Aluminum: 0.063 inch thick.
    c. Stainless Steel: 0.031 inch thick.
    d. Zinc-Tin Alloy-Coated Copper: 24 oz./sq. ft. thickness.
    e. Galvanized Steel: 0.034 inch thick.
    f. Aluminum-Zinc Alloy-Coated Steel: 0.040 inch thick.
    g. Zinc-Coated Steel: 0.034 inch thick.

C. Built-in Gutters: Fabricate to cross section required, with riveted and soldered joints, complete with end pieces, outlet tubes, and other special accessories as required. Fabricate in minimum 96-inch- long sections. Fabricate expansion joints and accessoriesfrom same metal as gutters unless otherwise indicated.

1. Fabricate gutters with leak proof built-in expansion joints.
2. Accessories: Continuous, removable leaf screen with sheet metal frame andhardware cloth screen and Wire-ball downspout strainer.
3. Interior or built-in gutters are required to be fabricated with an interior liner installed to bridge any seams, expansion joints or other joints in the primary gutter.
4. Fabricate the gutters from the Following Materials:

    a. Copper: 16 oz./sq. ft. thickness.
    b. Stainless Steel: 0.016 inch thick.
    c. Zinc-Tin Alloy-Coated Stainless Steel: 0.015 inch thick.
    d. Zinc-Tin Alloy-Coated Copper: 16 oz./sq. ft. thickness.
    e. Zinc: 0.039 inch thick.
    f. Copper-Clad Stainless Steel: 0.016 inch thick.

5. The liner material to be a membrane material submitted to and approved by the CTA.

D. Downspouts: As shown on the drawings. Fabricate rectangular downspouts to dimensions indicated, complete with mitered elbows. Furnish with metal hangers fromsame material as downspouts and anchors. Shop fabricate elbows, machine crimped,mitered or smooth curved.

1. Fabricated Hanger Style: According to SMACNA's "Architectural Sheet

MetalManual."

2. Manufactured Hanger Style: According to SMACNA's "Architectural Sheet MetalManual."
3. Fabricate downspouts from the following materials:

    a. Copper: 24 oz./sq. ft. thickness.
    b. Aluminum: 0.063 inch thick.
    c. Extruded Aluminum: 0.125 inch thick.
    d. Stainless Steel: 0.031 inch thick.
    e. Zinc-Tin Alloy-Coated Stainless Steel: 0.024 inch thick.
    f. Zinc-Tin Alloy-Coated Copper: 24 oz./sq. ft. thickness.
    g. Galvanized Steel: 0.034 inch thick.
    h. Aluminum-Zinc Alloy-Coated Steel: 0.040 inch thick.
    i. Zinc: 0.059 inch thick.
    j. Copper-Clad Stainless Steel: 0.027 inch thick.

E. Parapet Scuppers: Fabricate scuppers to dimensions required, with closure flange trim to exterior, 4-inch- wide wall flanges to interior, and base extending 4 inches beyond cant or tapered strip into field of roof. Fabricate from the following materials:

1. Copper: 24 oz./sq. ft. thickness.
2. Aluminum: 0.063 inch thick.
3. Stainless Steel: 0.031 inch thick.
4. Zinc-Tin Alloy-Coated Stainless Steel: 0.024 inch thick.
5. Zinc-Tin Alloy-Coated Copper: 24 oz./sq. ft. thickness.
6. Galvanized Steel: 0.034 inch thick.
7. Aluminum-Zinc Alloy-Coated Steel: 0.040 inch thick.
8. Zinc: 0.059 inch thick.
9. Copper-Clad Stainless Steel: 0.027 inch thick.

F. Conductor Heads: Fabricate conductor heads with flanged back and stiffened top edge and of dimensions and shape required, complete with outlet tubes, exterior flange trim,and built-in overflows. Fabricate from the following materials:

1. Copper: 24 oz./sq. ft. thickness.
2. Aluminum: 0.063 inch thick.
3. Stainless Steel: 0.031 inch thick.
4. Zinc-Tin Alloy-Coated Stainless Steel: 0.024 inch thick.
5. Zinc-Tin Alloy-Coated Copper: 24 oz./sq. ft. thickness.
6. Galvanized Steel: 0.034 inch thick.
7. Aluminum-Zinc Alloy-Coated Steel: 0.040 inch thick.
8. Zinc: 0.059 inch thick.
9. Copper-Clad Stainless Steel: 0.027 inch thick.

G. Splash Pans: Fabricate to dimensions and shape required and from the followingmaterials:

1. Copper: 24 oz./sq. ft. thickness.
2. Aluminum: 0.063 inch thick.
3. Stainless Steel: 0.031 inch thick.
4. Zinc-Tin Alloy-Coated Stainless Steel: 0.024 inch thick.
5. Zinc-Tin Alloy-Coated Copper: 24 oz./sq. ft. thickness.
6. Zinc: 0.059 inch thick.
7. Copper-Clad Stainless Steel: 0.027 inch thick.

2.06 MATERIALS

A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A, G90 coating designation.

B. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper to suit forming operations and performance required.

C. Aluminum Extrusions: ASTM B221, alloy and temper recommended by manufacturer for type of use and finish indicated, finished as follows.

D. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304.

E. Copper Sheet: ASTM B 370, cold-rolled copper sheet, H00 or H01 temper.

2.07 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils thick, consisting of slip- resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphaltadhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.

1. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F.
2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 degF.
3. Manufacturers: Subject to compliance with requirements, provide products byone of the following:

a. Carlisle Coatings & Waterproofing Inc.
b. Grace Construction Products; W.R. Grace & Co. -- Conn.
c. Henry Company.
d. Metal-Fab Manufacturing, LLC.
e. Owens Corning.
f. Approved equal.

B. Felt: ASTM D 226/D 226M, Type II (No. 30), asphalt-saturated organic felt,nonperforated.

C. Slip Sheet: Rosin-sized building paper, 3-lb/100 sq. ft. minimum.

2.08 MISCELLANEOUS MATERIALS

A. Fasteners: Manufacturer's recommended fasteners, suitable for application and designedto meet performance requirements. Furnish the following unless otherwise indicated:

1. Exposed Penetrating Fasteners: Gasketed screws with hex washer headsmatching color of sheet metal.
2. Fasteners for Aluminum: Aluminum or Series 300 stainless steel.
3. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
4. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Series 300 stainless steelor hot-dip zinc-coated steel according to ASTM A 153 or ASTM F 2329.

B. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane or silicone, as selected andapproved by the Authority, polymer sealant of type, grade, class, and use classifications required by roofing-specialty manufacturer for each application.

C. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type joints with limited movement.

D. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

E. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

F. Cleats: Of metal thicker than sheet metal fabrication it is holding; continuous unlessapproved otherwise; fasten at 4 inches unless approved otherwise.

2.09 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying astrippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within therange of approved Samples and are assembled or installed to minimize contrast.

D. Coil-Coated Galvanized-Steel Sheet Finishes:

1. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with ASTM A 755/A 755M and coating andresin manufacturers' written instructions.

    a. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containingnot less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
    b. Concealed Surface Finish: Apply pretreatment and manufacturer's standard acrylic or polyester backer finish consisting of prime coat andwash coat with a minimum total dry film thickness of 0.5 mil.

2. Surface: Smooth, flat finish.
3. Color: As selected by Authority from manufacturer’s standard colors.

E. Coil-Coated Aluminum Sheet Finishes:

1. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

    a. Three-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containingnot less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

b. Concealed Surface Finish: Apply pretreatment and manufacturer's standard acrylic or polyester backer finish consisting of prime coat andwash coat with a minimum total dry film thickness of 0.5 mil.

2. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm orthicker.
3. Surface: Smooth, flat finish.
4. Color: As selected by Authority from manufacturer’s standard colors.

F. Aluminum Extrusion Finishes:

1. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

a. Three-Coat Fluoropolymer: AAMA. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfacesto comply with coating and resin manufacturers' written instructions.

b. Concealed Surface Finish: Apply pretreatment and manufacturer's standard acrylic or polyester backer finish consisting of prime coat andwash coat with a minimum total dry film thickness of 0.5 mil.

2. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm orthicker.
3. Surface: Smooth, flat finish.
4. Color: As selected by Authority from manufacturer’s standard colors.

G. Formed Stainless Steel Sheet:

1. Finish: No. 4 (directional satin).

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions under which products of this section are to be installed and verify that Work may properly commence. Do not proceed with installation until unsatisfactory conditions have been corrected.

1. Examine walls, roof edges, and parapets for suitable conditions for roof specialties.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage where applicable, and securely anchored.
3. Verify that nailers, blocking, and other attachment provisions for sheet metal work are properly located and securely fastened to resist effects of wind and thermal stresses. Re-secure any loose nailers or blocking. Replace any damaged, rotted or missing nailers or blocking.
4. Verify that roofing system, including flashing, installation is completely and properly installed prior to installation of sheet metal work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

B. Isolate dissimilar metals by means of a heavy bituminous coating, approved paint coat-ing, adhered polyethylene sheet, or other approved means.

3.03 UNDERLAYMENT INSTALLATION

A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply wrinklefree, in shingle fashion to shed water, and with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days.

1. Apply continuously under copings, roof-edge copings, roof-edge specialties,reglets and counterflashings.
2. Coordinate application of self-adhering sheet underlayment under roof specialtieswith requirements for continuity with adjacent air barrier materials.

B. Felt Underlayment: Install with adhesive for temporary anchorage to minimize use of mechanical fasteners under roof specialties. Apply in shingle fashion to shed water, withlapped joints of not less than 2 inches.

C. Slip Sheet: Install with tape or adhesive for temporary anchorage to minimize use of mechanical fasteners under roof specialties. Apply in shingle fashion to shed water, withlapped joints of not less than 2 inches.

3.04 INSTALLATION, GENERAL

A. General: Install roof specialties according to manufacturer's written instructions and withSMACNA “Architectural Sheet Metal Manuel.” Anchor roof specialties securely in place,with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, underlayments, sealants, and other miscellaneous items as required to complete roof-specialty systems.

1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
2. Provide uniform, neat seams with minimum exposure of solder and sealant.
3. Install roof specialties to fit substrates and to result in weathertight performance.Verify shapes and dimensions of surfaces to be covered before manufacture.
4. Torch cutting of roof specialties is not permitted.
5. Do not use graphite pencils to mark metal surfaces.
6. Conceal fasteners where possible.
7. Adhear and seal water-stop membrane 3 inches over flashing termination, across nailer and extending down outside edge 1 inch below exposed nailer.

B. Install exposed sheet metal Work that is without excessive oil canning, buckling, and toolmarks. Fold back exposed edges to form hems. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal. Install to fit substrate and to resultin watertight performance.

1. Space cleats continuous or not more than 12 inches apart. Anchor each

cleatwith two fasteners or at 4” centers. Bend tabs over fasteners.

C. Secure metal coping, facia and other items as recommended by manufacturer and asrequired for wind design loads.

D. Metal Protection: Protect metals against galvanic action by separating dissimilar metalsfrom contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

1. Coat concealed side of uncoated aluminum and stainless-steel roof specialtieswith bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing metal flashing directly on cementitious or woodsubstrates, install a course of felt underlayment and cover with a slip sheet or install a course of polyethylene underlayment.
3. Bed flanges in thick coat of asphalt roofing cement where required bymanufacturers of roof specialties for waterproof performance.

E. Expansion Provisions: Allow for thermal expansion of exposed roof specialties.

1. Space movement joints at a maximum of 10 feet with no joints within 18 inches ofcorners or intersections unless otherwise indicated on Drawings.
2. When ambient temperature at time of installation is between 40 and 70 deg F,set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.

F. Fastener Sizes: Use fasteners of sizes that penetrate wood blocking or sheathing notless than 1-1/4 inches for nails and not less than ¾ inch for wood screws.

G. Seal concealed joints with butyl sealant as required by roofing-specialty manufacturer.

H. Seal joints as required for weathertight construction. Place sealant to be completelyconcealed in joint. Do not install sealants at temperatures below 40 deg F.

I. Sealed Joints: Form minimum 1-inch hooked joints and embed flange into sealant or adhesive. Form metal to completely conceal sealant or adhesive.

1. Use joint adhesive for nonmoving joints specified not to be soldered.
2. Moving joints: When ambient temperature is moderate (40-70 degrees F) at timeof installation, set joined members for 50 percent movement either way. Adjust setting position of joined members proportionally for temperatures above 70 degrees F. Do not install sealant at temperatures below 40 degrees F.

J. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches; however, reduce pre-tinning where pre-tinned surface would show in completed Work. Tin edges of uncoated copper sheets using solder for copper. Do not use torches for soldering. Heat surfaces to receivesolder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.

3.05 COPING INSTALLATION

A. Install cleats, anchor plates, and other anchoring and attachment accessories

anddevices with concealed fasteners.

B. Anchor copings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.

1. Interlock face and back leg drip edges of snap-on coping cap into cleated anchorplates anchored to substrate at 30-inch centers.
2. Interlock face-leg drip edge into continuous cleat anchored to substrate at 16- inch centers. Anchor back leg of coping with screw fasteners and elastomericwashers at 16-inch centers.

3.06 ROOF-EDGE SPECIALITIES INSTALLATION

A. Install cleats, cants, and other anchoring and attachment accessories and devices withconcealed fasteners.

B. Anchor roof edgings with manufacturer's required devices, fasteners, and fastenerspacing to meet performance requirements.

3.07 ROOF-EDGE DRAINAGE-SYSTEM INSTALLATION

A. General: Install components to produce a complete roof-edge drainage system according to manufacturer's written instructions. Coordinate installation of roof perimeter flashing with installation of roof-edge drainage system.

B. Gutters: Join and seal gutter lengths. Allow for thermal expansion. Attach gutters to firmly anchored gutter supports spaced not more than 24 inches apart. Attach ends with rivets and seal with solder unless sealing with sealant is approved by the Authority to make watertight. Slope to downspouts.

1. Fasten gutter spacers to front and back of gutter.
2. Anchor and loosely lock back edge of gutter to continuous cleat.
3. Anchor back of gutter that extends onto roof deck with cleats spaced not more than 24 inches apart.
4. Anchor gutter with gutter brackets or straps spaced not more than 24 inches apart to roof deck, unless otherwise indicated, and loosely lock to front gutter bead.
5. Install gutter with expansion joints at locations indicated, but not exceeding, 50 feet apart. Install expansion-joint caps.
6. Install continuous gutter screens on gutters with noncorrosive fasteners, hingedto swing open for cleaning gutters.

C. Downspouts: Join sections with manufacturer's standard telescoping joints. Provide hangers with fasteners designed to hold downspouts securely to walls and 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c.

1. Provide elbows at base of downspouts at grade to direct water away frombuilding.
2. Connect downspouts to underground drainage system where indicated on thedrawings.

D. Splash Pans: Install where downspouts discharge on low-slope roofs. Set in asphalt roofing cement or elastomeric sealant.

E. Parapet Scuppers: Install scuppers through parapet where indicated. Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over

cantsor tapered edge strips, and under roofing membrane.

1. Anchor scupper closure trim flange to exterior wall and seal or solder to scupper.
2. Loosely lock front edge of scupper with conductor head.
3. Seal or solder exterior wall scupper flanges into back of conductor head.

F. Conductor Heads: Anchor securely to wall with elevation of conductor top edge 1 inch below scupper or gutter discharge.

G. Expansion-Joint Covers: Install expansion-joint covers at locations and of configuration indicated. Lap joints minimum of 4 inches in direction of water flow.

3.08 QUALITY ASSURANCE

A. Roof accessories to be inspected and tested for adherence to the material, fabrication and installation requirements specified herein and according to the approved shop drawings and submittals.

1. Perform water tests in the field of the installed items.
2. Examine and test welded connections for leaks and potential leaks due toexpansion, contraction and vibration.
3. Examine and test attachment to substrate to withstand wind and vibration.

B. The testing agency to perform field tests for adherence to requirements and to test forleaks including leaks at joints, welds, connections and other locations throughout the installation.

C. Testing agency to provide a report of their inspections and tests to the CTA. Any deficiencies to be repaired or replaced by the Contractor at the direction of the CTA andat no cost to the CTA.

3.09 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation andweathering.

B. Clean and neutralize flux materials. Clean off excess solder and sealants.

C. Remove temporary protective coverings and strippable films as roof specialties are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain roofspecialties in a clean condition during construction.

D. Replace roof specialties that have been damaged or that cannot be successfully repairedby finish touchup or similar minor repair procedures.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 07 71 00, Roof Specialties shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 07 71 00, Roof Specialties shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 07 72 00

ROOF ACCESSORIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this section.

1.02 SUMMARY

A. This Section includes the following:

1. Roof curbs.
2. Equipment supports.
3. Roof hatches.
4. Hatch-type heat and smoke vents.
5. Dropout-type heat and smoke vents.
6. Gravity ventilators.
7. Pipe and duct supports.
8. Pipe portals.
9. Preformed flashing sleeves.
10. Roof walkways.
11. Expansion Joint Covers
12. Pitch Pocket System.
13. Vent hood with bird screen.

B. Related Sections:

1. Section 05 50 00 – Metal Fabrications.
2. Section 06 05 73 – Fire Retardant treated Wood for Exterior Applications.
3. Section 07 52 60 – Modified Bituminous Sheet Roofing – Heat welded.
4. Section 07 62 00 – Sheet Metal Flashing and Trim
5. Section 07 71 00 - Roof Specialties.
6. Section 07 90 00 – Joint Sealers.
7. Section 22 14 23 – Storm Drainage Piping Specialties.

C. The following are specified elsewhere:

1. Roofing accessories and flashing installed integral with roofing membranes arespecified in the roofing section.

1.03 REFERENCES

A. FM - Roof Assembly Classifications.

B. UL - Fire Hazard Classifications.

C. Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractor's NationalAssociation, Inc. (SMACNA); 1993.

D. ASTM A 653: Standard Specification for Steel Sheet, Zinc-coated (Galvanized) by theHot-Dip Process, and Lock-Forming Quality; 1990.

E. FS TT-C-494B: Coating Compound, Bituminous, Solvent Type, Acid Resistant; 1985.

1.04 COORDINATION

A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.

B. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

1.05 SUBMITTALS

A. General: Submit the following for the Authority's review and approval:

B. Product data and specifications for each type of roof accessory. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

C. Installation instructions for each type of roof accessory.

D. Shop drawings showing plans, elevations, keyed details, layout, profiles, methods of joining, and anchorages details, expansion provisions for major flashing and counter flashings, and attachments to other work. Indicate dimensions, loadings and special conditions. Provide layouts at 1/4-inch scale and details at 3-inch scale. Distinguish between shop and field-assembled work. Include the following:

1. Identify material, thickness, weight, and finish for each item and location in Project.
2. Details for forming sheet metal including profiles, shapes, seams, and dimensions.
3. Details for fastening, joining, supporting, providing for expansion, and anchoring including fasteners, clips, cleats, caps, and attachments to adjoining work.
4. Detail mounting, securing and flashing of roof mounted items to roof structure. Indicate coordinating requirements with roof membrane system.
5. Wind-Resistant Details: Detail fabrication and attachment of wind restraints. Show anchorage details and indicate quantity, diameter and depth of penetration of anchors.

E. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items. Show the following:

1. Size and location of roof accessories specified in this Section.
2. Method of attaching roof accessories to roof or building structure.
3. Other roof-mounted items including mechanical and electrical equipment, ductwork, piping, and conduit.
4. Required clearances.

F. Samples for each exposed product and for each color and texture specified, including fastening devices:

1. 8-inch-square or 12 inch long samples of each specified sheet material or productin the type of metal and finish required.

G. Samples for Initial Selection: For each type of pre-finished metal roof accessories and trim indicated with factory-applied color finishes, provide color samples and sample in actual selected finish and color.

H. Warranties: Submit a copy of the warranties for materials, workmanship and finish signedby the manufacturer and installer of the fabrications.

I. Certifications: Provide certification for each accessory item supplied that it meets the performance criteria set forth herein for wind loads and thermal movements. Provide certification for each accessory item supplied that it is accordance with SMACNA standards.

J. Provide verification that the installer(s) of the products of this section indicating that they comply with the requirements of the Quality Assurance article of this section and are approved by their respective manufacturers.

1.06 QUALITY ASSURANCE

A. Manufacturer: A company familiar with manufacturing products included in this section forat least ten (10) years.

B. Installer: A company familiar with installing products included in this section and which has completed at least twenty (20) installations similar in scope to work included in this section.

C. Quality Standard:

1. Fabricate and install sheet metal work in accordance with Sheet Metal and Air Conditioning Contractors' National Association, Inc. (SMACNA) "Architectural Sheet Metal Manual," unless specifically indicated otherwise.
2. Provide welding complying with American Welding Society Structural Welding Code for Steel, AWS D1.1.

D. Provide and install roof specialties and accessories to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing, including leaking and/or fastener disengagement.

1. Fabricate and install roof specialties and accessories to comply with recommendations of FM Loss Prevention Data Sheet 1-49 for wind zone appropriateto project site.

E. Thermal Movements: Provide roof specialties and accessories that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F., ambient; 180 deg F., material surfaces.

F. Water Infiltration: Provide roof accessories and accessories that do not allow water infiltration to building interior.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver manufactured roof specialties and accessory materials and fabrications undamaged. Protect roof specialties and accessory materials and fabrications during transportation andhandling.

B. Unload, store, and install roof specialties and accessory sheet metal flashing materials and fabrications in a manner to prevent bending, warping, twisting, and surface

damage.

C. Stack materials on platforms or pallets, covered with suitable weathertight and ventilated covering. Do not store roof specialties and accessory materials in contact with other materials that might cause staining, denting, or other surface damage.

1.08 PROJECT CONDITIONS

A. Coordinate work of this section with interfacing and adjoining work for proper sequencing of each installation. Ensure best possible weather resistance and durability of work and protection of materials and finishes.

1.09 WARRANTY

A. Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of manufactured roof specialties and accessories that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including, but not limited to, excessive deflection.
b. Noise or vibration caused by thermal movements.
c. Deterioration of metals or metal finishes and other materials beyond normalweathering.
d. Sealant failures.
e. Water leakage.
f. Failure of operating components.

2. Warranty Period: Five (5) years from the date of final acceptance.

B. Warranty on High Performance Finish: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes do not comply with requirements or that fail in materials or workmanship within specified warranty period. Warranty includes fading, cracking, chipping, peeling, pitting or other deterioration other than normal weathering.

1. Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Warranty Period: Twenty (20) years from date of final acceptance.

C. Installer’s Warranty: Installer shall warranty his installation of the roof specialties and accessories that do not comply with requirements or fail by leaking, dislodging, or otherwisenot maintaining its structural integrity.

1. Warranty Period: Two (2) years from the date of final acceptance.

D. Warranty for the materials, workmanship and installation of the Pitch Pocket System shallbe the same as the roofing system that incorporates it, typically 25 years.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. General Performance: Roof accessories shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

B. Delegated Design: Engage a qualified professional engineer to design roof curbs and equipment supports to comply with wind performance requirements, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. Wind-Restraint Performance: As required by code.

2.02 ROOF CURBS

A. Roof Curbs: Internally reinforced roof-curb units capable of supporting superimposed live and dead loads, including equipment loads and other construction indicated on Drawings, bearing continuously on roof structure, and capable of meeting performance requirements; with welded or mechanically fastened and sealed corner joints, cant and integrally formeddeck-mounting flange at perimeter bottom.

B. Coordinate dimensions with roughing-in information or Shop Drawings of equipment to besupported.

C. Supported Load Capacity: As required for equipment supported.

D. Material: Zinc-coated (galvanized) sheet metal, 0.064 inch thick.

1. Finish: Two-coat fluoropolymer.
2. Color: As selected by the Authority from manufacturer’s standards.

E. Material: Aluminum sheet, 0.125 inch thick.

1. Finish: Two-coat fluoropolymer.
2. Color: As selected by the Authority from manufacturer’s standards.

F. Material: Stainless-steel sheet, 0.078 inch thick.

1. Finish: No. 2D, directional satin finish.

G. Construction:

1. Curb Profile: Manufacturer's standard or profile as indicated on Drawings compatible with roofing system.
2. On ribbed or fluted metal roofs, form deck-mounting flange at perimeter bottom toconform to roof profile.
3. Galvanized metal welded construction; corners joined by continuous welds.
4. Cants with step to match roof insulation thickness.
5. Fabricate curbs to minimum height of 12 inches above roofing surface unless otherwise indicated.
6. Internally reinforce curbs and factory insulated with 1 ½ inch thick three pound density fiberglass insulation.
7. Top Surface: Level top of curb, with roof slope accommodated by sloping deck- mounting flange or by use of leveler frame.

8. Sloping Roofs: Where roof slope exceeds 1:48, fabricate curb with perimeter curb height tapered to accommodate roof slope so that top surface of perimeter curb is level. Equip unit with water diverter or cricket on side that obstructs water flow.
9. Insulation: Factory insulated with minimum 1-1/2-inch thick glass-fiber board insulation.
10. Liner: Same material as curb, of manufacturer's standard thickness and finish.
11. Nailer: Factory-installed treated wood nailer along top flange of curb or under top flange on side of curb, continuous around curb perimeter, anchored from undersidewith TEKscrews.
12. Wind Restraint Straps and Base Flange Attachment: Provide wind restraint straps, welded strap connectors, and base flange attachment to roof structure at perimeter of curb, of size and spacing required to meet wind uplift requirements.
13. Platform Cap: Where portion of roof curb is not covered by equipment, provide weathertight platform cap formed from 3/4-inch thick plywood covered with metal sheet of same type, thickness, and finish as required for curb.
14. Metal Counterflashing: Manufacturer's standard, removable, fabricated of same metal and finish as curb.
15. Security Grille: Provide where indicated.
16. Damper Tray: Provide damper tray or shelf with opening of size indicated.

H. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Adaptable Air Products.
2. AES Industries, Inc.
3. Air Balance Inc.; a division of MESTEK, Inc.
4. Bristolite Daylighting Systems, Inc.
5. Conn-Fab Sales, Inc.
6. Curbs Plus, Inc.
7. Custom Solution Roof and Metal Products.
8. Greenheck Fan Corporation.
9. KCC International Inc.
10. Lloyd Industries, Inc.
11. LMCurbs.
12. Louvers & Dampers, Inc.; a division of Mestek, Inc.
13. Metallic Products Corp.
14. Milcor; Commercial Products Group of Hart & Cooley, Inc.
15. Pate Company (The).
16. Plenums Incorporated.
17. Roof Curb Systems.
18. Roof Products and Systems (RPS); a division of Hart & Cooley, Inc.
19. Roof Products, Inc.
20. Safe Air of Illinois.
21. Thybar Corporation.
22. Vent Products Co., Inc.
23. Approved equal.

2.03 EQUIPMENT SUPPORTS

A. Equipment Supports: Internally reinforced perimeter or rail-type metal equipment supports capable of supporting superimposed live and dead loads between structural supports, including equipment loads and other construction indicated on Drawings, spanning between structural supports; capable of meeting performance requirements; with welded corner joints, integral metal cant and integrally formed structure-mounting

flange at bottom.

B. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipmentto be supported.

C. Supported Load Capacity: As required for equipment supported.

D. Material: Stainless-steel sheet, 0.078 inch thick.

1. Finish: No. 2D, directional satin finish.

E. Construction:

1. Curb Profile: Manufacturer’s standard or profile as indicated on the Drawings; compatible with roofing system.
2. Insulation: Factory insulated with minimum 1-1/2 inch thick glass-fiber board insulation.
3. Liner: Same material as equipment support, of manufacturer's standard thicknessand finish.
4. Nailer: Factory-installed continuous treated wood nailers 3-1/2 inches or 5-1/2 inches wide on top flange of equipment supports continuous around support perimeter.
5. Wind Restraint Straps and Base Flange Attachment: Provide wind restraint straps, welded strap connectors, and base flange attachment to roof structure at perimeterof curb of size and spacing required to meet wind uplift requirements.
6. Platform Cap: Where portion of equipment support is not covered by equipment, provide weathertight platform cap formed from 3/4-inch thick plywood covered with metal sheet of same type, thickness, and finish as required for curb.
7. Metal Counterflashing: Manufacturer's standard, removable, fabricated of same metal and finish as equipment support.
8. On ribbed or fluted metal roofs, form deck-mounting flange at perimeter bottom toconform to roof profile.
9. Fabricate equipment supports to minimum height of 8 inches above roofing surfaceunless otherwise indicated.
10. Sloping Roofs: Where roof slope exceeds 1:48, fabricate each support with height to accommodate roof slope so that tops of supports are level with each other. Equip supports with water diverters or crickets on sides that obstruct water flow.
11. Security Grille: Provide where indicated on Drawings.

F. Fabricate units to lengths and heights as shown or required. Units to be minimum 8 inches high above roof insulation and 6 inches longer than equipment being supported with integrally formed cants with step to match roof insulation thickness. Continuously join corners with welds. Supply supports with continuous treated wood nailer anchored to support with TEK screws. Provide 18 gage galvanized steel, welded cap/counter-flashing.

G. Field verify all support lengths, locations, roof slopes, roof insulation thickness and conditions prior to fabrication and submittal of shop drawings.

H. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Adaptable Air Products.
2. AES Industries, Inc.
3. Air Balance Inc.; a division of MESTEK, Inc.

4. Conn-Fab Sales, Inc.
5. Curbs Plus, Inc.
6. Custom Solution Roof and Metal Products.
7. Greenheck Fan Corporation.
8. KCC International Inc.
9. Lloyd Industries, Inc.
10. LMCurbs.
11. Louvers & Dampers, Inc.; a division of Mestek, Inc.
12. Milcor; Commercial Products Group of Hart & Cooley, Inc.
13. Pate Company (The).
14. Plenums Incorporated.
15. Roof Curb Systems.
16. Roof Products and Systems (RPS); a division of Hart & Cooley, Inc.
17. Roof Products, Inc.
18. Thybar Corporation.
19. Vent Products Co., Inc.
20. Approved equal.

2.04 ROOF HATCH

A. Roof Hatches: Metal roof-hatch units with lids and insulated double-walled curbs, welded or mechanically fastened and sealed corner joints, continuous lid-to-curb counterflashing and weathertight perimeter gasketing, integral metal cant and integrally formed deck- mountingflange at perimeter bottom.

B. Type and Size:

1. Single-leaf lid, size as shown on the drawings.
2. Double-leaf lid, size as shown on the drawings.

C. Loads: Minimum 40-lbf/sq. ft. external live load and 20-lbf/sq. ft. internal uplift load.

D. Hatch Material: Zinc-coated (galvanized) sheet metal, 0.064 inch thick.

1. Finish: Two-coat fluoropolymer.
2. Color: As selected by the Authority from manufacturer’s standards.

E. Hatch Material: Aluminum sheet, 0.125 inch thick.

1. Finish: Two-coat fluoropolymer.
2. Color: As selected by the Authority from manufacturer’s standards.

F. Hatch Material: Stainless-steel sheet, 0.078 inch thick.

1. Finish: No. 2D, directional satin finish.

G. Construction:

1. Insulation: Polyisocyanurate board; R-Value: 12.0 according to ASTM C 1363.
2. Nailer: Factory-installed treated wood nailer continuous around hatch perimeter.
3. Hatch Lid: Opaque, insulated, and double walled, with manufacturer's standard metal liner of same material and finish as outer metal lid.
4. Curb Liner: Manufacturer's standard, of same material and finish as metal curb.
5. On ribbed or fluted metal roofs, form flange at perimeter bottom to conform to roofprofile.
6. Fabricate curbs to minimum height of 8 inches above roofing surface unless otherwise indicated.
7. Sloping Roofs: Where slope or roof deck exceeds 1:48, fabricate curb with perimeter curb height that is tapered to accommodate roof slope so that top

surfaces of perimeter curb are level. Equip hatch with water diverter or cricket on side that obstructs water flow.

8. Hardware: Spring operators, hold-open arm, stainless-steel spring latch with turn handles, stainless-steel butt- or pintle-type hinge system, and padlock hasps insideand outside.
9. Provide two-point latch on lids larger than 84 inches.

H. Safety Railing System: Roof-hatch manufacturer's standard system including rails, clamps, fasteners, safety barrier at railing opening, and accessories required for a complete installation; attached to roof hatch and complying with 29 CFR 1910.23 requirements andlocal codes having jurisdiction.

1. Height: 42 inches above finished roof deck.
2. Posts and Rails: Galvanized-steel pipe, 1-1/4 inches (31 mm) in diameter orgalvanized-steel tube, 1-5/8 inches in diameter.
3. Flat Bar: Galvanized steel, 2 inches high by 3/8 inch thick.
4. Maximum Opening Size: System constructed to prevent passage of a sphere 21inches in diameter.
5. Self-Latching Gate: Fabricated of same materials and rail spacing as safety railingsystem. Provide manufacturer's standard hinges and self-latching mechanism.
6. Post and Rail Tops and Ends: Weather resistant, closed or plugged with prefabricated end fittings.
7. Provide weep holes or another means to drain entrapped water in hollow sectionsof handrail and railing members.
8. Fabricate joints exposed to weather to be watertight.
9. Fasteners: Manufacturer's standard, finished to match railing system.
10. Finish: Galvanized or manufacturer’s standard finish and color as indicated on thedrawings.

I. Ladder-Assist Post: Roof-hatch manufacturer's standard device for attachment to roof-access ladder.

1. Operation: Post locks in place on full extension; release mechanism returns post toclosed position.
2. Height: 42 inches above finished roof deck.
3. Material: Galvanized steel.
4. Post: 1-5/8 inch diameter pipe.
5. Finish: Galvanized or manufacturer’s standard finish and color as indicated on thedrawing.

J. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Acudor Products, Inc.
2. AES Industries, Inc.
3. Babcock-Davis.
4. Bilco Company (The).
5. Bristolite Daylighting Systems, Inc.
6. Custom Solution Roof and Metal Products.
7. Dur-Red Products.
8. Hi Pro International, Inc.
9. JL Industries, Inc.; a division of the Activar Construction Products Group.
10. KCC International Inc.
11. Lexcor; a division of Luxsuco corp.
12. Metallic Products Corp.
13. Milcor; Commercial Products Group of Hart & Cooley, Inc.
14. Natural Daylighting Systems.

15. Nystrom, Inc.
16. O'Keeffe's Inc.
17. Pate Company (The).
18. Precision Ladders, LLC.
19. Williams Bros. Corporation of America (The).
20. Approved equal.

2.05 HEAT AND SMOKE VENTS

A. Hatch-Type Heat and Smoke Vents: Manufacturer's standard, with insulated curbs, welded or mechanically fastened and sealed corner joints, integral condensation gutter, and cap flashing. Fabricate with insulated double-walled lid and continuous weathertight perimeter lid gaskets, and equip with automatic self-lifting mechanisms and UL-listed.

1. Type and Size: Single-leaf or Double-leaf lid, size as indicated on the drawings.
2. Loads: Minimum 40-lbf/sq. ft. external live load and 30-lbf/sq. ft. internal uplift load.
3. When release is actuated, lid shall open against 10-lbf/sq. ft. snow or wind load andlock in position.
4. Hatch-Lid Glazing: Minimum 40-lbf/sq. ft. external live load and 20-lbf/sq. internaluplift load.
5. Heat and Smoke Vent Standard: Provide units that have been tested and listed tocomply with UL 793 and are FM Approved.
6. Curb, Framing, and Lid Material: Zinc-coated (galvanized) steel sheet.

    a. Thickness: Manufacturer's standard thickness for hatch size indicated or
    0.079 inch minimum.
    b. Finish: Mill phosphatized, factory prime coating, two-coat fluoropolymer orbaked enamel or powder coat as selected by the Authority.
    c. Color: As selected by the Authority from manufacturer’s standard colors.

7. Curb, Framing, and Lid Material: Aluminum sheet.

    a. Thickness: Manufacturer's standard thickness for hatch size indicated or
    0.079 inch minimum.
    b. Finish: Mill, factory prime coating, clear anodic, color anodic,
    c. two-coat fluoropolymer, baked enamel or powder coat as selected by theAuthority.
    d. Color: As selected by the Authority from manufacturer’s standard colors.

8. Construction:

    a. Insulation: Cellulosic-fiber board or glass-fiber board, polyisocyanurateboard.
    b. R-Value: 12.0 according to ASTM C 1363.
    c. Nailer: Factory-installed wood nailer continuous around hatch perimeter.
    d. Hatch Lid: Opaque or glazed (as shown on the drawings or selected by the Authority), insulated, and double walled, with manufacturer's standard metal liner of same material and finish as outer metal lid.

9. Curb:

a. Exterior Curb Liner: Manufacturer's standard, of same material and finishas metal curb.
b. Fabricate curbs to minimum height of 12 inches above roofing surface unless otherwise indicated.

10. Security Grille: Provide for all units or where indicated on Drawings.
11. Hatch-Lid Glazing: Double acrylic or polycarbonate (as shown on the drawings or selected by the Authority) glazing of thickness capable of resisting indicated loads; colorless, transparent or white, translucent as shown on the drawings or as selectedby the Authority.
12. Hardware: Manufacturer's standard corrosion resistant or stainless steel (as selected by the Authority); with hinges, hold-open devices, and independent manual-release devices for operation of lids.

B. Manufacturers: Subject to compliance with requirements, provide products by one of thefollowing:

1. Acudor Products, Inc.
2. Babcock-Davis.
3. Bilco Company (The).
4. Bristolite Daylighting Systems, Inc.
5. Dur-Red Products.
6. Hi Pro International, Inc.
7. JL Industries, Inc.; a division of the Activar Construction Products Group.
8. KCC International Inc.
9. Lexcor; a division of Luxsuco corp.
10. Milcor; Commercial Products Group of Hart & Cooley, Inc.
11. Natural Daylighting Systems.
12. Nystrom, Inc.
13. O'Keeffe's Inc.
14. Pate Company (The).
15. Western Canwell.
16. Approved equal.

C. Dropout-Type Heat and Smoke Vents: Manufacturer's standard, gravity operated and automatic; with insulated curbs and frame, welded or mechanically fastened and sealed corner joints, integral condensation gutter, cap flashing, and heat-sensitive dome glazing that will deform and drop out of vent opening according to heat and smoke vent standard indicated.

1. Size: As indicated on the drawings.
2. Loads: Minimum 40-lbf/sq. ft. external live load and 30-lbf/sq. ft. internal uplift load.
3. Dome Glazing: Minimum 40-lbf/sq. ft. external live load and 20-lbf/sq. ft. internaluplift load.
4. Heat and Smoke Vent Standard: Provide units that have been tested and listed tocomply with UL 793 and are FM Approved.
5. Curb, Framing, and Lid Material: Zinc-coated (galvanized) steel sheet.

a. Thickness: Manufacturer's standard thickness for hatch size indicated or
0.079 inch minimum.
b. Finish: Mill phosphatized, factory prime coating, two-coat fluoropolymer orbaked enamel or powder coat as selected by the Authority.
c. Color: As selected by the Authority from manufacturer’s standard colors.

6. Curb, Framing, and Lid Material: Aluminum sheet:

   a. Thickness: Manufacturer's standard thickness for hatch size indicated or
      0.079 inch minimum.
   b. Finish: Mill, factory prime coating, clear anodic, color anodic, two-coatfluoropolymer, baked enamel or powder coat as selected by the Authority.
   c. Color: As selected by the Authority from manufacturer’s standard colors.

7. Construction:

   a. Insulation: Manufacturer’s standard.
   b. Nailer: Factory-installed wood nailer continuous around hatch perimeter.

8. Curb:

   a. Exterior Curb Liner: Manufacturer's standard, of same material and finishas metal curb.
   b. Fabricate curbs to minimum height of 12 inches above roofing surfaceunless otherwise indicated.

9. Dome Glazing: Double acrylic or polycarbonate (as shown on the drawings or selected by the Authority) glazing of thickness capable of resisting indicated loads; colorless, transparent or white, translucent as shown on the drawings or as selectedby the Authority.
10. Fall Protection Safety Structure: Manufacturer's standard meeting impact load requirements of 29 CFR 1910.23 and authorities having jurisdiction and manuallyopenable from exterior without special tools.
11. Hardware: Manufacturer's standard corrosion resistant or stainless steel (as selected by the Authority); with hinges, hold-open devices, and independent manual-release devices for operation of lids.

D. Manufacturers: Subject to compliance with requirements, provide products by one of thefollowing:

1. APC Dayliter; C/S Group.
2. Construction Specialties, Inc.
3. Natural Daylighting Systems.
4. Pate Company (The).
5. Plasteco, Inc.
6. Approved equal.

2.06 GRAVITY VENTILATORS

A. Low-Profile, Cylindrical-Style Gravity Ventilators: Manufacturer's standard, fabricated asindicated, with manufacturer's standard welded or sealed mechanical joints.

1. Construction: Integral base flange, vent cylinder, cylinder bird screen, and rain capor hood.
2. Dimensions: as shown on the drawings.
3. Configuration: As indicated on the drawings.
4. Bird Screens: Manufacturer's standard mesh with rewireable frame.
5. Insect Screens: Manufacturer's standard mesh with rewireable frame.
6. Security Grille: Provide for all units or as indicated on Drawings.

7. Vent Cylinder, Base Flange, and Rain cap or hood material: Zinc-coated (galvanized) steel, Aluminum, or Stainless-steel sheet, as selected by the Authorityand of manufacturer's standard thickness.
8. Finish: As selected by the Authority from manufacturer’s standards.
9. Manufacturers: Subject to compliance with requirements, provide products by oneof the following:

    a. Active Ventilation Products, Inc.
    b. Air Vent, Inc.; a Gibraltar Industries company.
    c. Dur-Red Products.
    d. Greenheck Fan Corporation.
    e. Loren Cook Company.
    f. Metallic Products Corp.
    g. Moffitt Corporation Inc.
    h. PennBarry.
    i. Romlair Ventilator Co.
    j. Safe Air of Illinois.
    k. Thaler Metal Industries Ltd.
    l. Approved equal.

B. Louvered Penthouse-Style Gravity Ventilators: Manufacturer's standard, fabricated asindicated, with manufacturer's standard welded or sealed mechanical joints.

1. Construction: Integral frame with base flange, weathertight cap and weatherproofsidewall louvers.
2. Dimensions: As indicated on Drawings.
3. Configuration: As indicated on Drawings.
4. Bird Screens: Manufacturer's standard mesh with rewireable frame.
5. Insect Screens: Manufacturer's standard mesh with rewireable frame.
6. Security Grille: Provide for all units or as indicated on Drawings.
7. Frame, Base Flange, Cap, and Louver Material: Zinc-coated (galvanized) steel, Aluminum, Stainless-steel sheet, as selected by the Authority and of manufacturer's standard thickness.
8. Finish: As selected by the Authority from manufacturer's standards.
9. Manufacturers: Subject to compliance with requirements, provide products by oneof the following:

    a. Dur-Red Products.
    b. Greenheck Fan Corporation.
    c. Loren Cook Company.
    d. PennBarry.
    e. Romlair Ventilator Co.
    f. Safe Air of Illinois.
    g. Vent Products Co., Inc.
    h. Approved equal.

C. Turbine-Style Gravity Ventilators: Manufacturer's standard, fabricated as indicated, withmanufacturer's standard welded or sealed mechanical joints:

1. Provide integral weathertight base cap, outlet duct, and rotating louvered turbine.
2. Throat Size and Height: As indicated on Drawings.
3. Configuration: As indicated on Drawings.
4. Bird Screens: Manufacturer's standard mesh with rewireable frame.
5. Insect Screens: Manufacturer's standard mesh with rewireable frame.
6. Security Grille: Provide for all units or as indicated on Drawings.
7. Weathertight Base Cap, Outlet Duct, and Turbine Material: Manufacturer's

standard, Zinc-coated (galvanized) steel or Aluminum] sheet, of manufacturer's standard thickness.

8. Finish: As selected by the Authority from manufacturer's standards.
9. Manufacturers: Subject to compliance with requirements, provide products by oneof the following:

    a. Air Vent, Inc.; a Gibraltar Industries company.
    b. Metallic Products Corp.
    c. Moffitt Corporation Inc.
    d. PennBarry.
    e. Romlair Ventilator Co.
    f. Approved equal.

2.07 PIPE AND DUCT SUPPORTS

A. Fixed-Height Cradle-Type Pipe Supports: Closed cell polyethylene foam with galvanized steel strut channel or polycarbonate pipe stand accommodating up to 1-1/2 inch diameter pipe or conduit; with provision for pipe retainer and with manufacturer's support pad or deck plate as recommended for penetration-free installation over roof membrane type; as required for quantity of pipe runs and sizes.

1. Size 4 inches by 4 inches by 10.5 inches.
2. Pipe mounting hardware to be supplied with support.

B. Adjustable-Height Structure-Mounted Pipe Supports: Extruded-aluminum tube, filled with urethane insulation; 2 inches in diameter; accommodating up to 7 inch diameter pipe or conduit, with provision for pipe retainer; with aluminum baseplate, EPDM base seal, manufacturer's recommended hardware for mounting to structure or structural roof deck as indicated, stainless-steel roller and retainer, and extruded-aluminum carrier assemblies; asrequired for quantity of pipe runs and sizes.

C. Curb-Mounted Pipe Supports: Galvanized steel support with welded or mechanically fastened and sealed corner joints and integrally formed deck-mounting flange at perimeter bottom; with adjustable-height roller-bearing pipe support accommodating up to 20-inch diameter pipe or conduit and with provision for pipe retainer; as required for quantity of piperuns and sizes.

1. Manufacturers: Subject to compliance with requirements, provide products by oneof the following:

    a. MIRO Industries, Inc.
    b. Pate Company (The).
    c. PHP Systems/Design.
    d. Thaler Metal Industries Ltd.
    e. Approved equal.

D. Duct Supports: Extruded-aluminum, urethane-insulated supports, 2 inches in diameter; withmanufacturer's recommended hardware for mounting to structure or structural roof deck.

1. Manufacturers: Subject to compliance with requirements, provide products by oneof the following:

    a. Eberl Iron Works, Inc.
    b. Thaler Metal Industries Ltd.
    c. Approved equal.

2.08 PIPE PORTALS

A. Curb-Mounted Pipe Portal: Insulated roof-curb units with welded or mechanically

fastened and sealed corner joints and integrally formed deck-mounting flange at perimeter bottom; with weathertight curb cover with single or multiple collared openings and pressure-sealed conically shaped EPDM (ethylene propylene diene monomer) protective rubber caps sized for piping indicated, with stainless-steel draw bands and snaplock swivel clamps.

1. Manufacturers: Subject to compliance with requirements, provide products by thefollowing:

    a. Roof Products and Systems (RPS); a division of Hart & Cooley, Inc.
    b. Approved equal.

B. Flashing Pipe Portal: Formed aluminum membrane-mounting flashing flange and sleeve with collared opening and pressure-sealed conically shaped EPDM (ethylene propylene diene monomer) protective rubber cap sized for piping indicated, with stainless-steel snaplock swivel clamping rings.

1. Manufacturers: Subject to compliance with requirements, provide products by oneof the following:

    a. Portals Plus, Inc.
    b. Roof Products and Systems (RPS), a division of Hart & Cooley, Inc.
    c. Approved equal.

C. Fabricate roof penetration assemblies to maintain watertight conditions at all roof penetrations.

D. Field verify all roof penetration locations, conditions and curb sizes prior to fabrication andsubmittal of shop drawings.

2.09 PREFORMED FLASHING SLEEVES

A. Exhaust Vent Flashing: Double-walled metal flashing sleeve or boot, insulation filled, with integral deck flange, minimum 12 inches high, with removable metal hood and perforated metal collar.

1. Metal: Aluminum sheet, 0.063 inch thick; Galvanized sheet metal, 0.064 inch thick.
2. Diameter: As indicated on the drawings or as required for the pipe.
3. Finish: Manufacturer’s standard.
4. Manufacturers: Subject to compliance with requirements, provide products by oneof the following:

    a. Custom Solution Roof and Metal Products.
    b. Menzies Metal Products.
    c. Thaler Metal Industries Ltd.
    d. Approved equal.

B. Vent Stack Flashing: Metal flashing sleeve, uninsulated, with integral deck flange.

1. Metal: Aluminum sheet, 0.063 inch thick; Lead, 4 pound.
2. Height: As indicated on the drawings or required for the vent, 8 inches minimum.
3. Diameter: As indicated on the drawings or as required for the vent.
4. Finish: Manufacturer's standard.
5. Manufacturers: Subject to compliance with requirements, provide products by oneof the following:

    a. Custom Solution Roof and Metal Products.
    b. Lifetime Tool & Building Products, LLC.
    c. Menzies Metal Products.

d. Milcor; Commercial Products Group of Hart & Cooley, Inc.
e. Thaler Metal Industries Ltd.
f. Approved equal.

2.10 EXPANSION JOINT COVERS

A. Expansion Joints: Provide factory fabricated weatherproof, exterior covers for expansion joint openings consisting of flexible rubber membrane, supported by a closed cell foam to form flexible bellows, with two metal flanges, adhesively and mechanically combined to the bellows by a bifurcation process. Provide product manufactured to be compatible with the actual roofing system and that will be included in the guarantee of the entire roofing system.

1. Exposed metal of expansion joint system shall be prefinished galvanized sheetmetal. Color to match other sheet metal at roof.
2. Bellows: Neoprene expansion bellow flashing at four sides as shown on drawings.
3. Manufacturers of Expansion Joint Systems: Provide one of the following and/or asystem that meets the requirements of this specification.

a. Expand-O-Flash.
b. Expand-O-Gard.
c. Johns Manville Corporation.
d. Approved Equal.

2.11 PITCH POCKET SYSTEM

A. Pitch pocket system used to seal pipe penetrations and other penetrations thru the roof that are otherwise difficult to flash. The use of the pitch pocket system shall be only at locations shown on the drawings or as approved by the Authority. The pitch pocket system shall be comprised of solid urethane curbs in half round circles and straights all 2 inches in height; polyether adhesive/sealant to seal around the penetrating element and to adhere the curbs to the roof and to each other and two-part self-leveling sealant to fill the pitch pocket after itis secured and sealed.

1. Pitch Pocket System shall be M-Curb as manufactured by GAF or an approvedequal.
2. The curb size must be large enough to allow for a minimum of 1 inch clearance fromthe inside of the curb to the penetration.

2.12 OTHER FABRICATIONS

A. Sealant pans, hoods for pans and pipe chases:

1. Gauge: 24.
2. Minimum Pan Depth: 4 inches.
3. Fabricate in accord with Sealant Pan Detail and Pipe Chase Detail.

B. Soil Stack Extensions:

1. Cast Iron.
2. Size: Match existing pipe diameter.
3. Type: Pipe extension.

C. Lead Sleeve at Vent Pipes:

1. One piece No. 4 lead sleeve lapped inside vent.

D. Equipment Pad:

1. Material: Polyolefin.
2. Color: Grey.
3. Size: 36 inches by 2 inches thick.
4. Manufacturer: Carson Industries Duragrid Equipment Pad or approved equal.

2.13 ACCESSORY MATERIALS

A. Fasteners: Corrosion-resistant metal of same material as the material being fastened; stainless steel, galvanized metal or other material recommended by sheet metal manufacturer. Match finish and color of exposed accessories and fastener heads to finish and color of sheet material being fastened. Fasteners to be designed and spaced to withstand design loads. Screw, screw/plate, anchor systems:

1. Maxiseal HWH Traxx/1 (CL) with encapsulated EPDM washers.
2. HWH Trugrip series with EPDM washers by ITW Buildex.
3. Tapcon series with Climaseal coating by ITW Buildex.
4. Masonry Zamac Nailins with Zinc Anchor by Rawl.
5. Self-taping TEK screws when attaching wood to existing steel.

B. Sealant: As specified in Division 07.

1. Use noncuring type for concealed joints.
2. Use nonsag elastromeric type for exposed joints.

C. Joint Adhesive: Two-component noncorrosive epoxy adhesive, recommended by metal manufacturer for sealing of nonmoving joints.

D. Metal Accessories: Provide sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of Work, matching with material being installed;non-corrosive; size and thickness required for performance.

E. Slip Sheet: Five (5) pound red rosin-sized paper.

F. Water-Stop Membrane: Ice and Water Shield by W.R. Grace Co. or equivalent.

G. Lead flashing for vent stacks, as recommended by manufacturer.

2.14 ROOF WALKWAYS

A. Roof Walkway: Metal planking formed from multiple C-shaped channels with upper surface punched in serrated diamond or rectangular shapes to produce raised slip-resistant surface and drainage holes. Provide support framing, brackets, connectors, nosings, and other accessories and components needed for complete installation.

1. Include step units or stairs of similar construction for changes in elevation. Comply with ASCE-7, 29 CFR 1910.23, and requirements of authorities having jurisdiction.Equip walkways with safety railings where required.
2. Plank Width: As indicated on the drawings.
3. Walkway Width: As indicated on the drawings.
4. Channel Depth: As indicated or manufacturer’s standard; 1-1/2 inches minimum.
5. Metal Material: 0.108-inch- thick zinc-coated (galvanized) steel sheet; 0.078-inch- thick stainless-steel sheet; 0.100-inch- thick aluminum sheet; perforated, with serrated slip-resistant walking surface.
6. Support Stands: Manufacturer's standard, with protective pads compatible with roofing material.
7. Support Pads: Continuous wood isolation pads, pressure-preservative treated; attach roof-walkway supports to pads so that supports are separated from roof membrane surface and walkway support loads are distributed evenly.

8. Wind Restraint: Provide wind restraint attachment to roof structure of size and spacing required to meet wind uplift requirements.
9. Finish: Manufacturer's standard.
10. Walkway pads of membrane similar to top ply of roofing system are specified in thesheet roofing system specification section.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. B-line, an Eaton business.
2. Eberl Iron Works, Inc.
3. MIRO Industries, Inc.
4. PHP Systems/Design.
5. Unistrut; Part of Atkore International.
6. Approved equal.

2.15 METAL MATERIALS

A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653, G90 (Z275) coating designation andmill phosphatized for field painting where indicated.

1. Mill-Phosphatized Finish: Manufacturer's standard for field painting.
2. Factory Prime Coating: Where field painting is indicated, apply pretreatment and white or light-colored, factory-applied, baked-on epoxy primer coat, with a minimumdry film thickness of 0.2 mil.
3. Exposed Coil-Coated Finish: Prepainted by the coil-coating process to comply with ASTM A 755. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

    a. Two-Coat Fluoropolymer Finish: AAMA 621. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDFresin by weight.

4. Baked-Enamel or Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of 2 mils.
5. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of 0.5 mil.

B. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792, AZ50 coated.

1. Factory Prime Coating: Where field painting is indicated, apply pretreatment and white or light-colored, factory-applied, baked-on epoxy primer coat, with a minimumdry film thickness of 0.2 mil.
2. Exposed Coil-Coated Finish: Prepainted by the coil-coating process to comply with ASTM A 755. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

    a. Two-Coat Fluoropolymer Finish: AAMA 621. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDFresin by weight.

3. Baked-Enamel or Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of 2 mils.
4. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of 0.5 mil.

C. Aluminum Sheet: ASTM B 209, manufacturer's standard alloy for finish required, with temperto suit forming operations and performance required.

1. Mill Finish: As manufactured.
2. Factory Prime Coating: Where field painting is indicated, apply pretreatment and white or light-colored, factory-applied, baked-on epoxy primer coat, with a minimumdry film thickness of 0.2 mil.
3. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.
4. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.
5. Exposed Coil-Coated Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

    a. Two-Coat Fluoropolymer Finish: AAMA 2605. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDFresin by weight.

6. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
7. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of 0.5 mil.

D. Aluminum Extrusions and Tubes: ASTM B 221, manufacturer's standard alloy and temperfor type of use, finished to match assembly where used; otherwise mill finished.

E. Stainless-Steel Sheet and Shapes: ASTM A 240 or ASTM A 666, Type 304.

F. Steel Shapes: ASTM A 36, hot-dip galvanized according to ASTM A 123 unless otherwiseindicated.

G. Steel Tube: ASTM A 500, round tube.

H. Galvanized-Steel Tube: ASTM A 500, round tube, hot-dip galvanized according to ASTM A123.

I. Steel Pipe: ASTM A 53, galvanized.

2.16 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, sealants, and othermiscellaneous items required by manufacturer for a complete installation.

B. Acrylic Glazing: ASTM D 4802, thermoformable, monolithic sheet, manufacturer's standard, Type UVA (formulated with UV absorber), Finish 1 (smooth or polished).

C. Polycarbonate Glazing: Thermoformable, monolithic polycarbonate sheets manufactured by extrusion process, burglar-resistance rated according to UL 972 with an average impact strength of 12 to 16 ft-lbf/in. of width when tested according to ASTM D 256, Method A (Izod).

D. Cellulosic-Fiber Board Insulation: ASTM C 208, Type II, Grade 1, thickness as indicated.

E. Glass-Fiber Board Insulation: ASTM C 726, nominal density of 3 lb/cu. ft. (48 kg/cu. thermal resistivity of 4.3 deg F x h x sq. ft./Btu x in. at 75 deg F (29.8 K x m/W at 24 deg C),

thicknessas indicated.

F. Polyisocyanurate Board Insulation: ASTM C 1289, thickness and thermal resistivity as indicated.

G. Wood Nailers: Softwood lumber, fire retardant treated wood for exterior applications, acceptable to authorities having jurisdiction containing no arsenic or chromium, and complying with AWPA C2; not less than 1-1/2 inches thick.

H. Security Grilles: 3/4-inch diameter, ASTM A 1011 steel bars spaced 6 inches o.c. in one direction and 12 inches o.c. in the other; factory finished as follows:

1. Surface Preparation: Remove mill scale and rust, if any, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."
2. Factory Priming for Field-Painted Finish: Apply shop primer specified below immediately after surface preparation and pretreatment.
3. Shop Primer: Manufacturer's or fabricator's standard, fast-curing, lead- and chromate-free, universal primer; selected for resistance to normal atmospheric corrosion, for compatibility with substrate and field-applied finish paint system indicated, and for capability to provide a sound foundation for field-applied topcoatsunder prolonged exposure.

I. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

J. Underlayment:

1. Felt: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
2. Polyethylene Sheet: 6-mil- thick polyethylene sheet complying with ASTM D 4397.
3. Slip Sheet: Building paper, 3 lb/100 sq. ft. (0.16 kg/sq. m) minimum, rosin sized.
4. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils (0.76 to 1.0 thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
5. Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:
6. Fasteners for Zinc-Coated or Aluminum-Zinc Alloy-Coated Steel: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A 153 or ASTM F 2329.
7. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
8. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.

K. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, orsilicone or a flat design of foam rubber, sponge neoprene, or cork.

L. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane or silicone polymer sealant as recommended by roof accessory manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints and remain watertight.

M. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for expansion joints with limited movement.

N. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.17 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the rangeof approved Samples and are assembled or installed to minimize contrast.

1. Color: As selected by Authority from the manufacturer's standard color selections.

C. Touch up finish as required after fabrication, forming, drilling or cutting.

D. Provide strippable plastic protective film on prefinished surface.

2.18 FABRICATED UNITS

A. General Metal Fabrication: Shop-fabricate work to greatest extent possible. Comply with details shown and with applicable requirements of SMACNA "Architectural Sheet Metal Manual" and other recognized industry practices. Fabricate for waterproof and

B. Weather-resistant performance, with expansion provisions for running work, sufficient to permanently prevent leakage, damage, or deterioration of the work. Form work to fit substrates. Comply with material manufacturer instructions and specifications for forming material. Form exposed sheet metal to match profiles indicated free of oil-canning, fish- mouths, buckling, tool marks, and other defects; true to line and levels indicated. Form a 1/2 inch hem, folded back, on underside of exposed edges.

C. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.

D. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. For metal other than aluminum, tin edges shall be seamed, form seams, and solder. Form aluminum seams with epoxy seam sealer; rivet joints for additional strength where required.

E. Expansion Provisions: Provide for thermal expansion of exposed sheet metal work exceeding ten (10) foot running length. For flashing and trim, provide movement joints at maximum spacing of ten (10) feet; no joints allowed within two (2) feet of corner or intersection. Where lapped or bayonet-type expansion provisions in work cannot be used, or would not be sufficiently water/weatherproof, form expansion joints of intermeshing hooked flanges, not less than one” deep, filled with mastic sealant (concealed within joints).

F. Conceal fasteners and expansion provisions wherever possible. Exposed fasteners are notallowed on faces of sheet metal exposed to public view.

G. Fabricate cleats and attachment devices from same material as sheet metal component being anchored or from compatible, noncorrosive metal recommended by sheet metal manufacturer.

H. Gauge: As specified or as recommended by SMACNA or metal manufacturer for application, but in no case less than gauge of metal being secured.

I. Sealant Joints: Where movable, nonexpansion type joints are indicated or required for proper performance of work, form metal to provide for proper installation of elastomeric sealant, in compliance with SMACNA standards.

J. Separations: Provide for separation of metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with bituminous coating slip sheets to isolate sheet metal from dissimilar materials, or other permanent separation as specified by manufacturer/fabricator.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actuallocations, dimensions, and other conditions affecting performance of the Work.
1. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securelyanchored.
2. Verify dimensions of roof openings for roof accessories.
3. Verify that nailers, blocking, and other attachment provisions for metal work are properly located and securely fastened to resist effects of wind and thermal stresses. Re-secure any loose nailers or blocking. Replace any damaged, rotted or missing nailers or blocking.
4. Verify that roofing system, including flashing, is completely and properly installed prior to installation of sheet metal work.
5. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 COORDINATION

A. Coordinate locations and sizes of all vents, fans, equipment, duct, pipe and conduit penetrations into the roof with mechanical and electrical contractors.

B. Coordinate locations and sizes of all fire, smoke and explosion relief vents and skylights asshown on the drawing for those items requiring curbs.

3.03 INSTALLATION

A. General: Install roof accessories according to manufacturer's written instructions.
1. Install roof accessories level; plumb; true to line and elevation; and without warping,jogs in alignment, buckling, or tool marks.
2. Anchor roof accessories securely in place so they are capable of resisting indicatedloads.
3. Use fasteners, separators, sealants, and other miscellaneous items as required tocomplete installation of roof accessories and fit them to substrates.
4. Fasteners: Use fasteners of sizes that will penetrate substrate not less than 3/4 inchfor screws.
    a. Galvanized or Prefinished sheet metal: Use stainless-steel or galvanized metal fasteners.

5. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.
6. Anchor units of work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated. Install work to fit substrates and with laps, joints, and seamsthat will be permanently watertight and weatherproof.

    a. The installer/fabricator is to determine the locations, quantities, capacity and design for anchors and fasteners used in the installation subject to review by the Authority, if not shown or noted on the drawings.
    b. Provide anchorage devices and fasteners as required to anchor, secure or attach the prefabricated curbs, equipment supports and penetration covers to the in place or subsequent construction, including but not necessarily limited to bolts, nuts, screws, clips, washers, toggle bolts, through bolts and other devices required to complete the installation of each fabrication.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

1. Coat concealed side of uncoated aluminum or stainless-steel roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing roof accessories directly on cementitious or wood substrates, install a course of underlayment and cover with manufacturer's recommended slip sheet.
3. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof accessories for waterproof performance.

C. Install exposed Work that is without excessive oil canning, buckling, and tool marks. Installto fit substrate and to result in watertight performance.

D. Seal joints with elastomeric sealant as required for watertight construction.

1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F set joint members for 50 percent movement either way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
2. Prepare joints and apply sealants to comply with requirements in Division 07 Section, “Sealants."

E. Roof Curb Installation: Install each roof curb so top surface is level.

F. Equipment Support Installation: Install equipment supports so top surfaces are level with each other.

G. Roof-Hatch Installation:

1. Verify that roof hatch operates properly. Clean, lubricate, and adjust operatingmechanism and hardware.
2. Attach safety railing system to roof-hatch curb.
3. Attach ladder-assist post according to manufacturer's written instructions.

H. Heat and Smoke Vent Installation:

1. Install heat and smoke vent so top perimeter surfaces are level.
2. Install and test heat and smoke vents and their components for proper operationaccording to NFPA 204.

I. Gravity Ventilator Installation: Verify that gravity ventilators operate properly and have unrestricted airflow. Clean, lubricate, and adjust operating mechanisms.

J. Pipe Support Installation: Comply with MSS SP-58 and MSS SP-89. Install supports and attachments as required to properly support piping. Arrange for grouping of parallel runs ofhorizontal piping, and support together.

1. Pipes of Various Sizes: Space supports for smallest pipe size or install intermediatesupports for smaller diameter pipes as specified for individual pipe hangers.

K. Preformed Flashing-Sleeve and Flashing Pipe Portal Installation: Secure flashing sleeve to roof membrane according to flashing-sleeve manufacturer's written instructions; flash sleeve flange to surrounding roof membrane according to roof membrane manufacturer's instructions.

L. Security Grilles: Weld bar intersections and using tamper-resistant bolts, attach the ends ofbars to structural frame or primary curb walls.

M. Roof Walkway Installation:

1. Verify that locations of access and servicing points for roof-mounted equipment areserved by locations of roof walkways.
2. Remove ballast from top surface of low-slope roofing at locations of contact withroof-walkway supports.
3. Install roof walkway support pads prior to placement of roof walkway support standsonto low-slope roofing.
4. Redistribute removed ballast after installation of support pads.

N. Seal joints with elastomeric or butyl sealant as required by roof accessory manufacturer.

O. Pitch Pocket System: Pitch Pocket System shall be installed according to manufacturer’s directions.

1. Provide a bonding surface clean and free of moisture, dirt, oil and debris.
2. Completely seal the penetration according to manufacturer’s directions.
3. Adhere the curbs firmly to the substrate with continuous sealant around the entire perimeter and down the center of the curb section. After bonding, apply a continuous bead to adhere one curb to another and around the outside base of the curb as directed by the manufacturer.
4. Mix and pour the pourable sealant in the pitch pocket to fill the pitch pocket completely.
5. Follow manufacturer’s recommendations for installation. Do not install at temperatures below 32 degrees F. Do not apply if rain or other precipitation is expected within four hours. Do not install over smooth, non-granulated APP modified bitumen membranes.

P. Vent Stack Flashing: Plumbing vent stack flashing shall be provided 4-inch minimum roll one inch down into pipe.

3.04 REPAIR AND CLEANING

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and

repairgalvanizing according to ASTM A 780.

B. Touch up factory-primed surfaces with compatible primer ready for field painting accordingto Division 09 Section, "Painting."

C. Clean exposed surfaces according to manufacturer's written instructions, removing substances that might cause metal corrosion or finish deterioration. Clean off excess sealants.

D. Replace roof accessories that have been damaged or that cannot be successfully repairedby finish touchup or similar minor repair procedures.

E. Remove protective film from pre-finished sheet metal immediately after installation. Cleanoff excess sealants.

F. Repair or replace work which is damaged or defaced, as directed by the Authority.

1. Refinish marred and abraded areas of pre-finished sheet using finish manufacturer's recommended methods and materials. Replace units which, in the opinion of the Authority, cannot satisfactorily be refinished in place.

G. Protect sheet metal work as recommended by the installer so that completed work will beclean, secured, and without damage at substantial completion.

H. Upon completion of flashing installation, clean finished surfaces and remove all excess materials, fasteners and debris immediately so as to avoid damage to the roof.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 07 72 00, Roof Accessories shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 07 72 00, Roof Accessories shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 07 72 53

SNOW GUARDS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes providing all materials, labor and equipment to provide and install snow guards where shown on the drawings on roofs, ledges, sills and other façade elements and building projections to prevent or lessen the probability of snow and ice falling upon peopleand surfaces at roof edges and spaces below.

B. Types of snow guard systems include:

1. Pad-type, flat-mounted metal snow guards.
2. Pad-type, seam-mounted cast-metal snow guards.
3. Rail-type, flat-mounted snow guards.
4. Rail-type, seam-mounted snow guards.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product, include construction details, material descriptions,dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Include roof plans showing layouts and attachment details of snow guards.

1. Include details of rail-type snow guards.

C. Samples:

1. Pad-Type Snow Guards: Full-size unit with installation hardware.

a. For units with factory-applied finishes, submit manufacturer's standardcolor selections.

2. Rail-Type Snow Guards: Bracket, 12-inch long rail, and installation hardware.

a. For units with factory-applied finishes, submit manufacturer's standardcolor selections.

D. Delegated-Design Submittal: For snow guards, include analysis reports signed and sealedby the qualified professional engineer responsible for their preparation.

1. Include calculation of number and location of snow guards.

1.04 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer's experience with providing delegated design engineering services of the kind indicated, including documentation that the

engineer is licensed in the state in which the Project is located.

B. Product Test Reports: For each type of snow guard, for tests performed by a qualified testing agency, indicating load at failure of attachment to roof system identical to roof system usedon this Project.

1.05 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit adhesive-mounted snow guards to be installed, and adhesive cured, according to adhesive manufacturer's written instructions.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer licensed in the State of Illinois to design snow guards, including attachment to roofing material and roof deck, as applicable for attachment method, based on the following:

1. Roof snow load.
2. Snow drifting
3. Roof slope.
4. Roof type.
5. Roof dimensions.
6. Roofing substrate type and thickness.
7. Snow guard type.
8. Snow guard fastening method and strength.
9. Snow guard spacing.
10. Coefficient of Friction Between Snow and Roof Surface: 0.
11. Factor of Safety: 3.

B. Performance Requirements: Provide snow guards that withstand exposure to weather and resist thermally induced movement without failure, rattling, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

C. Structural Performance: Snow guards shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.

1. Snow Loads: Per code and/or as indicated on Drawings.

D. Compatibility: Snow guard design and material to be as recommended by the manufacturerof the roofing system and determined to be compatible with the system.

2.02 PAD-TYPE SNOW GUARDS

A. Pad-Type, Flat-Mounted Metal Snow Guards:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Alpine SnowGuards, a division of Vermont Slate & Copper Services, Inc.

b. Berger Building Products, Inc.
c. PMC Industries, Inc.
d. Roofers Edge.
e. S-5! Attachment Solutions; Metal Roof Innovations, Ltd.
f. Sieger Snow Guards Inc.
g. Sno-Gem, Inc.
h. SnoGuard.
i. TRA SNOW AND SUN, INC.
j. Zaleski Snow-Guard and Roofing Specialties Inc.

2. Material: Must be compatible with the roofing system material:

a. ASTM B209 aluminum sheet, not less than 0.032 inch thick.

1) Finish: Mill; Black epoxy coating; Powder coat finish complying with AAMA 2603, with a minimum dry film thickness of 1.5 mils or High- performance organic two-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat; as selected by the CTA.

a) Color: As selected by the CTA from manufacturer's fullrange.

b. ASTM B26 cast aluminum.
c. ASTM B584 cast bronze.
d. ASTM B370 copper sheet, not less than 16 oz./sq. ft.
e. ASTM A653, metallic-coated steel sheet with G90 (Z275) coating, not lessthan 0.022 inch thick.

1) Finish: Powder coat finish complying with AAMA 2603, with a minimum dry film thickness of 1.5 mils or High-performance organic two-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in colorcoat; as selected by the CTA.

a) Color: As selected by the CTA from manufacturer's fullrange.

f. ASTM A792, Class AZ50 aluminum-zinc alloy-coated steel sheet, Grade 40Grade 275, not less than 0.022 inch thick.

1) Finish: High-performance organic two-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat.

a) Color: As selected by the CTA from manufacturer's fullrange.

g. ASTM A606 steel sheet, not less than 0.022 inch thick.
h. ASTM A240, Type 316 stainless steel sheet, not less than 0.0156 inch thick.

1) Finish: ASTM A480, No. 2D No. 4.

3. Attachment: Manufacturer's tested system, capable of resisting design loads.

B. Pad-Type, Seam-Mounted Cast-Metal Snow Guards:

1. Material:

a. ASTM B26 cast aluminum; mill or factory black epoxy finish; as selected bythe CTA.
b. ASTM B584 cast bronze; polished finish.
c. ASTM B584 cast brass; polished finish.

2. Attachment: Manufacturer's tested system, capable of resisting design loads.

C. Polycarbonate Canopy Snow Guard: Snow guard to be compatible with canopy system andas recommended by manufacturer of the canopy system.

1. Attachment: Manufacturer's tested system, capable of resisting design loads.

2.03 RAIL-TYPE SNOW GUARDS

A. Rail-Type, Flat-Mounted Snow Guards:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Alpine SnowGuards, a division of Vermont Slate & Copper Services, Inc.
b. Berger Building Products, Inc.
c. S-5! Attachment Solutions; Metal Roof Innovations, Ltd.
d. Sieger Snow Guards Inc.
e. Sno-Gem, Inc.
f. SnoGuard.
g. Snow Management Systems.
h. TRA Snow and Sun, Inc.
i. Approved equal.

2. Description: Units fabricated from metal baseplate anchored to adjustable or fixed (as selected by the CTA) brackets and equipped with one, two, three or four bar(s),rail(s), or pipe(s); as shown on the drawings or as selected by the CTA.
3. Brackets and Baseplate: ASTM B209 aluminum; mill finished; ASTM B209 aluminum; clear anodized ASTM B584 bronze or brass; ASTM A240, Type 304 stainless steel; mill finish; Galvanized steel, G90 coating; Galvanized steel, G60Z180 coating; material and finish as selected by the CTA.
4. Bars: ASTM B221 aluminum; mill finish ASTM B221 aluminum; clear anodized ASTM B584 bronze or brass; ASTM A240, Type 304 stainless steel; mill finish; material and finish as selected by the CTA.

a. Profile: Round or Square; with integral track to accept color-matchinginserts of material and finish used for metal roof.

5. Seam Clamps: ASTM B221 aluminum extrusion or ASTM B85 aluminum casting with stainless steel set screws incorporating round nonpenetrating point; designed for use with applicable roofing system to which clamp is attached.

B. Rail-Type, Seam-Mounted Snow Guards:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. Alpine SnowGuards, a division of Vermont Slate & Copper Services, Inc.
   b. LM Curbs.
   c. S-5! Attachment Solutions; Metal Roof Innovations, Ltd.
   d. Sno-Gem, Inc.
   e. Snow Management Systems.
   f. TRA Snow and Sun, Inc.

2. Description: Snow guard rails fabricated from metal pipes, bars, or extrusions, anchored to brackets and equipped with one rail, two rails, three rails, one rail with integral track to accept color-matching inserts of material and finish used for metal roof, two rails with integral track to accept color-matching inserts of material and finish used for other metal roof accessories or three rails with integral track to accept color-matching inserts of material and finish used for other metal roof accessories; as shown on the drawings or selected by the CTA.
3. Brackets and Baseplate: ASTM B209 aluminum, mill finished; ASTM B209 aluminum, clear anodized; ASTM A240, Type 304 stainless steel, mill; ASTM A240, Type 304 stainless steel, 180-grit polished finish; uniform, directionally textured finish; ASTM A240, Type 304 stainless steel, 320-grit polished finish, oil-ground, uniform, fine, directionally textured finish or ASTM B584 brass, polished; material and finish as shown on the drawings or as selected by the CTA.
4. Bars: ASTM B221 aluminum, mill finish ASTM B221 aluminum, clear anodized ASTM A240, Type 304 stainless steel, mill finish; ASTM A240, Type 304 stainless steel, 180-grit polished finish, uniform, directionally textured finish; ASTM A240, Type 304 stainless steel, 320-grit polished finish, oil-ground, uniform, fine, directionally textured finish; ASTM B584 brass, polished; Galvanized steel, G90 (Z275) coating or Galvanized steel, G60Z180 coating; material and finish as shownon the drawings or as selected by the CTA.

   a. Profile: Round or Square as shown on the drawings or as selected by the CTA with integral track to accept color-matching inserts of material and finish used for other metal roof accessories as shown on the drawings or asselected by the CTA.

5. Seam Clamps: ASTM B221 aluminum extrusion or ASTM B85 aluminum casting with stainless steel set screws incorporating round nonpenetrating point; designed for use with applicable roofing system to which clamp is attached.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, snow guard attachment, and other conditions affecting performance of the Work.

1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean and prepare substrates for bonding snow guards.

B. Prime substrates according to snow guard manufacturer's written instructions.

3.03 INSTALLATION

A. Install snow guards according to manufacturer's written instructions.

1. Space rows as indicated on drawings, approved shop drawings or as directed by theCTA.
2. Space rows as recommended by manufacturer.

B. Attachment for Sloped Roofs:

1. Pad-Type, Flat-Mounted Snow Guards: Mechanically anchored through each factory-prepared hole with approved fasteners; retrofit mechanical anchor and counter-flashing sleeve system or hook and mechanically anchored through each factory-prepared hole as shown on the drawings, as recommended by the manufacturer or as directed by the CTA.
2. Rail-Type, Flat-Mounted, Snow Guards: Mounting plates bolted or screwed to the roof framing or roof deck; as shown on the drawings, as recommended by the manufacturer or as directed by the CTA.

C. Attachment for Standing-Seam Metal Roofing:

1. Do not use fasteners that will penetrate metal roofing or fastening methods that voidmetal roofing finish warranty.
2. Pad-Type, Flat-Mounted Snow Guards:

    a. Attach or adhere to metal roofing according to manufacturer's instructions.
    b. Solder to copper roofing according to manufacturer's instructions.

3. Pad-Type, Seam-Mounted Snow Guards:

    a. Install snow guards in straight rows.
    b. Secure in place using stainless steel set screws, incorporating roundnon-penetrating point.
    c. Torque set screw according to manufacturer's instructions.

4. Rail-Type, Seam-Mounted Snow Guards:

    a. Install brackets to vertical ribs in straight rows.
    b. Secure with stainless steel set screws, incorporating round non-penetrating point, on same side of standing seam.
    c. Torque set screw according to manufacturer's instructions.
    d. Install cross members to brackets.

D. Attachment for Exposed Fastened Metal Roofing:

1. Do not use fasteners that will penetrate metal roofing or fastening methods that voidmetal roofing finish warranty.
2. Pad-Type, Flat-Mounted Snow Guards:

a. Adhere to metal roofing according to manufacturer's instructions.
b. Mechanically fasten to metal roofing, using fasteners identical to those usedto secure metal roofing to substrate.
c. Solder to copper roofing according to manufacturer's instructions.

3. Rail-Type, Flat-Mounted Snow Guards:

a. Install brackets in straight rows.
b. Mechanically fasten to metal roofing, using sealant and mechanical fasteners identical to those used to secure metal roofing to substrate.
c. Install cross members to brackets.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 07 72 53, Snow Guards shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 07 72 53, Snow Guards shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 07 81 00

APPLIED FIRE PROTECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions and other Division 01 Specification sections, apply to this section.

1.02 SUMMARY

A. General: Provide all labor, materials, and equipment necessary to provide and install spray-on fire resistive materials in areas shown on the drawings or as otherwise required. Apply Fire Protection on structural steel members and decking according to local codes and as specified herein.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM E 84, "Test Method for Surface Burning Characteristics of Building Materials".
2. ASTM E 119, "Method for Fire Tests of Building Construction and Materials".
3. ASTM E 605, "Test Methods for Thickness and Density of Sprayed Fire-Resistive Material Applied to Structural Members".
4. ASTM E 736, "Test Method for Cohesion/Adhesion of Sprayed Fire Resistive Materials Applied to Structural Members".
5. ASTM E 759, “Test Method for Effect of Deflection of Sprayed Fire – Resistive Material Applied to Structural Members”.
6. ASTM E 760, “Standard Test Method for Effect of Bonding of Sprayed Fire – Resistive Material Applied to Structural Members”.
7. ASTM E 761, “Test Method for Compressive Strength of Sprayed Fire – Resistive Material Applied to Structural Members”.
8. ASTM E 859, “Test Method for Air Erosion of Sprayed Fire – Resistive Material (SFRM) Applied to Structural Members”.
9. ASTM E 937, “Test Method for Corrosion of Steel by Sprayed Fire – Resistive Material (SFRM) Applied to Structural Members”.

B. Association of the Wall & Ceiling Industries International (AWCI): "Inspection Procedure for Field Applied Sprayed Fire Protection Materials".

C. International Building Code (IBC).

D. Underwriters Laboratories Inc. (UL): UL "Fire Resistance Directory".

1.04 DEFINITIONS

A. SFRM: Sprayed fire-resistive materials.

1.05 SYSTEM DESCRIPTION

A. Performance Requirements: Provide fireproofing in accordance with requirements indicated on the Drawings and specified herein. Refer to Drawings for locations of the fireproofing. Use

only the materials explicitly recommended by manufacturer for the application, as stated inthe submitted product data and supplementary product literature.

1. Content: Fireproofing materials shall not contain asbestos fibers or dust particles,nor other substance prohibited by law.
2. Fire Endurance Rating: ASTM E 119, UL tested and listed for the fire rating and application shown. Materials shall bear the UL Classification Marking.
3. Thickness and Density: ASTM E 605, thickness and density as required by UL test to attain the fire endurance rating shown or as required by governing authorities for the application shown. Thickness shown is the minimum thickness required solely to determine clearances and, in case of conflict, the fire endurance rating prevails.

    a. For structural members of sizes not included in the UL beam and column designs, calculate the required fireproofing thickness in accordance with the equation listed in the UL "Fire Resistance Directory" for adjustment of sprayed protection material thickness.

4. Bond Strength: ASTM E 736, not less than the specified bond strength or the bondstrength listed in the manufacturer's data, whichever is greater.
5. Fire Hazard Ratings: ASTM E 84, ratings not exceeding flame spread 15 and smokedeveloped 0.

1.06 ACTION SUBMITTALS

A. Procedures: Furnish submittals in accordance with general requirements specified in Special Conditions and Section 01 33 00, Submittal Procedures.

B. Product Data: Furnish a material list scheduling each product and the areas proposed for use in the Work. Show current fire endurance ratings and thickness as listed by together with ULapproval numbers as required by governing agencies for locations required.

C. Provide product data for the following (if applicable):

1. Sprayed fire-resistive material.
2. Substrate primers.
3. Bonding agent.
4. Metal lath.
5. Reinforcing fabric.
6. Reinforcing mesh.
7. Sealer.
8. Topcoat.

D. Supplementary Product Literature: Furnish manufacturer's literature describing the general properties of each product to be used in the Work. Include test reports and other data as may be required to verify conformance with specified requirements.

E. Certification of Asbestos Content: Furnish a certificate, signed by the fireproofing manufacturer and Contractor, stating that fireproofing materials to be used in the Work do not contain any asbestos fiber or dust particles nor other substance prohibited by law.

F. Statement of Manufacturer's Review: Furnish statement in form stipulated by Authority, signed by the Contractor and Installer, stating that the Authority's Drawings and Specifications, the shop drawings and product data have been reviewed with qualified representatives of the materials manufacturers, and that they are in agreement that the selected materials and systems are proper and adequate for the application shown

including compatibility with adjacent systems and materials.

G. Statement of Application: Furnish statement in form stipulated by Authority, signed by the Contractor and Installer, stating that the Work was provided in compliance with the Contract Documents and that the installation was proper for the conditions of application and use.

H. Quality Control Testing and Inspection Reports: Submit reports for the required Field Quality Control inspections and tests.

I. Shop Drawings: Framing plans or schedules, or both, indicating the following:

1. Extent of fireproofing for each construction and fire-resistance rating.
2. Applicable fire-resistance design designations of a qualified testing and inspectingagency acceptable to authorities having jurisdiction.
3. Minimum fireproofing thicknesses needed to achieve required fire-resistance ratingof each structural component and assembly.
4. Treatment of fireproofing after application.

J. Samples: For each exposed product and for each color and texture specified, four (4) inchessquare minimum in size.

1.07 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and testing agency.

B. Product Certificates: For each type of fireproofing.

C. Evaluation Reports: For fireproofing, from ICC-ES.

D. Preconstruction Test Reports: For fireproofing.

E. Field quality-control reports.

1.08 QUALITY ASSURANCE

A. Contractor's Quality Assurance Responsibilities: Contractor is solely responsible for qualitycontrol of the Work.

B. Licensed Installer: The Installer shall be trained and licensed by the fireproofing manufacturer in the use of the materials and equipment to be employed in the Work.

C. Field Samples or Mockups: Prior to the Pre-Construction Conference, provide a field sample for each type fireproofing in the building at areas to be designated by the Authority. Prepare a sample not less than 50 ft^2 in area, and representative of substrate conditions, exposed fireproofing application and contours. Provide generally smooth finish with uniform texture. Utilize the same materials and installation methods in the sample as required for the final Work. Schedule the installation with allowance for sufficient curing time so that the sample may be examined, and any necessary adjustments made, at least I week prior to date scheduled for commencing installation of the Work. When accepted, sample areas shall serve as the standard for materials, workmanship, and appearance for such Work throughout the project and shall remain a part of the final Work if undisturbed at time of Substantial Completion.

D. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having

jurisdiction.Obtain necessary approvals from all such authorities.

E. Inspections and Testing: Contractor to engage and pay for an independent qualified inspector and licensed testing agency approved by the Authority to perform inspections and testing at the site.

1.09 DELIVERY, STORAGE, AND HANDLING

A. General: Deliver and store materials in manufacturer's original packaging labeled to show name, brand, type, and grade. Store materials in protected dry location off ground in accordance with manufacturer's instructions. Do not open packaging nor remove labels until time for installation.

1.10 PREINSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

1. Review products, design ratings, restrained and unrestrained conditions, densities, thicknesses, bond strengths, and other performance requirements.

1.11 PROJECT/SITE CONDITIONS

A. Environmental Requirements: Do not proceed with the Work during inclement weather nor when weather forecasts are unfavorable, unless the Work will proceed in accordance with the manufacturer's requirements and instructions and any agreements or restrictions of the Pre-Construction Conference. Provide adequate ventilation and protect adjacent surfaces from overspray. Do not apply materials when ambient temperature or substrate temperature is below the minimum recommended by manufacturer. Maintain not less than the minimum temperature for 24 hours before, during, and 24 hours after application of fireproofing until completed installation has dried thoroughly.

1.12 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Testing agency to perform preconstruction testing on fieldsamples of fireproofing.

1. Provide test specimens and assemblies representative of proposed materials andconstruction.

B. Preconstruction Adhesion and Compatibility Testing: Test for compliance with requirementsfor specified performance and test methods.

1. Bond Strength: Test for cohesive and adhesive strength according to ASTM E 736.Provide bond strength indicated in referenced fire-resistance design.
2. Density: Test for density according to ASTM E 605. Provide density indicated in referenced fire-resistance design, but not less than minimum specified in Part 2.
3. Verify that manufacturer, through its own laboratory testing or field experience, attests that primers or coatings are compatible with fireproofing.
4. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
5. For materials failing tests, obtain applied-fireproofing manufacturer's written instructions for corrective measures including the use of specially formulated bonding agents or primers.

1.13 FIELD CONDITIONS

A. Environmental Limitations: Do not apply fireproofing when ambient or substrate

temperature is 44 deg F or lower unless temporary protection and heat are provided to maintain temperature at or above this level for 24 hours before, during, and for 24 hours after product application.

B. Ventilation: Ventilate building spaces during and after application of fireproofing, providing complete air exchanges according to manufacturer's written instructions. Use natural means or, if they are inadequate, forced-air circulation until fireproofing dries thoroughly.

1.14 WARRANTY

A. Fireproofing Warranty: Furnish five (5) year written warranty, signed by the Contractor and Installer, agreeing to repair or replace fireproofing which has cracked, flaked or peeled from the substrate, or otherwise failed as a result of defects in materials or workmanship. Upon notification of such defects, within the warranty period, make necessary repairs or replacement at the convenience of the Authority.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Assemblies: Provide fireproofing, including auxiliary materials, according to requirements of each fire-resistance design and manufacturer's written instructions.

B. Source Limitations: Obtain fireproofing for each fire-resistance design from single source.

C. Fire-Resistance Design: Indicated on Drawings, tested according to ASTM E 119 or UL 263; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

D. Asbestos: Provide products containing no detectable asbestos.

2.02 SPRAYED FIRE-RESISTIVE MATERIALS

A. Sprayed Fire-Resistive Material: Manufacturer's standard, factory-mixed, lightweight, dry formulation, complying with indicated fire-resistance design, and mixed with water at Project site to form a slurry or mortar before conveyance and application; or conveyed in a dry stateand mixed with atomized water at place of application.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Carboline Company; a subsidiary of RPM International.
b. GCP Applied Technologies Inc. (formerly Grace Construction Products).
c. Isolatek International.
d. Pyrok, Inc.
e. Schundler Company (The).
f. Southwest Fireproofing Products Co.
g. Approved equal.

2. Application: Designated for exterior use by a qualified testing agency acceptable toauthorities having jurisdiction.
3. Bond Strength: Minimum 150-lbf/sq. ft., 430-lbf/sq. ft. or 1000-lbf/sq. ft. (as

indicated on the drawings or as required by the Authority) cohesive and adhesive strength based on field testing according to ASTM E 736.

4. Density: Not less than density specified in the approved fire-resistance design, according to ASTM E 605.
5. Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design or ASTM E 605, whichever is thicker, but notless than 0.375 inch.
6. Combustion Characteristics: ASTM E 136.
7. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

    a. Flame-Spread Index: 10 or less.
    b. Smoke-Developed Index: 10 or less.

8. Compressive Strength: Minimum 10 lbf/sq. in.;100 lbf/sq. in. or 300 lbf/sq. in. (asindicated on the drawings or as required by the Authority) according to ASTM E 761.
9. Corrosion Resistance: No evidence of corrosion according to ASTM E 937.
10. Deflection: No cracking, spalling, or delamination according to ASTM E 759.
11. Effect of Impact on Bonding: No cracking, spalling, or delamination according toASTM E 760.
12. Air Erosion: Maximum weight loss of 0.025 g/sq. ft. in 24 hours according to ASTME 859.
13. Fungal Resistance: Treat products with manufacturer's standard antimicrobial formulation to result in no growth on specimens per ASTM G 21 or rating of 10 according to ASTM D 3274 when tested according to ASTM D 3273.
14. Sound Absorption: NRC or SAA of not less than 0.60 according to ASTM C 423 forType A mounting according to ASTM E 795.
15. 15 Finish: As selected by the Authority from manufacturer's standard finishes: Spray- textured finish; Rolled, spray-textured finish; Skip-troweled finish; or Skip-troweled finish with corner beads. Apply separate, colored topcoat after finish.

    a. Color: as selected by the Authority from manufacturer's full range.

2.03 SPRAYED-ON FIREPROOFING

A. Low Density Cementitious Sprayed-On Fireproofing: Factory-compounded mixture of expanded vermiculite aggregate and gypsum cement binders. Self-adhering and noncombustible, designed to be sprayed in place with air and water. ASTM E 605, minimum 15 pcf dry applied density. W.R. Grace & Co. "Monokote Type MK-6" or approved equal.

B. Low Density Mineral Fiber Sprayed-On Fireproofing (Optional): At Contractor's option, provide in lieu of specified low density cementitious fireproofing. Factory--compounded mixture of mineral fibers and inorganic binders. Self-adhering and noncombustible, designed to be sprayed in place with air and water. ASTM E 605, minimum 13 pcf dry applied density. Isolatek International Corp. "Cafco Blaze-Shield Type DC/F" or approved equal.

C. Water: Potable, free of deleterious matter.

2.04 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that are compatible with fireproofing and substrates

and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.

B. Substrate Primers: Primers approved by fireproofing manufacturer and complying with oneor both of the following requirements:

1. Primer and substrate are identical to those tested in required fire-resistance design by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
2. Primer's bond strength in required fire-resistance design complies with specified bond strength for fireproofing and with requirements in UL's "Fire Resistance Directory" or in the listings of another qualified testing agency acceptable to authorities having jurisdiction, based on a series of bond tests according to ASTME 736.

C. Bonding Agent: Product approved by fireproofing manufacturer and complying with requirements in UL's "Fire Resistance Directory" or in the listings of another qualified testingagency acceptable to authorities having jurisdiction.

D. Metal Lath: Expanded metal lath fabricated from material of weight, configuration, and finish required, according to fire-resistance designs indicated and fireproofing manufacturer's written instructions. Include clips, lathing accessories, corner beads, and other anchorage devices required to attach lath to substrates and to receive fireproofing.

E. Reinforcing Fabric: Glass- or carbon-fiber fabric of type, weight, and form required to comply with fire-resistance designs indicated; approved and provided by fireproofing manufacturer.

F. Reinforcing Mesh: Metallic mesh reinforcement of type, weight, and form required to comply with fire-resistance design indicated; approved and provided by fireproofing manufacturer.Include pins and attachment.

G. Sealer: Transparent-drying, water-dispersible, tinted protective coating recommended in writing by fireproofing manufacturer for each fire-resistance design.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Isolatek International.
    b. Approved equal.

H. Topcoat: Suitable for application over applied fireproofing; of type recommended in writingby fireproofing manufacturer for each fire-resistance design.

1. Cement-Based Topcoat: Factory-mixed, cementitious hard-coat formulation for trowel or spray application over SFRM.

    a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

        1) Carboline Company; a subsidiary of RPM International.
        2) Isolatek International.
        3) Approved equal.

2. Water-Based Permeable Topcoat: Factory-mixed formulation for brush, roller,

or spray application over applied SFRM. Provide application at a rate of 30 sq. ft./gal.; 60 sq. ft./gal.; or 120 sq. ft./gal. as shown on the drawings or required by the Authority.

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1) Isolatek International.
2) Approved equal.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine the areas to receive the Work and the conditions under which the Work would be performed. Contractor shall remedy conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.

1. Do not apply fireproofing material until hangers, inserts, clips, and other attachments are installed. Apply fireproofing prior to installation of ducts, piping, conduit, and other Work which would prevent proper application of fireproofing.
2. Verify that substrates are free of dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, incompatible primers, paints, and encapsulants, or other foreign substances capable of impairing bond of fireproofing with substrates underconditions of normal use or fire exposure.

B. Verify that concrete work on steel deck is complete before beginning fireproofing work.

C. Verify that roof construction, installation of rooftop HVAC equipment, and other related work are complete before beginning fireproofing work.

D. Conduct tests according to fireproofing manufacturer's written instructions to verify that substrates are free of substances capable of interfering with bond.

E. Prepare written report, endorsed by Installer, listing conditions detrimental to performanceof the Work.

F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Surface Preparation: Contractor shall clean substrate to remove coatings or other substances which might interfere with bond of fireproofing. Remove projections which might interfere with the visual uniformity of exposed fireproofing. Fill voids and joints in the substrate, using troweled fireproofing or other material, so that exposed fireproofing will be uniform in thickness and without visual indications of voids or other imperfections in the substrate.

B. Cover other work subject to damage from fallout or overspray of fireproofing materials duringapplication.

C. Prime substrates where included in fire-resistance design and where recommended in writing by fireproofing manufacturer unless compatible shop primer has been applied

andis in satisfactory condition to receive fireproofing.

D. For applications, visible on completion of Project, repair substrates to remove surface imperfections that could affect uniformity of texture and thickness in finished surface of fireproofing. Remove minor projections and fill voids that would telegraph through fire-resistive products after application.

3.03 APPLICATION OF SPRAYED-ON FIREPROOFING

A. General: Comply with manufacturer's instructions for the type of fireproofing and conditionof substrate in each particular application.

1. Application to Deck and Beams: Apply fireproofing after all dead loads have been imposed and maximum deflections have occurred to prevent detrimental effect on bond of fireproofing to substrate.

B. Mixing: Mix materials in accordance with manufacturer's directions in clean machine mixers free of particles from previously mixed batch. Do not use frozen, caked, or lumpy material,or material that has partially set.

C. Spraying of Fireproofing: Use spray equipment of the type recommended by the fireproofing manufacturer to assure uniform consistency of materials. Apply fireproofing to required fullthickness over entire substrate in a monolithic blanket of uniform texture.

D. Sealer for Low Density Fireproofing: Coat the surfaces of low density fireproofing with a protective sealer, where the fireproofing is exposed in the following areas. Provide sealer product recommended and tested by manufacturer to prevent erosion, dusting, or flaking offireproofing. Tint the sealer to assist in verifying application.

1. In elevator shafts.
2. In the equipment rooms or spaces.
3. In the return air plenums.
4. In Atrium ceiling space.

E. Construct fireproofing assemblies that are identical to fire-resistance design indicated and products as specified, tested, and substantiated by test reports; for thickness, primers, sealers, topcoats, finishing, and other materials and procedures affecting fireproofing work.

F. Comply with fireproofing manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and apply fireproofing; as applicable to particular conditions of installation and as required to achieve fire-resistanceratings indicated.

G. Coordinate application of fireproofing with other construction to minimize need to cut or remove fireproofing.

1. Do not begin applying fireproofing until clips, hangers, supports, sleeves, and otheritems penetrating fireproofing are in place.
2. Defer installing ducts, piping, and other items that would interfere with applying fireproofing until application of fireproofing is completed.

H. Metal Decks:

1. Do not apply fireproofing to underside of metal deck substrates until concrete topping, if any, is completed.
2. Do not apply fireproofing to underside of metal roof deck until roofing is completed;prohibit roof traffic during application and drying of fireproofing.

I. Install auxiliary materials as required, as detailed, and according to fire-resistance design and fireproofing manufacturer's written instructions for conditions of exposure and intended use. For auxiliary materials, use attachment and anchorage devices of type recommendedin writing by fireproofing manufacturer.

J. Spray apply fireproofing to maximum extent possible. After the spraying operation in each area, complete the coverage by trowel application or other placement method recommendedin writing by fireproofing manufacturer.

K. Extend fireproofing in full thickness over entire area of each substrate to be protected.

L. Install body of fireproofing in a single course unless otherwise recommended in writing byfireproofing manufacturer.

M. For applications over encapsulant materials, including lockdown (post-removal) encapsulants, apply fireproofing that differs in color from that of encapsulant over which itis applied.

N. Where sealers are used, apply products that are tinted to differentiate them from fireproofingover which they are applied.

O. Provide a uniform finish complying with description indicated for each type of fireproofing material and matching finish approved for required mockups.

P. Cure fireproofing according to fireproofing manufacturer's written instructions.

Q. Do not install enclosing or concealing construction until after fireproofing has been applied, inspected, and tested and corrections have been made to deficient applications.

R. Finishes: Where indicated, apply fireproofing to produce the following finishes:

1. Manufacturer's Standard Finishes: Finish according to manufacturer's written instructions for each finish selected.
2. Spray-Textured Finish: Finish left as spray applied with no further treatment.
3. Rolled, Spray-Textured Finish: Even finish produced by rolling spray-applied finishwith a damp paint roller to remove drippings and excessive roughness.
4. Skip-Troweled Finish: Even leveled surface produced by troweling spray-applied finish to smooth out the texture and neaten edges.
5. Skip-Troweled Finish with Corner Beads: Even, leveled surface produced by troweling spray-applied finish to smooth out the texture, eliminate surface markings,and square off edges.

3.04 FIELD QUALITY CONTROL

A. Inspections and Testing: Approved Inspector and Testing Agency to perform the followinginspections and tests:

1. Test and inspect as required by the IBC, Subsection 1705.13, "Sprayed Fire-Resistant Materials."

B. Perform the tests and inspections of completed Work in successive stages. Do not proceed with application of fireproofing for the next area until test results for previously completed applications of fireproofing show compliance with requirements. Tested values must equal or exceed values as specified and as indicated and required for approved fire- resistance design.

C. Fireproofing will be considered defective if it does not pass tests and inspections.

1. Remove and replace fireproofing that does not pass tests and inspections, and retest.
2. Apply additional fireproofing, per manufacturer's written instructions, where test results indicate insufficient thickness, and retest.

D. Prepare test and inspection reports.

1. Condition of Substrates: Visual inspection of all areas.
2. Thickness: Test 25% of each floor area by bay including slabs, columns and beams.
3. Density: 1 test for each floor or 10,000 ft^2.
4. Bond Strength: 2 tests per floor, or 1 test for each 10,000 ft^2.
5. Condition of Finished Material: Visual inspection of all areas, including patchedareas, if any. Cracks or fissures which expose the substrate are not acceptable.

3.05 ADJUSTING

A. Repair: Remove and replace fireproofing damaged by weather as required at no extra cost to Authority. Do not remove fireproofing without permission. Recoat fireproofing areas damaged by other trades, or removed by other trades for installation of their work, and thecost of such repairs shall be borne by responsible trade.

3.06 CLEANING, PROTECTING, AND REPAIRING

A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and cleanexposed surfaces to remove evidence of soiling.

B. Protect fire protection, according to advice of manufacturer and Installer, from damage resulting from construction operations or other causes, so fireproofing is without damage ordeterioration at time of Substantial Completion.

C. As installation of other construction proceeds, inspect fireproofing and repair damaged areasand fire protection removed due to work of other trades.

D. Repair fire protection damaged by other work before concealing it with other construction.

E. Repair fire protection by reapplying it using same method as original installation or using manufacturer's recommended trowel-applied product.

F. Immediately after completion of sprayed-on fireproofing application in each room or space, clean the adjoining surfaces of over-sprayed material and fallout from the spraying operation.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 07 81 00, Applied Fire Protection shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 07 81 00, Applied Fire Protection shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 07 84 13

PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and SupplementaryConditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:

1. Penetrations in fire-resistance-rated walls.
2. Penetrations in horizontal assemblies.
3. Penetrations in smoke barriers.

B. Related Requirements:

1. Section 07 84 43 "Joint Firestopping" for joints in or between fire-resistance-ratedconstruction, at exterior curtain-wall/floor intersections, and in smoke barriers.

1.03 REFERENCES

A. American National Standards Institute (ANSI):

1. ANSI/UL 263 - Fire Tests of Building Construction and Materials.
2. ANSI/UL 723 - Surface Burning Characteristics of Building Materials.
3. ANSI/UL 1479 - Standard for Fire Tests of Through-Penetration Firestops.

B. American Society for Testing and Materials(ASTM):

1. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of BuildingMaterials.
2. ASTM E 119 - Standard Test Methods for Fire Tests of Building Construction andMaterials.
3. ASTM E 814 - Standard Test Method for Fire Tests of Through-PenetrationFirestops.
4. ASTM E 2174 - Standard Practice for On-Site Inspection of Installed Firestops.

C. Factory Mutual (FM) - FM4991 - Standard for Approval of Firestop Contractors.

D. International Code Congress (ICC):

1. International Building Code (IBC).
2. International Residential Code (IRC).
3. International Mechanical Code (IMC).
4. International Fire Code (IFC).
5. International Code Congress Evaluation Service (ICC ES).

E. National Fire Protection Association (NFPA):

1. NFPA 70 - National Electrical Code.
2. NFPA 80 – Standard for Fire Doors and Other Opening Protectives.
3. NFPA 96 – Standard for Ventilation Control and Fire Protection of CommercialCooking Operations.

4. NFPA 101 - Life Safety Code.
5. NFPA 5000 – Building Construction and Safety Code.

F. Underwriters Laboratories (UL) - UL Building Materials Directory:

1. Through-Penetration Firestops Systems (XHEZ).
2. Firestop Devices (XHJI).
3. Forming Materials (XHKU),
4. Wall Opening Protective Materials (CLIV).
5. Fill, Void or Cavity Materials (XHHW).

G. American Society of Sanitary Engineering (ASSE):

1. ASSE Series 9000 – Professional Qualification Standard for Firestop Systems andDevice Installers, Inspectors and Surveyors.

H. International Association of Plumbing and Mechanical Officials (IAPMO):

1. Uniform Plumbing Code (UPC).
2. Uniform Mechanical Code (UMC).

I. International Standards Organization (ISO):

1. ISO 6944.
2. ISO 10295-1: 2007.

1.04 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at the project site.

1.05 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.

1. Engineering Judgments: Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping system, submit illustration, with modifications marked, approved by penetration firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly. Obtain approval of authorities having jurisdiction prior to submittal.

1.06 INFORMATIONAL SUBMITTALS

A. Qualification Data:

1. For Manufacturer.
2. For Installer.

B. Product Test Reports: For each penetration firestopping system, for tests performed by aqualified testing agency.

1.07 CLOSEOUT SUBMITTALS

A. Installer Certificates: From Installer indicating that penetration firestopping systems havebeen installed in compliance with requirements and manufacturer's written instructions.

1.08 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm that has been successfully manufacturing firestopping and fill materials that meet the requirements of this section for a minimum period of five (5)years.

B. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply withits "Qualified Firestop Contractor Program Requirements."

C. Fire-Test-Response Characteristics: Penetration firestopping shall comply with the followingrequirements:

1. Penetration firestopping tests are performed by UL.
2. Penetration firestopping is identical to those tested per testing standard referenced in “Penetration Firestopping” Article. Provide rated systems bearing marking of qualified testing and inspection agency.

D. Source Limitations: Provide all firestopping sealants throughout project from single manufacturer.

1.09 PROJECT CONDITIONS

A. Environmental Limitations: Do not install penetration firestopping system when ambient or substrate temperatures are outside limits permitted by penetration firestopping system manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

B. Install and cure penetration firestopping materials per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.10 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping systems can be installed according to specified firestopping system design.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodatepenetration firestopping systems.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:

1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:

a. Penetration firestopping systems shall bear classification marking of aqualified testing agency.

1) UL in its “Fire Resistance Directory."
2) Intertek Group in its “Directory of Listed Building Products."

3) FM Global in its “Building Materials Approval Guide."
4) Approved equal.

2.02 PENETRATION FIRESTOPPING SYSTEMS

A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substratesforming openings, and with penetrating items if any.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited the following:

1. 3M Fire Protection Products.
2. A/D Fire Protection Systems Inc.
3. Construction Solutions.
4. Grabber Construction Products.
5. Grace Construction Products
6. Hilti, Inc.
7. HOLDRITE.
8. NUCO Inc.
9. Passive Fire Protection Partners.
10. RectorSeal.
11. Specified Technologies, Inc.
12. STC Sound Control.
13. Tremco, Inc.
14. USG Corporation
15. Approved equal

C. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.

1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

D. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.

1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.
2. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
3. W-Rating: Provide penetration firestopping systems showing no evidence of waterleakage when tested according to UL 1479.

E. Penetrations in Smoke Barriers: Penetration firestopping systems with ratings determined per UL 1479, based on testing at a positive pressure differential of 0.30-inch wg.

1. L-Rating: Not exceeding 5.0 cfm/sq. ft. (0.025 cu. m/s per sq. m) of penetration opening at and no more than 50-cfm cumulative total for any 100 sq. ft. at both ambient and elevated temperatures.

F. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexesof less than 25 and 450, respectively, per ASTM E 84.

G. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.

1. Permanent forming/damming/backing materials.
2. Substrate primers.
3. Collars.
4. Steel sleeves.

2.03 FILL MATERIALS

A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer sleeve lined with an intumescent strip, a flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.

C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced intumescentelastomeric sheet bonded to galvanized-steel sheet.

E. Intumescent Putties: Nonhardening, water-resistant, intumescent putties containing no solvents or inorganic fibers.

F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers and lightweight aggregate formulated for mixing with water at Project site toform a nonshrinking, homogeneous mortar.

H. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh toprotect pillows/bags from being easily removed.

I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants.

2.04 MIXING

A. Penetration Firestopping Materials: For those products requiring mixing before application, comply with penetration firestopping system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for applicationindicated.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Surface Cleaning: Before installing penetration firestopping systems, clean out openings immediately to comply with manufacturer's written instructions and with the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping materials.
2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping materials. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.03 INSTALLATION

A. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.

B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes anddepths required to achieve fire ratings.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.

C. Install fill materials by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories andpenetrating items to achieve required fire-resistance ratings.
2. Apply materials so they contact and adhere to substrates formed by openings andpenetrating items.
3. For fill materials that will remain exposed after completing the Work, finish toproduce smooth, uniform surfaces that are flush with adjoining finishes.

3.04 IDENTIFICATION

A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches high and with minimum 0.375-inch strokes.

1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet from endof wall and at intervals not exceeding 30 feet.

B. Penetration Identification: Identify each penetration firestopping system with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of penetration firestopping system edge so labels are visible to anyone seeking to remove penetrating items or firestopping systems. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words “Warning - Penetration Firestopping - Do Not Disturb. Notify BuildingManagement of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing and inspecting agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.05 FIELD QUALITY CONTROL

A. Unless indicated otherwise, the Contractor to engage a qualified testing agency to perform tests and inspections according to ASTM E 2174. Testing agency to be approved by the Authority.

B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.

C. Proceed with enclosing penetration firestopping systems with other construction only afterinspection reports are issued and installations comply with requirements.

3.06 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping material and install new materials to produce systems complying with specified requirements.

3.07 PENETRATION FIRESTOPPING SYSTEM SCHEDULE

A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product specific categories.

B. Where Intertek Group-listed systems are indicated, they refer to design numbers in IntertekGroup's "Directory of Listed Building Products" under "Firestop Systems."

C. Where FM Global-approved systems are indicated, they refer to design numbers listed in FM Global's "Building Materials Approval Guide" under "Wall and Floor Penetration Fire Stops."

D. Penetration Firestopping Systems with No Penetrating Items:

1. UL-Classified Systems: As shown on the drawings.
2. Intertek Group-Listed Systems: As shown on the drawings.
3. FM Global-Approved Systems: As shown on the drawings.
4. F-Rating: 1 hour or 2 hours; as shown on the drawings.
5. T-Rating: 1 hour or 2 hours; as shown on the drawings.
6. L-Rating at Ambient: As shown on the drawings.
7. L-Rating at 400 Deg F: As shown on the drawings.
8. W-Rating: No leakage of water at completion of water leakage testing.
9. Type of Fill Materials: As required to achieve rating.

E. Penetration Firestopping Systems for Metallic Pipes, Conduit, or Tubing:

1. UL-Classified Systems: As shown on the drawings.
2. Intertek Group-Listed Systems: As shown on the drawings.
3. FM Global-Approved Systems: As shown on the drawings.
4. F-Rating: As shown on the drawings.
5. T-Rating: As shown on the drawings.
6. L-Rating at Ambient: As shown on the drawings.
7. L-Rating at 400 Deg F: As shown on the drawings.
8. W-Rating: No leakage of water at completion of water leakage testing.
9. Type of Fill Materials: As required to achieve rating.

F. Penetration Firestopping Systems for Nonmetallic Pipe, Conduit, or Tubing:

1. UL-Classified Systems: As shown on the drawings.
2. Intertek Group-Listed Systems: As shown on the drawings.
3. FM Global-Approved Systems: As shown on the drawings.
4. F-Rating: As shown on the drawings.
5. T-Rating: As shown on the drawings.
6. L-Rating at Ambient: As shown on the drawings.
7. L-Rating at 400 Deg F: As shown on the drawings.
8. W-Rating: No leakage of water at completion of water leakage testing.
9. Type of Fill Materials: As required to achieve rating.

G. Penetration Firestopping Systems for Electrical Cables:

1. UL-Classified Systems: As shown on the drawings.
2. Intertek Group-Listed Systems: As shown on the drawings.
3. FM Global-Approved Systems: As shown on the drawings.
4. F-Rating: As shown on the drawing.
5. T-Rating: As shown on the drawings.
6. L-Rating at Ambient: As shown on the drawings.
7. L-Rating at 400 Deg F: As shown on the drawings.
8. W-Rating: No leakage of water at completion of water leakage testing.
9. Type of Fill Materials: As required to achieve rating.

H. Penetration Firestopping Systems for Cable Trays with Electric Cables:

1. UL-Classified Systems: As shown on the drawings.
2. Intertek Group-Listed Systems: As shown on the drawings.
3. FM Global-Approved Systems: As shown on the drawings.
4. F-Rating: As shown on the drawings.
5. T-Rating: As shown on the drawings.
6. L-Rating at Ambient: As shown on the drawings.
7. L-Rating at 400 Deg F: As shown on the drawings.
8. W-Rating: No leakage of water at completion of water leakage testing.
9. Type of Fill Materials: As required to achieve rating.

I. Penetration Firestopping Systems for Insulated Pipes:

1. UL-Classified Systems: As shown on the drawings.
2. Intertek Group-Listed Systems: As shown on the drawings>.
3. FM Global-Approved Systems: As shown on the drawings.
4. F-Rating: As shown on the drawings.
5. T-Rating: As shown on the drawings.
6. L-Rating at Ambient: As shown on the drawings.
7. L-Rating at 400 Deg F: As shown on the drawings.
8. W-Rating: No leakage of water at completion of water leakage testing.
9. Type of Fill Materials: As required to achieve rating.

J. Penetration Firestopping Systems for Miscellaneous Electrical Penetrants:

1. UL-Classified Systems: As shown on the drawings.
2. Intertek Group-Listed Systems: As shown on the drawings.
3. FM Global-Approved Systems: As shown on the drawings.
4. F-Rating: As shown on the drawings.
5. T-Rating: As shown on the drawings.
6. L-Rating at Ambient: As shown on the drawings.
7. L-Rating at 400 Deg F: As shown on the drawings.
8. W-Rating: No leakage of water at completion of water leakage testing.
9. Type of Fill Materials: As required to achieve rating.

K. Penetration Firestopping Systems for Miscellaneous Mechanical Penetrants:

1. UL-Classified Systems: As shown on the drawings.
2. Intertek Group-Listed Systems: As shown on the drawings.
3. FM Global-Approved Systems: As shown on the drawings.
4. F-Rating: As shown on the drawings.
5. T-Rating: As shown on the drawings.
6. L-Rating at Ambient: As shown on the drawings.
7. L-Rating at 400 Deg F: As shown on the drawings.
8. W-Rating: No leakage of water at completion of water leakage testing.
9. Type of Fill Materials: As required to achieve rating.

L. Penetration Firestopping Systems for Groupings of Penetrants:

1. UL-Classified Systems: As shown on the drawings.
2. Intertek Group-Listed Systems: As shown on the drawings.
3. FM Global-Approved Systems: As shown on the drawings.
4. F-Rating: As shown on the drawings.
5. T-Rating: As shown on the drawings.
6. L-Rating at Ambient: As shown on the drawings.
7. L-Rating at 400 Deg F: As shown on the drawings.
8. W-Rating: No leakage of water at completion of water leakage testing.
9. Type of Fill Materials: As required to achieve rating.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 07 84 13, Penetration Firestopping shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 07 84 13, Penetration Firestopping shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 07 84 43

JOINT FIRESTOPPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and SupplementaryConditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:

1. Joints in or between fire-resistance-rated constructions.
2. Joints at exterior curtain-wall/floor intersections.
3. Joints in smoke barriers.

B. Related Requirements:

1. Section 07 84 13 "Penetration Firestopping" for penetrations in fire-resistance-ratedwalls, horizontal assemblies, and smoke barriers.

1.03 REFERENCES

A. American National Standards Institute (ANSI):

1. ANSI/UL 263 - Fire Tests of Building Construction and Materials.
2. ANSI/UL 723 - Surface Burning Characteristics of Building Materials.
3. ANSI/UL 1479 - Standard for Fire Tests of Through-Penetration Firestops.

B. American Society for Testing and Materials(ASTM):

1. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of BuildingMaterials.
2. ASTM E 119 - Standard Test Methods for Fire Tests of Building Construction andMaterials.
3. ASTM E 814 - Standard Test Method for Fire Tests of Through-PenetrationFirestops.
4. ASTM E 2174 - Standard Practice for On-Site Inspection of Installed Firestops.

C. Factory Mutual (FM) - FM4991 - Standard for Approval of Firestop Contractors.

D. International Code Congress (ICC):

1. International Building Code (IBC).
2. International Residential Code (IRC).
3. International Mechanical Code (IMC).
4. International Fire Code (IFC).
5. International Code Congress Evaluation Service (ICC ES).

E. National Fire Protection Association (NFPA):

1. NFPA 70 - National Electrical Code.
2. NFPA 80 – Standard for Fire Doors and Other Opening Protectives.
3. NFPA 96 – Standard for Ventilation Control and Fire Protection of CommercialCooking Operations.
4. NFPA 101 - Life Safety Code.

5. NFPA 5000 – Building Construction and Safety Code.

F. Underwriters Laboratories (UL) - UL Building Materials Directory:

1. Through-Penetration Firestops Systems (XHEZ).
2. Firestop Devices (XHJI).
3. Forming Materials (XHKU),
4. Wall Opening Protective Materials (CLIV).
5. Fill, Void or Cavity Materials (XHHW).

G. American Society of Sanitary Engineering (ASSE):

1. ASSE Series 9000 – Professional Qualification Standard for Firestop Systems andDevice Installers, Inspectors and Surveyors.

H. International Association of Plumbing and Mechanical Officials (IAPMO):

1. Uniform Plumbing Code (UPC).
2. Uniform Mechanical Code (UMC).

I. International Standards Organization (ISO):

1. ISO 6944.
2. ISO 10295-1: 2007.

1.04 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.05 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Product Schedule: For each joint firestopping system. Include location, illustration offirestopping system, and design designation of qualified testing agency.

1. Engineering Judgments: Where Project conditions require modification to a qualified testing agency's illustration for a particular joint firestopping system condition, submit illustration, with modifications marked, approved by joint firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalentfire-resistance-rated assembly.

1.06 INFORMATIONAL SUBMITTALS

A. Qualification Data:

1. For Manufacturer
2. For Installer

B. Product Test Reports: For each joint firestopping system, for tests performed by a qualifiedtesting agency.

1.07 CLOSEOUT SUBMITTALS

A. Installer Certificates: From Installer indicating that joint firestopping systems have beeninstalled in compliance with requirements and manufacturer's written instructions.

1.08 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm that has been successfully manufacturing firestopping and fill materials that meet the requirements of this section for a minimum

period of five (5)years.

B. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply withUL's "Qualified Firestop Contractor Program Requirements."

C. Fire-Test-Response Characteristics: Joint firestopping shall comply with the following requirements:

1. Joint firestopping tests are performed by UL.
2. Joint firestopping is identical to those tested per testing standard referenced in “Joint Firestopping” Article. Provide rated systems bearing marking of qualified testing and inspection agency.

D. Source Limitations: Provide all firestopping sealants throughout project from single manufacturer.

1.09 PROJECT CONDITIONS

A. Environmental Limitations: Do not install joint firestopping systems when ambient or substrate temperatures are outside limits permitted by joint firestopping system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Install and cure joint firestopping systems per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

1.10 COORDINATION

A. Coordinate construction of joints to ensure that joint firestopping systems can be installedaccording to specified firestopping system design.

B. Coordinate sizing of joints to accommodate joint firestopping systems.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:

1. Perform joint firestopping system tests by a qualified testing agency acceptable toauthorities having jurisdiction.
2. Test per testing standards referenced in "Joint Firestopping Systems" Article. Provide rated systems complying with the following requirements:

a. Joint firestopping systems shall bear classification marking of a qualifiedtesting agency.

1) UL in its “Fire Resistance Directory."
2) Intertek Group in its “Directory of Listed Building Products."
3) Approved equal.

2.02 JOINT FIRESTOPPING SYSTEMS

A. Joint Firestopping Systems: Systems that are produced and installed to resist spread of fire, according to requirements indicated, resist passage of smoke and other gases, and

maintainoriginal fire-resistance rating of assemblies in or between which joint firestopping systems are installed. Joint firestopping systems shall accommodate building movements withoutimpairing their ability to resist the passage of fire and hot gases.

B. Joints in or between Fire-Resistance-Rated Construction: Provide joint firestopping systemswith ratings determined per ASTM E 1966 or UL 2079.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. A/D Fire Protection Systems Inc.
b. Grabber Construction Products.
c. Grace Construction Products
d. Hilti, Inc.
e. Johns Manville
f. Nelson Firestop; a brand of Emerson Industrial Automation.
g. NUCO Inc.
h. Passive Fire Protection Partners.
i. RectorSeal.
j. ROCKWOOL (ROXUL Inc.).
k. Specified Technologies, Inc.
l. Thermafiber, Inc.; an Owens Corning company.
m. 3M Fire Protection Products.
n. Tremco, Inc. Tremco Fire Protection Systems Group.
o. USG Corporation
p. Approved Equal

2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of the wall,floor, or roof in or between which it is installed.

C. Joints at Exterior Curtain-Wall/Floor Intersections: Provide joint firestopping systems withrating determined per ASTM E 2307.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Grace Construction Products
b. Hilti, Inc.
c. Johns Manville; a Berkshire Hathaway Company.
d. Nelson Firestop; a brand of Emerson Industrial Automation.
e. NUCO Inc.
f. RectorSeal.
g. ROCKWOOL (ROXUL Inc.).
h. Specified Technologies, Inc.
i. Thermafiber, Inc.; an Owens Corning company.
j. 3M Fire Protection Products
k. USG Corporation
l. Tremco, Inc. Tremco Fire Protection System Group.
m. Approved equal.

2. F-Rating: Equal to or exceeding the fire-resistance rating of the floor assembly.

D. Joints in Smoke Barriers: Provide fire-resistive joint systems with ratings determined per UL2079 based on testing at a positive pressure differential of 0.30-inch wg (74.7 Pa).

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. A/D Fire Protection Systems Inc.
    b. Grace Construction Products.
    c. Hilti, Inc.
    d. Johns Manville; a Berkshire Hathaway Company.
    e. Nelson Firestop; a brand of Emerson Industrial Automation.
    f. NUCO Inc.
    g. Passive Fire Protection Partners.
    h. RectorSeal.
    i. ROCKWOOL (ROXUL Inc.).
    j. Specified Technologies, Inc.
    k. Thermafiber, Inc.; an Owens Corning company.
    l. 3M Fire Protection Products
    m. Tremco, Inc. Tremco Fire Protection System Group.
    n. USG Corporation
    o. Approved equal.

2. L-Rating: Not exceeding 5.0 cfm/ft. (0.00775 cu. m/s x m) of joint at both ambient andelevated temperatures.

E. Exposed Joint Firestopping Systems: Flame-spread and smoke-developed indexes of lessthan 25 and 450, respectively, as determined per ASTM E 84.

F. VOC Content; Provide fire resistive joint systems that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Architectural Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

G. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install elastomeric fill materials and to maintain ratings required. Use only components specified by joint firestopping system manufacturer and approved by the qualified testing agency for conditions indicated.

1. Permanent forming/damming/backing materials.
2. Substrate primers.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Surface Cleaning: Before installing fire-resistive joint systems, clean joints immediately to comply with fire-resistive joint system manufacturer's written instructions and the followingrequirements:

1. Remove from surfaces of joint substrates foreign materials that could interfere withadhesion of elastomeric fill materials or compromise fire-resistive rating.
2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with elastomeric fill materials. Remove loose particles remaining fromcleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Prime substrates where recommended in writing by joint firestopping system manufacturer using that manufacturer's recommended products and methods. Confine primers to areasof bond; do not allow spillage and migration onto exposed surfaces.

3.03 INSTALLATION

A. General: Install fire-resistive joint systems to comply with manufacturer's written installationinstructions and published drawings for products and applications indicated.

B. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.

C. Install fire-resistive joint systems to comply with manufacturer’s written installation instructions and published drawings for products and applications indicated.

D. Install forming materials and other accessories of types required to support elastomeric fill materials during their application and in position needed to produce cross-sectional shapesand depths required to achieve fire ratings indicated.

1. After installing elastomeric fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.

E. Install elastomeric fill materials for fire-resistive joint systems by proven techniques to produce the following results:

1. Elastomeric fill voids and cavities formed by joints and forming materials as requiredto achieve fire-resistance ratings indicated.
2. Apply elastomeric fill materials so they contact and adhere to substrates formed byjoints.
3. For elastomeric fill materials that will remain exposed after completing the Work,finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.04 IDENTIFICATION

A. Joint Identification: Identify joint firestopping systems with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of joint edge so labels are visible to anyone seeking to remove or joint firestopping system. Use mechanical fasteners or self- adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words “Warning - Joint Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.05 FIELD QUALITY CONTROL

A. Inspecting Agency: Unless indicated otherwise, the Contractor to engage a qualified testing agency to perform tests and inspections according to ASTM E 2393. Testing agency to beapproved by the Authority.

B. Where deficiencies are found or joint firestopping systems are damaged or removed due to testing, repair or replace joint firestopping systems so they comply with requirements.

C. Proceed with enclosing joint firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.06 CLEANING AND PROTECTION

A. Clean off excess elastomeric fill materials adjacent to joints as the Work progresses by methods and with cleaning materials that are approved in writing by joint firestopping systemmanufacturers and that do not damage materials in which joints occur.

B. Provide final protection and maintain conditions during and after installation that ensure joint firestopping systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

3.07 JOINT FIRESTOPPING SYSTEM SCHEDULE

A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory".

B. Where Intertek Group-listed systems are indicated, they refer to design numbers in IntertekGroup's "Directory of Listed Building Products".

C. Floor-to-Floor, Joint Firestopping Systems:

1. UL-Classified Systems: As shown on the drawings on as otherwise indicated. .
2. Assembly Rating: 1 or 2 hours as required.
3. Nominal Joint Width: As shown on the drawings.
4. Movement Capabilities: Class I Class II Class III - percent as indicated or requiredcompression or extension compression, extension, or horizontal shear.
5. L-Rating at Ambient: Less than amount indicated cfm/ft.
6. L-Rating at 400 Deg F Less than amount indicated cfm/ft.
7. W-Rating: No leakage of water at completion of water leakage testing.

D. Wall-to-Wall, Joint Firestopping Systems:

1. UL-Classified Systems: As shown on the drawings on as otherwise indicated
2. Assembly Rating: 1 or 2 hours as required.
3. Nominal Joint Width: As shown on the drawings.
4. Movement Capabilities: Class I Class II Class III percent as indicated or requiredcompression or extension.
5. L-Rating at Ambient: Less than amount indicated cfm/ft.
6. L-Rating at 400 Deg F: Less than amount indicated cfm/ft.

E. Floor-to-Wall, Joint Firestopping Systems:

1. UL-Classified Systems: As shown on the drawings on as otherwise indicated.

2. Assembly Rating: 1 or 2 hours as required.
3. Nominal Joint Width: As shown on the drawing
4. Movement Capabilities: Class I Class II Class III percent as indicated or requiredcompression or extension compression, extension, or horizontal shear.
5. L-Rating at Ambient: Less than amount indicated cfm/ft.
6. L-Rating at 400 Deg F: Less than amount indicated cfm/ft.

F. Head-of-Wall, Fire-Resistive Joint Firestopping Systems:

1. UL-Classified Systems: As shown on the drawings on as otherwise indicated
2. Intertek Group-Listed Systems: As shown on the drawings.
3. Assembly Rating: 1 or 2 hours as required.
4. Nominal Joint Width: As shown on the drawing.
5. Movement Capabilities: Class I Class II Class III percent as indicated or requiredcompression or extension.
6. L-Rating at Ambient: Less than amount indicated cfm/ft.
7. L-Rating at 400 Deg F: Less than amount indicated cfm/ft.

G. Bottom-of-Wall, Joint Firestopping Systems:

1. UL-Classified Systems: As shown on the drawings on as otherwise indicated
2. Assembly Rating: 1 or 2 hours as required.
3. Nominal Joint Width: As shown on the drawing.
4. Movement Capabilities: Class I Class II Class III percent as indicated or requiredcompression or extension.
5. L-Rating at Ambient: Less than amount indicated cfm/ft.
6. L-Rating at 400 Deg F: Less than amount indicated cfm/ft.

H. Wall-to-Wall, Joint Firestopping Systems Intended for Use as Corner Guards:

1. UL-Classified Systems: As shown on the drawings on as otherwise indicated
2. Assembly Rating: 1 or 2 hours as required.
3. Nominal Joint Width: As shown on the drawing.
4. Movement Capabilities: Class I Class II Class III percent as indicated or requiredcompression or extension.
5. L-Rating at Ambient: Less than amount indicated cfm/ft.
6. L-Rating at 400 Deg F: Less than amount indicated cfm/ft.

I. Perimeter Joint Firestopping Systems:

1. UL-Classified Perimeter Fire-Containment Systems: As shown on the drawings onas otherwise indicated.
2. Intertek Group-Listed, Perimeter Fire-Barrier Systems: As shown on the drawingson as otherwise indicated.
3. Integrity Rating: 1 or 2 hours as required.
4. Insulation Rating: Zero hour, 1/4 hour, 3/4 hour, 1 hour as shown on the drawingsor required.
5. Linear Opening Width: 2-1/2 inches, 8 inches or as indicated; maximum.
6. Movement Capabilities: Class I Class II Class III percent as indicated or requiredcompression or extension.
7. F-Rating: 1 hour, 2 hours or as indicated or required.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 07 84 43, Joint Firestopping shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 07 84 43, Joint Firestopping shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 07 90 00

JOINT SEALERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this section.

1.02 SUMMARY

A. This Section includes joint sealers for the project:

1. Exterior and interior joints in vertical and horizontal surfaces:

a. Perimeter joints between materials, frames of doors, windows, vents,flashing, roof items and other items, control and expansion joints.
b. At hardware items, fixtures, and other protrusions.
c. Control and expansion joints.
d. At electrical and mechanical protrusions, attachments and joints.
e. Perimeter joints of exterior openings where indicated.
f. As required for an air and water tight joints.
g. Other joints as indicated.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 03 Section: "Cast-In-Place Concrete".
2. Division 07 Section: "Flashing and Sheet Metal".

1.03 REFERENCES

A. American Society for Testing and Materials

1. ASTM C 719: “Standard Test Method for Adhesion and Cohesion of ElastomericJoint Sealants Under Cyclic Movement (Hockman Cycle)”.
2. ASTM C 920: “Standard Specification for Elastomeric Joint Sealants”.
3. ASTM C 1193: “Standard Guide for Use of Joint Sealants”.

1.04 DEFINITIONS

A. Product Type:

1. Type S products: Single component products (premixed).
2. Type M products: Multi-component products (requires mixing at the jobsite).

B. Grade:

1. Grade P products: Products have sufficient flow to fill joints in horizontal surfaces(products rated for traffic use).
2. Grade NS products: Products suitable for installation in joints in vertical surfaceswithout sagging.

C. Class:

1. Classes 12 ½, 25, 35, 50 and 100/50 are the designations in ASTM C 920 for ratingmovement capability to remain adhered to the joint substrates without experiencing cohesive failure when subjected to repeated cycles of joint expansion andcontraction.

D. Exposure:

1. T-type conditions: Traffic conditions.
2. NT-type conditions: Non-traffic conditions.

E. Substrates:

1. M-type Substrates: Concrete, concrete masonry units, brick, mortar, natural stone.The term “masonry” means brick, stone and concrete masonry work.
2. G-type Substrates: Glass and transparent plastic glazing sheets.
3. A-type Substrates: Metals, porcelain, glazed tile and smooth plastics.
4. O-type Substrates: Wood, unglazed tile; substrates not included under othercategories.

1.05 SUBMITTALS

A. Product Data from manufacturers for each joint sealer product required, including instructions for joint preparation and joint sealer application.

B. Certificates from manufacturers of joint sealers attesting that their products comply with specification requirements and are suitable for the use indicated.

C. Qualification data complying with requirements specified in "Quality Assurance" article.

D. Compatibility and adhesion test reports from elastomeric sealant manufacturer indicating that materials forming joint substrates and joint sealant backings have been tested for compatibility and adhesion with joint sealants. Include sealant manufacturer's interpretation of test results relative to sealant performance and specifications for primers and substratepreparation needed to obtain adhesion.

E. Product test reports for each type of joint sealers indicated, evidencing compliance with requirements specified.

F. Samples for verification purposes of each type and color of joint sealer required.

G. Submit a copy of the warranty from the contractor and installer of the joint sealers.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Engage an Installer who has successfully completed applications similar in type and size to that of this Project.

B. Single Source Responsibility for Joint Sealer Materials: Obtain joint sealer materials from asingle manufacturer for each different product required.

C. Preconstruction Compatibility and Adhesion Testing:

1. Submit samples of all materials that will contact or affect joint sealers to joint sealermanufacturers for compatibility and adhesion testing.
2. Use test methods standard with manufacturer to determine if priming and other specific joint preparation techniques are required to obtain rapid, optimum

adhesion of joint sealers to joint substrates. Perform tests under normal environmental conditions that will exist during actual installation.

3. Schedule sufficient time for testing and analysis of results to prevent delay in the work progress.
4. Investigate materials failing compatibility or adhesion tests and obtain joint sealer manufacturer's written specifications for corrective measures, including use of specially formulated primers.
5. Testing will not be required when joint sealer manufacturer is able to submit joint preparation data based on previous testing of sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

D. Product Testing: Provide comprehensive test data for each type of joint sealer based on tests conducted by a qualified independent testing laboratory on current product formulations within a 24-month period preceding date of Contractor's submittal of test results to the Authority.

1. Test elastomeric sealants for compliance with requirements specified by reference to ASTM C 920. Include test results for hardness, stain resistance, adhesion and cohesion under cyclic movement (per ASTM C 719), low-temperature flexibility, modulus of elasticity at 100 percent strain, effects of heat aging, and effects of accelerated weathering.
2. Include test results performed on joint sealers after they have cured 1 year.

E. Preconstruction Field Testing: Prior to installation of joint sealants, field-test their adhesionto joint substrates as follows:

1. Locate test joints where indicated or, if not indicated, as directed by Authority.
2. Conduct field tests for each type of elastomeric sealant and joint substrate indicated.
3. Arrange for tests to take place with joint sealer manufacturer's technical representative present.
4. Test Method: Test joint sealers by hand pull method described below:

    a. Install joint sealants in 5-feet joint lengths using same materials and methods for joint preparation and joint sealant installation required for completed Work. Allow sealants to cure fully before testing.
    b. Make knife cuts as follows: A horizontal cut from one side of joint to the other followed by 2 vertical cuts approximately 2 inches long at side of joint and meeting horizontal cut at top of 2 inch cuts. Place a mark 1 inch from top of2 inch piece.
    c. Use fingers to grasp 2 inch piece of sealant just above 1 inch mark; pull firmly down at a 90 degree angle or more while holding a ruler along side of sealant. Pull sealant out of joint to the distance specified by sealant manufacturer for testing adhesive capability, but not less than that equaling specified maximum movement capability in extension; hold this position for 10 seconds.

5. Report whether or not sealant in joint connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test eachtype of product and joint substrate.
6. Evaluation of Field Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants which fail to adhere to joint substratesduring testing.

F. Field-Constructed Mock-Ups: Prior to installation of joint sealers, apply elastomeric sealants to the following selected building joints as indicated below for further

verification of colors selected from sample submittals and to represent completed work for qualities of appearance, materials and application:

1. Joints in field-constructed mock-ups of assemblies specified in other sections, whichare indicated to receive elastomeric joint sealants specified in this section.
2. Retain mock-ups during construction as standard for judging completed construction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels informing about manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi-component materials.

B. Store and handle materials in compliance with manufacturers' specifications to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or othercauses.

1.08 PROJECT CONDITIONS

A. Environmental Conditions: Do not proceed with installation of joint sealers under the following conditions:

1. When ambient and substrate temperature conditions are outside the limits permittedby joint sealer manufacturers.
2. When ambient and substrate temperature conditions are outside the limits permittedby joint sealer manufacturer or below 40 deg F.
3. When joint substrates are wet due to rain, frost, condensation, or other causes.

1.09 WARRANTY

A. Furnish a written warranty in form stipulated by the Authority, signed by the Contractor and Installer, agreeing to repair or replace work which has failed to provide airtight or watertight joints, failed in adhesion or cohesion, failed in resistance to abrasion, weather, extrusion, migration, staining or otherwise failed as a result in materials or workmanship. Upon notice of such defects, within the warranty period, make necessary repairs or replacement as approved by the Authority and at no cost to the Authority.

B. Warranty:

1. For Silicone Building Sealants: Twenty (20) years from date of Substantial Completion.
2. For all other sealants: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Provide joint sealers that have been produced and installed to establish and maintain watertight and airtight continuous seals.

B. Compatibility: Provide only the sealants and joint fillers which are explicitly recommended by the manufacturer for the application and which have been determined by tests to be totally compatible with the joint surfaces and each other, as stated in the manufacturer’s publisheddata or certified by the manufacturer for each application.

C. Staining: Provide sealant systems which will not cause or contribute to staining of substrate surfaces. Manufacturer shall perform staining tests of sealant systems in accordance with ASTM C 510 and ASTM D 2203 methods for each joint substrate condition in the work.

D. Adhesion: For elastomeric sealant systems, manufacturer shall test each sealant for bond with each joint substrate condition in the work, as per ASTM C 719, no failure in adhesion or cohesion; and as per ASTM C 794, minimum 15 lbs. peel strength with no loss in adhesion.

E. Hardness: For sealant systems to be exposed to abrasion and traffic, provide the sealants having suitable hardness to resist damage including indentation by stiletto heel shoes. Determine the proper sealant system and hardness or compressibility in consultation with the manufacturer, considering movement and exposure for the size of each joint.

2.02 MATERIALS, GENERAL

A. Compatibility: Provide joint sealers, joint fillers and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

B. Colors: Provide color of exposed joint sealers indicated or, if not otherwise indicated, as selected by the Authority from manufacturer's standard colors.

2.03 ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated which complies with ASTM C 920 requirements, including those referenced for Type, Grade, Class, and Uses.

B. One-Part Mildew-Resistant Silicone Sealant: Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide; intended for sealing interior joints with nonporous substrates and subject to in-service exposure to conditions of high humidity and temperature extremes.

C. One-Part High-Modulus Nonacid-Curing Silicone Sealant: Type S, Grade NS, Class UsesNT, M, G, A, and, as applicable to joint substrates indicated, O.

D. One-Part Non-sag Urethane Sealant: Type S, Grade NS, Class 25, Uses NT, M, A and asapplicable to joint substrates indicated, Use O.

E. One-Part Pourable Self-Leveling Urethane Sealant for Use T: Type S, Grade P, Class 25 and complying with the following requirements for Uses T, M and, as applicable to joint substrates indicated, Use O.

F. Multicomponent Nonsag Polysulfide Sealant: Type M and NS, Class 25, Uses M, G, A, and,as applicable to joint substrates indicated, O.

G. Available Products: Subject to compliance with requirements, elastomeric sealants which may be incorporated in the Work include, but are not limited to, the following:

1. One-Part Neutral-Curing Silicone Sealant:

a. "Dow Corning 795" (“Dow Corning 790” for expansion jts, control jts.masonry, precast conc.); Dow Corning Corp.
b. "SCS 1700 Sanitary"; General Electric Co.
c. "863 #345 White"; Pecora Corp.
d. "Rhodorsil 6B White"; Rhone-Poulenc Inc.
e. "Proglaze White"; Tremco Corp.
f. "OmniPlus"; Sonneborn Bldg Prod. Div., Rexnord Chem. Prod. Inc

2. One-Part High-Modulus Nonacid-Curing Silicone Sealant:

a. "Dow Corning 799", Dow Corning Corp.
b. "Ultraglaze SSG 4000", General Electric Co.

3. One-Part Non-sag Urethane Sealant:

a. “Chem-Calk 900”, Bostik Construction Products Division.
b. “Chem-Calk 2639”, Bostik Construction Products Division.
c. “Vulkem 116”, Mameco International, Inc.
d. “Vulkem 921”, Mameco International, Inc.
e. Dynatrol 1”,’ Pecora Corporation.
f. Permapol RC-1”, Product Research and Chem. Corporation.
g. “Sikaflex-1a”, Sika Corporation.
h. “Sikaflex-15LM”, Sika Corporation.
i. “Sonolastic NP 1”, Sonneborn Building Product Division Rexnord Chem.Products, Inc.
j. “Dymonic”, Tremco Inc.

4. One-Part Pourable Self-Leveling Urethane Sealant:

a. “Chem-Calk 950”, Bostik Construction Products division.
b. “Vulkem 45”, Mameco International, Inc.
c. “NR-201 Urexpan”’ Pecora Corporation.
d. “Sonolastic SL-1”, Sonneborn Building Products Division, Rexnord Chemical Products Inc.

5. One-Part Mildew-Resistant Acid-Curing Silicone Sealant:

a. "Dow Corning 786", Dow Corning Corp.
b. GE Silicones; Sanitary SCS1700.
c. Tremco; Tremco 200 White or Clear.

6. One-Part Nonsag Polyurethane Sealant:

a. BASF: MasterSeal NP-1.
b. Tremco: Dymonic.

7. Multicomponent Nonsag Polysulfide Sealant:

a. Pacific Polymers, Inc.; Elasto-Seal 227 Type II (Gun Grade).
b. Pecora Corporation; Synthacalk GC-2+.
c. Polymeric Systems Inc.; PSI-350.
d. PolySpec Corp.; T-2235-M, T-2282, Thiokol 2P.
e. Sonneborn, Division of ChemRex Inc.; Sonolastic Polysulfide Sealant.

2.04 COMPRESSION SEALS

A. Preformed Foam Sealant: Manufacturer's standard preformed, precompressed, impregnated open-cell foam sealant manufactured from high-density urethane foam impregnated with a nondrying, water repellant agent; factory-produced in precompressed sizes and in roll or stick form to fit joint widths indicated and to develop a watertight and airtight seal when compressed to the degree specified by manufacturer; and complying with the following requirements:

1. Properties: Permanently elastic, mildew-resistant, nonmigratory, nonstaining, compatible with joint substrates and other joint sealers.
2. Impregnating Agent: Neoprene rubber suspended in chlorinated hydrocarbons.
3. Density: 9-10 lb/cu ft.
4. Backing: Pressure sensitive adhesive, factory applied to one side, with protectivewrapping.
5. Available Products: Subject to compliance with requirements, preformed foam sealants which may be incorporated in the Work include, but are not limited to, thefollowing:

    a. "Emseal"; Emseal Corp.
    b. "Emseal Greyflex"; Emseal Corp.
    c. "Will-Seal 250"; Wil-Seal Construction Foams Div., Illbruck.
    d. "York-Seal 200"; York Manufacturing, Inc.

B. Preformed Hollow Neoprene Gasket: Manufacturer's standard preformed polychloroprene elastomeric joint seal of the open-cell compression type complying with ASTM D 2628 and with requirements indicated for size, profile and cross-sectional design. Subject to compliance with requirements, manufacturers offering preformed hollow neoprene gaskets which may be incorporated in the Work include, but are not limited to, the following:

1. The D.S. Brown Co.
2. Watson-Bowman & Acme Corp.

2.05 JOINT SEALANT BACKING

A. General: Provide sealant backings of material and type which are nonstaining; are compatible with joint substrates, sealants, primers and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratorytesting.

B. Plastic Foam Joint Fillers: Preformed, compressible, resilient, nonstaining, nonwaxing, nonextruding strips of flexible plastic foam of material indicated below and of size, shape, and density to control sealant depth and otherwise contribute to producing optimum sealant performance:

1. Open-cell polyurethane foam.
2. Closed-cell polyethylene foam, nonabsorbent to liquid water and gas, nonoutgassing in unruptured state.
3. Proprietary, reticulated, closed-cell polymeric foam, nonoutgassing, with a density of 2.5 pcf and tensile strength of 35 psi per ASTM D 1623, and with water absorptionless than 0.02 gms/cc per ASTM C 1083.
4. Any material indicated above.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape as specified by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provideself-adhesive tape where applicable.

2.06 MISCELLANEOUS MATERIALS

A. Primer: Provide type specified by joint sealer manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint sealer-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Provide nonstaining, chemical cleaners of type which are acceptable to manufacturers of sealants and sealant backing materials, which are not harmful to substrates and adjacent nonporous materials, and which do not leave oily residues or otherwise have a detrimental effect on sealant adhesion or in-service performance.

C. Masking Tape: Provide nonstaining, nonabsorbent type compatible with joint sealants andto adjacent surfaces.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine joints indicated to receive joint sealers, with Installer present, for compliance with requirements for joint configuration, installation tolerances and other conditions affecting joint sealer performance. Do not proceed with installation of joint sealers until unsatisfactory conditions have been corrected.

B. Do not proceed with installation of joint sealers under the following conditions:

1. Environmental Conditions: When environmental conditions are not within the manufacturer's recommendations.
2. Joint Width Conditions: Where joint widths are less or more than allowed by joint sealer manufacturer for application indicated.
3. Joint Substrate Conditions: Where contaminants capable of interfering with the sealer's adhesion.at joint substrates need to be removed and the surfaces need tobe cleaned.

3.02 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealers to comply with specifications of joint sealer manufacturers and the following requirements:

1. Remove all foreign material from joint substrates which could interfere with adhesion of joint sealer, including dust; paints, except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer; old joint sealers; oil; grease; waterproofing; water repellants; water;surface dirt; and frost.
2. Clean concrete, masonry, and similar porous joint substrate surfaces, by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealers. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
3. Remove laitance and form release agents from concrete.
4. Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile; and other nonporous surfaces by chemical cleaners or other means which are not harmful to substrates or leave residues capable of interfering with adhesion of

joint sealers.

B. Joint Priming: Prime joint substrates where indicated or where specified by joint sealer manufacturer based on preconstruction joint sealer-substrate tests or prior experience. Apply primer to comply with joint sealer manufacturer's specifications. Confine primers to areas of joint sealer bond, do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces which otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.03 INSTALLATION OF JOINT SEALERS

A. General: Comply with joint sealer manufacturers' printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.

B. Elastomeric Sealant Installation Standard: Comply with specifications of ASTM C 1193 foruse of joint sealants as applicable to materials, applications and conditions.

C. Solvent-Release-Curing Sealant Installation Standard: Comply with requirements of ASTMC 1193 for use of solvent-release-curing sealants.

D. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:

1. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths which allow optimum sealant movement capability.

    a. Do not leave gaps between ends of joint fillers.
    b. Do not stretch, twist, puncture, or tear fillers.
    c. Remove absorbent joint fillers which have become wet prior to sealantapplication and replace with dry material.

2. Install bond breaker tape between sealants and joint fillers, compression seals, or back of joints where adhesion of sealant to surfaces at back of joints would resultin sealant failure.
3. Install compressible seals serving as sealant backings to comply with requirements indicated for fillers.

E. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint widths which allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents which discolor sealants or adjacent surfaces or are not approved by sealant manufacturer. Provide concave joint configuration per Figure 6A in ASTM C 1193, unless otherwise indicated.

G. Installation of Preformed Foam Sealants: Install each length of sealant immediately

after removing protective wrapping, taking care not to pull or stretch material, and to comply with sealant manufacturer's directions for installation methods, materials, and tools which produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures where expansion of sealant requires acceleration to produce seal, apply heat to sealant in conformance with sealant manufacturer's specifications.

H. Installation of Preformed Hollow Neoprene Gaskets: Install gaskets, with minimum number of end joints, in joint recesses with edges free of spalls and sides straight and parallel, both within tolerances specified by gasket manufacturer. Apply manufacturer's specified adhesive to joint substrates immediately prior to installing gaskets. For straight sections provide gaskets in continuous lengths; where changes in direction occur, adhesively splice gasket together to provide watertight joint. Recess gasket below adjoining joint surfaces by1/8 to 1/4 inch.

3.04 CLEANING

A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealers and of products in which joints occur.

3.05 PROTECTION

A. Protect joint sealers during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealers immediately and reseal joints with new materials to produce joint sealer installations with repaired areas indistinguishable from original work.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 07 90 00, Joint Sealers shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 07 90 00, Joint Sealers shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 07 95 00
BUILDING EXPANSION JOINT

PART 1 - GENERAL

1.01 SUMMARY

A. The Contractor shall furnish all labor, material, equipment, and services necessary to fabricate, deliver and install vertical and horizontal expansion joint or isolation assemblies where shown on the drawings, as specified herein, or as otherwise required by the actual conditions.

B. The work under this Section includes the installation of an expansion joint assembly between the elevator shaft and the walls of the station house, as shown and detailed on the drawings and as required to isolate the vibration between the two structures.

1.02 RELATED DOCUMENTS

A. Drawings and Division 01 Specification Sections, apply to this Section.

1.03 RELATED WORK

A. Division 07 Section, Joint Sealants.

B. Division 08 Section, Aluminum Entrance.

C. Division 14 Section, Joint Sealer.

1.04 SUBMITTALS

A. Shop Drawings: Provide large scale drawings completely illustrating the design and construction of each type of expansion joint assembly and of each type of expansion joint assembly coordinated with adjacent structural elements. Indicate number, size and thickness of expansion joint components and accessories. Indicate size and thickness for each assembly. Indicate location of each assembly.

B. Product Data: Provide manufacturer’s published product data for materials proposed to be incorporated into each expansion joint assembly and fabrication of assemblies. Provide product data for expansion joint components and accessories.

C. Provide manufacturer’s technical specifications for each assembly and material including foam, adhesive, seal, silicone coating, backing, etc. proposed to be used including:

1. Compression.
2. Density.
3. Hardness.
4. Stability.
5. Tolerances.
6. Service Life.
7. Resistance to water, oil, and heat.
8. Conductivity.
9. Maximum load.

10. Deflection.
11. Damping.
12. Tolerance to temperature.

D. Indicate manufacturer's recommended installation instructions, including recommended environmental conditions for installation of materials and assemblies.

E. Provide test reports for the materials making up the expansion assembly and for the elastomeric expansion assembly indicating that the materials and assemblies meet all requirements of the specifications. Indicate fatigue test reports for the material being used.

F. Indicate the allowable movement in each direction for each pad or assembly, as specified by manufacturer. Indicate required movement in each direction for each assembly.

G. Provide certifications from the manufacturer that the expansion joint assemblies meets all criteria specified herein and will perform as indicated. See below.

H. Provide color charts for manufacturer's standard colors for expansion joint material for Authority's selection.

I. Provide copies of the warranty from the manufacturer and the installer for the Authority's review and approval.

1.05 QUALITY ASSURANCE

A. Manufacturer of expansion joint assemblies shall have a minimum of three years experience in designing and fabricating assemblies similar to that specified herein.

B. Installer of the expansion joint assemblies shall have a minimum of three years experience in designing and fabricating assemblies similar to that specified herein and be approved by the manufacturer to install their products.

C. The expansion joint assembly shall be designed and installed to provide a continuous sealed, air and water tight thru joint vertically or horizontally between the two structural elements that absorbs vibration, allows expansion and contraction, and other movement without failing.

D. The Contractor shall certify in writing that the expansion joint components are free in composition of any waxes or asphalts, wax compounds or asphalt compounds.

E. The Contractor shall certify in writing that the expansion joint assembly is capable of withstanding 150 degrees F. for 3 hours while compressed down to the minimum of movement capability dimension of the basis of design product (-50% of nominal material size) without evidence of any bleeding of impregnation medium from the material.

F. The Contractor shall certify in writing that the same material after the heat stability test will self-expand to the maximum of movement capability dimension of the basis-of-design product (+50% of nominal material size) within 24 hours at room temperature 68 degrees F.

1.06 SEQUENCING/SCHEDULING

A. The Contractor shall schedule and perform tasks required to furnish and deliver the expansion joint assemblies in conformance with the requirements of the accepted project schedule.

1.07 PRODUCT DELIVERY, STORAGE AND HANDLING

A. The Contractor shall repair or replace, to the satisfaction of the Authority, any components that are damaged, corroded or otherwise deteriorated at no additional expense to the Authority and without any delay to the completion of the work.

B. The Contractor shall deliver complete, sealed, packaged expansion joint assemblies to the project site for immediate installation. On-site storage of assemblies prior to installation shall be minimized.

1.08 WARRANTY

A. Manufacturer of expansion joint system shall provide a written and signed warranty indicating that the expansion joint systems and products used on this project will not fail in materials or workmanship including delamination, cracking, drying, premature aging, discoloration, stiffness or other situation that will cause the materials not to expand or contract as specified and possibly allow water or air infiltration for a period of five (5) years from the date of final acceptance.

B. Installer of expansion joint system shall provide a written and signed warranty indicating that the expansion joint system installation will not fail in materials or workmanship including delamination, loosening, or other situation that will cause the materials not to expand or contract as specified and possibly allow water or air infiltration for a period of five (5) years from the date of final acceptance.

C. Materials or workmanship that fail within the warranty period shall be repaired or replaced to the Authority's satisfaction at no cost to the Authority.

PART 2 - PRODUCTS

2.01 MATERIALS AND PRODUCTS FOR EXPANSION JOINT ASSEMBLIES

A. The Contractor shall provide an expansion joint assembly of the size and type indicated on the Drawings, or if not indicated, of size and type adequate for all design loads and movements in accordance with the actual requirements and conditions of the installation.

B. The various products for the expansion joint assembly are to be comprised of all new (unused) materials including multiple layers of silicone sealing faces provided in one integrated system.

C. Preformed sealant shall be silicone pre-coated, preformed, pre-compressed, self-expanding, sealant system. Expanding foam to be open-cell polyurethane foam impregnated with a water-based, non- drying, polymer-modified acrylic adhesive. Impregnation density not to exceed 150kg per cubic meter. Wax or acrylic-modified wax not permitted. Seal shall combine factory-applied, low-modulus silicone and a backing of acrylic-impregnated expanding foam into a unified hybrid sealant system. Silicone must be proved to have been tested for hardness according to ASTM D2240 (Shore-A hardness not to exceed 25).

D. Multiple silicone external color facings to be factory-applied to the foam while it I partially pre-compressed to a width greater than maximum joint extension and cured before final compression. When compressed to final supplied dimension, a bellows with distinct and uniform folds to handle movement must be created in the silicone coating. Silicone coating to be available in a range of not less than 12 colors for coordination with typical building materials.

E. Sealant must be supplied precompressed to less than the joint size, packaged in shrink-wrapped lengths (sticks) with a mounting adhesive on one face. End to end joins of consecutive lengths of material to be buffed and joined bellows surfaces to be lightly coated with silicone. Use identical color of sealant. Depth of seal as recommended by manufacturer.

F. Sealing against the substrate to be achieved through a combination of the pressure-sensitive adhesive impregnation, and the backpressure of the expanding foam, as well as through the addition, by the contractor in the field, of a corner bead of silicone supplied by the sealant manufacturer.

G. Material shall be capable of movements of +50%, -50% (100%) total) of nominal material size.

H. All products furnished shall be free of frayed or irregularly cut edges, nicks, cuts or any other defects that can affect the service life of the product. The ends of all bushings shall be cut straight, 90 degrees plus or minus 1 degree to the center longitudinal axis.

I. All metal components and attachment devices of the expansion assembly shall be galvanized or stainless steel.

PART 3 - EXECUTION

3.01 FABRICATION

A. The expansion joint system shall be appropriately designed to accommodate all expected longitudinal movements (i.e. thermal, creep, shrinkage, elastic shortening, etc.), vibration, as well as vertical and horizontal rotations; and all other requirements specified herein.

3.02 INSTALLATION

A. The expansion joint assemblies shall be installed in strict accordance with the manufacturer’s instructions and recommendations.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 07 95 00, Sheet Metal Flashing and Trim shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 07 95 00, Building Expansion Joint shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 07 95 13

EXPANSION JOINT COVER ASSEMBLIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this section.

1.02 SUMMARY

A. This Section includes providing and installing expansion joint cover assemblies.

B. Expansion Joint Cover Assembly Applications:

1. Floors and Platforms.

a. Concrete.
b. Precast Concrete.
c. Wood.
d. Walls.

2. Ceilings.
3. Floor to Wall.
4. Ceiling to Wall.

C. Related Sections:

1. Section 07 62 00, Sheet Metal Flashing and Trim.
2. Section 07 90 00, Joint Sealers.
3. Section 07 95 00, Building Expansion Joint

1.03 REFERENCES

A. ASTM A666 - Standard Specification for Annealed or Cold- Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

B. ASTM B221 - Standard Specification for Extruded Aluminum.

C. ASTM B209 - Standard Specification for Aluminum Sheet and Plate.

D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.

E. ASTM D2000 - Standard Classification System for Rubber Products in Automotive Applications.

F. ASTM E1612 - Standard Specification for Preformed Architectural Compression Seals forBuildings and Parking Structures.

G. ASTM E1783 - Standard Specification for Preformed Architectural Strip Seals for Buildingsand Parking Structures.

1.04 SUBMITTALS

A. Submit for review and approval for all materials provided: Manufacturer’s product data,

product specifications, installation instructions, and general recommendations for each type of expansion joint cover assembly indicated.

B. Submit for review and approval shop drawings showing full extent of expansion joint cover assemblies for each condition; include large-scale details indicating profiles of each type of expansion joint cover assembly, splice joints between sections, joinery with other types, special end conditions, type and conditions for anchorages and fasteners, installation details and relationship to adjoining work and finishes. Include description of materials and finishes. Indicate all dimensions: Width of joint and length of cover required.

1. Where expansion joint cover assemblies change planes, provide isometric or clearlydetailed drawing depicting how components interact.
2. Shop drawings to indicate dimensions and details for block out, recesses, ledges, grooves and other requirements for the installation and attachment of the expansion joint cover assemblies as required to be cast into the cast in place concrete slabs, cast into the precast concrete panels at the expansion joint, created in the wood decking or other substrate.

C. Provide for review and approval samples for each type of expansion joint cover assembly required, each metal finish indicated on each type of metal required of same thickness and alloy to be used in work. Where normal color and texture variations are to be expected, include two or more units in each set of samples showing limits of such variations. Indicate type of finishes that are standard for Authority's selection; including smooth finish, granular, lined grooves, cross hatch grooves and other variations. Indicate slip resistance of each finish available.

1. Samples to be 6 inches long in size.
2. Provide manufacturer's color charts showing the full range of colors and finishesavailable for each exposed metal and elastomeric seal material.
3. Provide a sample of the water containment barrier when required.
4. Provide a sample of the fire rated expansion joint cover assembly when required.

D. Provide for review and approval a copy of the manufacturer's and installer's warranty.

E. Provide for review and approval manufacturer's instructions for maintenance of the expansion joint cover assembly.

F. Provide for review and approval manufacturer's qualifications, installer's qualifications and certification signed by the manufacturer stating that the installer is certified to install their product.

1.05 QUALITY ASSURANCE

A. Materials and work shall conform to the latest edition of reference specifications specified herein and to all applicable codes and requirements of local authorities having jurisdiction.

B. Manufacturer's Instructions: In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for all phases of work, including preparation of substrate, applying materials, installation of products and protection of installed units.

C. Single-Source Responsibility: Obtain components for each expansion joint assembly fromone source and from a single manufacturer.

D. Performance Requirements: Provide factory-fabricated architectural joint systems

capable of withstanding the types of loads and of accommodating the kinds of movement, and the other functions for which that are designed, including maintaining continuity of weather enclosure.

E. Manufacturer's Qualifications: Manufacturer shall have a minimum of five (5) years experience manufacturing expansion joint cover assemblies similar to the type(s) specifiedherein.

F. Installer's Qualifications: Installer shall have a minimum of five (5) years experience installing expansion joint cover assemblies similar to the type(s) specified herein and in substrates similar to those of this project.

1. The installer must be certified in writing by the manufacturer of the corresponding expansion joint cover assembly as an approved installer of the assembly.

G. Fire Performance Characteristics:

1. Fire Resistance – Where indicated on the drawings or required by code, provide expansion joint cover assemblies identical to those of assemblies whose fire resistance and cycling capability has been determined per UL 2079. Fire rating notless than the rating of adjacent construction.

1.06 DELIVERY, STORAGE AND HANDLING

A. Exercise proper care in the handling of all work so as not to injure the finished surface, andtake proper precautions to protect the work from damage after it is in place.

B. Deliver materials to the job site ready for use, and fabricated in as large sections and assemblies as practical. Assemblies shall be identical to submitted and reviewed shop drawings, samples and certificates.

C. Store materials under cover in a dry and clean location off the ground. Remove materials that are damaged or otherwise not suitable for installation from the job site and replace with acceptable materials at no additional cost.

1.07 PROJECT CONDITIONS

A. Where necessary, check actual locations of walls and other construction to which work must fit, by accurate field measurements before fabrication. Show recorded measurements on final shop drawings and coordinate fabrication schedule with construction progress to avoid delay of the work.

1.08 SEQUENCING AND SCHEDULING

A. Coordinate installation of block outs, inserts and anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to project site in time for installation.

1.09 WARRANTY

A. The manufacturer and installer shall warrant the expansion joint cover assembly to be free of defects in material and workmanship and warrant the expansion joint cover assembly installation for a period of one (1) year after the date of substantial completion. Failures include degradation of the finish, dislodging of the components, bending, denting, cracking and its attachment to the substrate failing or loosening. If

applicable, the warranty shall also cover the elastomeric parts of the assembly and failures with the water tightness requirements of the assembly. The manufacturer and installer shall repair or replace the expansion joint cover assembly to the Authority's satisfaction and at no cost to the Authority.

PART 2 - PRODUCTS

2.01 EXPANSION JOINT COVER ASSEMBLY DESCRIPTION

A. Furnish units in longest practicable lengths to minimize field splicing; stock lengths shall beten (10) feet minimum.

B. Include factory-fabricated closure materials and transition pieces, T-joints, corners, curbs, cross- connections and other accessories as required to provide continuous expansion joint cover assemblies.

2.02 PERFORMANCE REQUIREMENTS

A. Expansion Joint Design Criteria:

1. Thermal movement:

a. Joint width as indicated on the drawings.

2. Fire Resistance Ratings:

a. Provide expansion joint cover assemblies with fire barriers identical to those of systems tested for fire resistance according to UL 2079 or ASTM E 1966 by a qualified testing agency.

2.03 FLOOR EXPANSION JOINT COVERS

A. Center-Plate Floor Joint Cover: Recessed assembly consisting of center plate that slides over metal frames fixed to sides of floor joint gaps. Expansion Joint Cover Assembly shall be flush with floor surface; heavy-duty to handle continuous pedestrian and heavy wheel traffic; exposed side cover plate surfaces to be serrated or grooved for slip resistance.

1. Load Capacity:

a. Uniform Load: 100 lb./sq. ft.
b. Concentrated Load: 2,000 lb.
c. Maximum Deflection: 0.0625 inch.

2. Side Cover Plate Design: Serrated or grooved for slip resistance and as approvedby the Authority.
3. Center Cover Plate Design: Non-Serrated or grooved surface.
4. Exposed Metal:

a. Aluminum: Mill finish.
b. Stainless steel: No. 4 finish.
c. Wall and Ceiling Expansion Joint Covers.

B. Center-Plate Wall Joint Cover: Surface mounted assembly consisting of center plate that slides over metal frames fixed to sides of wall joint gaps.

1. Cover-Plate Design: Smooth, flush as approved by the Authority.
2. Exposed Metal:

a. Aluminum: Mill finish.
b. Stainless steel: No. 4 finish.

2.04 MANUFACTURERS

A. Floor Expansion Joint Cover Assemblies:

1. See Drawings for type of expansion joint cover assembly to be used at each location. Designs are based upon the following:

a. Three (3) inch gap at Platform: Model AL-300HD with serrated side cover plates as manufactured by Construction Specialties.

2. Other manufacturers that may provide products equal to the above and meet the requirements of this specification may be submitted for the Authority's review andapproval and include, but are not limited to, the following:

a. D.S. Brown Company.
b. Erie Metal Specialties.
c. Watson Bowman Acme Corp.
d. Approved equal.

B. Wall, Ceiling, Floor to Wall or Ceiling to Wall Expansion Joint Cover Assemblies:

1. Manufacturers that may provide products that meet the requirements of this specification may be submitted for the Authority's review and approval and include,but are not limited to, the following:

a. Architectural Art Mfg., Inc.; A division of Pittcon Architectural Metals, LLC.
b. Balco, Inc.
c. Construction Specialties, Inc.
d. InPro Corporation (IPC)
e. MM Systems Corp.
f. Nystrom, Inc.
g. Watson Bowman Acme Corp.
h. Approved equal.

2.05 MATERIALS

A. Expansion Joint Cover Assembly Extrusions and Plates: Expansion joint cover assemblyframes, cover plates and slide plates shall be of the same type of metal.

B. Aluminum: ASTM B221, alloy 6063-T5 for extrusions; ASTM B209, alloy 6061-T6 for sheetand plate.

1. Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious materials.

C. Stainless Steel: ASTM A666, Type 316L with No. 4 finish, unless otherwise indicated, forplates, sheet, and strips.

D. Nonmetal Products:

1. Extruded Preformed Seals: Single or multilayered rubber extrusions as classified under ASTM D2000, designed with or without continuous, longitudinal, internal baffles and formed to fit compatible frames, in color indicated, or, if not indicated, as selected by Authority from manufacturer's

standard colors.

2. Preformed Seals: Manufacturer's standard extruded elastomeric seals designed with or without continuous, longitudinal, internal baffles, complying with ASTM C920, Use T, factory-formed and bonded to metal frames or anchor members; in color indicated, or, if not indicated, as selected by the Authority from manufacturer's standard colors. Joints up to 2 inches wide must withstand plus or minus 35 percent movement of the joint width without failure.
3. Strip Seals: Elastomeric membrane or tubular extrusions with a continuous
4. longitudinal internal baffle system throughout complying with ASTM E1783; used with compatible frames, flanges, and molded- rubber anchor blocks.
5. Compression Seals: Preformed, elastomeric extrusions having internal baffle system complying with ASTM E1612 in sizes and profiles indicated or as recommended by manufacturer.
6. Water Containment Barrier: Manufacturer’s standard, flexible, elastomeric, continuous, waterproof membrane gutter within joint and attached to substrate on sides of joint; where shown on the drawings. Flexible membrane shall be reinforced60 mil PVC unless approved otherwise.
7. Fire Barriers: Any material or material combination, when fire tested after cycling, designated to resist the passage of flame and hot gases through a movement joint and to comply with performance criteria for required fire-resistance rating.
8. Accessories: Manufacturer's standard filler materials, drain tubes, adhesive, and other accessories compatible with material in contact, as indicated or required forcomplete installations.
9. Attachment Devices: Manufacturer’s recommended attachment devices including anchors, clips, fasteners, set screws, spacers and other accessories compatible with material in contact, as indicated or required for complete installations. Fasteners, screws and anchorage shall be stainless steel unless approved otherwise by the Authority. All exposed screw heads shall be tamper proof.

E. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, non-staining, mixed with water to consistency suitable for application and a 30-minute working time.

F. Backer Rod and Sealant: Sika 1a with 3/8” backer rod where shown on the drawings.

2.06 FABRICATION

A. General: Provide expansion joint assemblies of design, profile, materials, and operation indicated on the Drawings, the approved shop drawings and as indicated herein. Select units of the type indicated as required to accommodate joint width, variations in adjacent surfaces, and structural movement. Furnish units in longest practicable lengths to minimize number of end joints. Provide hairline mitered corners where joint changes directions or abuts other materials. Include closure materials and transition pieces, tee-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous joint cover assemblies.

B. Extruded Expansion Joint Cover Assemblies: Provide continuous extruded frame assemblies of suitable profile to receive free floating cover plate of design indicated. Furnish depth and configuration to suit type of construction with no exposed fasteners. All metal in contact with concrete to have heavy metal free high solids primer, exposed metal to be finished as noted, free of gaskets and filler and be capable of 50% expansion and contraction without loss of cover. Provide continuous flexible water stop where detailed.

1. Heavy Duty Floor Cover: Provide continuous heavy duty frame on each side of joint with seating surface to accept serrated cover plates fixed with countersunk fasteners 12” on center. Center plate to be free floating and capable of withstanding 2,000-lb. concentrated load without damage or permanent deformation.

    a. Minimum plate thickness for AL-200-HD Models: 1/4”.
    b. Minimum plate thickness for AL-400-HD Models: 1/4”.
    c. Minimum plate thickness for EEHFX-4-2-1.5H Models: 5/16” for side coverplates and 3/8” thick for center cover plate.

C. Joint Cover Assembly with Preformed Seal: Provide joint cover assemblies consisting of continuously anchored aluminum or stainless steel (as specified) metal extrusions and continuous extruded preformed seals of profile indicated or required to suit types of installation conditions shown. Furnish extrusions designed for embedment in concrete and mechanical retention of lugs of field-installed extruded preformed seals. Vulcanize or heat-seal splices (if any) to ensure hermetic joint condition.

D. For floors, provide non-slip finishes and non-slip seals designed to lie flat with adjacent surfaces, and complying with Americans with Disabilities Act regulations in Title 49 CFR Part 37 including Appendix A.

2.07 METAL FINISHES

A. General: Comply with NAAMM "Metal Finishes Manual" for finish designations and application recommendations, except as otherwise indicated. Apply finishes in factory after products are fabricated. Protect finishes on exposed surfaces with protective covering before shipment.

B. Aluminum Finishes:

1. Mill finish.

C. Stainless-Steel Finishes:

1. Uniform, Natural Satin Finish - NAAMM-M31, mechanical finish, directional textured, medium satin, No. 4

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine surfaces where expansion joint cover assemblies will be installed for installationtolerances and other conditions affecting performance of the Work.

B. Notify Authority where discrepancies occur that will affect proper expansion joint cover assembly installation and performance.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Coordinate and furnish anchorages, setting drawings, templates, and instructions for installation of expansion joint cover assemblies to be embedded in concrete or have recesses formed into edges of concrete slab for later placement and grouting-in of frames. Prepare substrates according to architectural joint system manufacturer's written instructions.

B. Prepare substrates according to expansion joint cover assembly manufacturer's written instructions.

C. Provide block outs or recesses in concrete, wood or other material as required to provide flush installation of the expansion joint cover assembly with the finished floor. Coordinate with structural work. Coordinate installation of expansion joint cover assembly with detectable warning tiles where applicable.

D. For wood installations, provide wood blocking of exterior treated wood. Refer to Section 06 10 00 Rough Carpentry.

E. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of expansion joint cover assemblies. Provide all templates as requiredto related trade for locations of all support and anchorage items.

F. Verify all measurements and dimensions at the job site and cooperate in the coordination and scheduling of the work of this section with the work of related trades, with particular attention given to the installation of items embedded in concrete and masonry so as not to delay jobprogress.

G. Substrate shall be clean, dry and sound. Blockouts shall be level before installation can begin.

3.03 BLOCKOUTS

A. Blockouts: The blockouts must be prepared to receive the joint cover. The blockout should be formed a minimum of 1/8" deeper to allow the base to be leveled prior to installation ofthe joint cover. Blockouts must be level across the joint opening.

B. Apply a high-strength leveling grant to the base of the blockouts to provide a continuous, solid, flat and level base for the joint cover.

3.04 INSTALLATION

A. Comply with manufacturer's written instructions and recommendations for installing expansion joint cover assemblies and materials, including preparation of substrate, unlessmore stringent requirements are indicated.

B. Fastening to In-Place Construction: Provide and install anchorage devices and fasteners where necessary for securing expansion joint assemblies to in-place construction, including threaded fasteners with drilled-in expansion shields for concrete where anchoring members are not embedded in concrete. Provide fasteners of metal, type, and size to suit type of construction indicated and provide for secure attachment of expansion joint assemblies.

C. Cutting, Fitting and Placement: Perform all cutting, drilling, and fitting required for installation of expansion joints. Install joint assemblies in true alignment and proper relationship to expansion joints and adjoining finished surfaces measured from

established lines and levels.

D. Allow adequate free movement for thermal expansion and contraction of metal to avoid buckling.

E. Set expansion joint assemblies at elevations to be flush with adjacent finished floor materials. Do not create tripping hazards at floor level. Do not leave any sharp edges at any part of any expansion joint cover assembly. If necessary and as approved, shim to level but ensure base frames have continual support to prevent rocking and vertical deflection.

F. Metal Frames: Perform cutting, drilling, and fitting required to install expansion joint coverassemblies.

1. Repair or grout block out as required for continuous frame support using nonmetallic, shrinkage-resistant grout.
2. Install in true alignment and proper relationship to joints and adjoining finishedsurfaces measured from established lines and levels.
3. Adjust for differences between actual structural gap and nominal design gap due toambient temperature at time of installation.
4. Cut and fit ends to accommodate thermal expansion and contraction of metalwithout buckling of frames.
5. Install frames in continuous contact with adjacent surfaces.

    a. Shimming is not permitted unless approved by the Authority.

G. Joinery and Continuity: Maintain continuity of expansion joint assemblies with end joints held to a minimum, and metal members aligned mechanically using splice joints. Cut and fit ends to produce joints that will accommodate thermal expansion and contraction of metal to avoidbuckling of frames.

H. Install expansion joint cover assemblies with hairline mitered corners where expansion joint cover assemblies change direction or abut other materials.

I. Terminate exposed ends of expansion joint cover assemblies with field- or factory-fabricated termination devices.

J. Securely attach in place expansion joint cover frames with anchors of type as shown on the drawings or as recommended by the manufacturer for the specific substrate. Space anchors a minimum of 12 inches on center unless a closer spacing is required by the drawings or is recommended by the manufacturer. Provide anchorage not more than 3 inches from each end.

K. Securely attach the expansion joint covers to the frames with screws, nuts or attachment devices of type as shown on the drawings or as provided or recommended by the manufacturer. Space anchorage a minimum of 12 inches on center unless a closer spacing is indicated otherwise or is recommended by the manufacturer. Provide anchorage not more than 3 inches from each end.

L. Installation of Extruded Preformed Seals: Install seals to comply with manufacturer's instructions and with minimum number of end joints. For straight sections provide preformed seals in continuous lengths. Vulcanize or heat-seal all field splice joints in preformed seal material to provide watertight joints using manufacturer's recommended procedures. Adhere and mechanically lock flexible filler materials (if any) by applying manufacturer's approved pressure-sensitive tape, adhesive, epoxy, or lubricant-adhesive to both frame interfaces prior to installing preformed seal. Seal transitions and ends in accordance with manufacturer's instructions.

M. Slope for waterproof membrane to be the same slope as the finish floor or as required to provide positive drainage. If indicated, provide drainage fittings and connect to drains.

N. Expansion Joint Cover Assembly shall extend thru the detectable warning strip at platform edges. Detectable warning tiles shall be tightly butted to the edge of the side cover plate ateach side and the joint shall be fully sealed.

O. Fire-Resistance-Rated Assemblies: Coordinate installation of expansion joint cover assembly materials and associated work so complete assemblies comply with performance requirements.

1. Fire Barriers: Install fire barriers to provide continuous, uninterrupted fire resistance throughout length of joint, including transitions and field splices.

3.05 CLEANING AND PROTECTION

A. Do not remove strippable protective material until finish work in adjacent areas is complete. When protective material is removed, clean exposed metal surfaces to comply with manufacturer's instructions.

B. Protect the installation from damage by work of other Sections. Where necessary due to heavy construction traffic, remove and properly store cover plates or seals and install temporary protection over expansion joint cover assemblies. Reinstall cover plates or seals prior to Substantial Completion.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 07 95 13, Expansion Joint Cover Assemblies shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 07 95 13, Expansion Joint Cover Assemblies shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 08 11 00
STANDARD STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following products manufactured in accordance with SDI Recommended Standards.

1. Doors: Seamless, hollow, insulated standard steel doors for interior and exterior locations.
2. Frames: Pressed steel welded unit frames.
3. Labeled door and frame where indicated or required.
4. Louvers: Where shown in doors and at transoms.
5. All door, frame and louver assemblies to be fabricated of galvanized metal components and factory primed. Final coats of paint to be applied in the field.

1.03 RELATED WORK:

A. Related work specified elsewhere:

1. Division 04 Section, Unit Masonry.
2. Division 07 Section, Joint Sealers.
3. Division 08 Section, Door Hardware.
4. Division 09 Section, Painting.

1.04 REFERENCES

A. National Association of Architectural Metal Manufactures (NAAMN):

1. "Hollow Metal Technical and Design Manual".
2. "Metal Finishes Manual".

B. National Fire Protection Association (NFPA): NFPA 80 "Standard for Fire Doors and Windows".

C. Underwriter Laboratories Inc. (UL): UL 63, "Standard for Safety of Fire Doors and Frames".

D. Steel Door Institute (SDI): SDI-100, Recommended Specification for Standard Steel Doors and Frames"; SDI-117, "Manufacturing Tolerances for Standard Steel Doors and Frames".

1.05 SUBMITTALS

A. General: Submit the following in accordance with Division 01 Specification Section, Submittals:

B. Product data for each type of door and frame specified, including details of construction, materials, profiles, dimensions, hardware preparation, louver assembly, label compliance, insulation, fire ratings and finishes.

C. Shop drawings showing fabrication and installation of standard steel doors and frames. Include details of each frame type, elevations of frames including those with transoms, elevations of door design types, conditions at openings, details of construction, location and installation requirements of door and frame hardware and reinforcements, and details of joints and connections. Show anchorage and accessory items. Show size and location of openings for louver and glass lites. Show louver construction including frame, blades, and detail for installation in door or at transom. Show details for openings in doors, reinforcing and glass stops.

D. Provide certification for labeled door and frame assemblies.

1.06 QUALITY ASSURANCE

A. Provide doors and frames complying with Steel Door Institute "Recommended Specifications Standard Steel Doors and Frames" ANSI/SDI-100 and as herein specified.

B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252.

1. Test Pressure: Test at atmospheric pressure.
2. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies provide certification by a testing agency acceptable to authorities having jurisdiction that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
3. Temperature-Rise Rating: Where indicated, provide doors that have a temperature-rise rating of 450 deg F maximum in 30 minutes of fire exposure.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames cardboard-wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to finish of factory-finished doors and frames.

B. Inspect doors and frames upon delivery for damage. Minor damages may be repaired provided refinished items are equal in all respects to new work and acceptable to Commissioner; otherwise, remove and replace damaged items as directed.

C. Store doors and frames at building site under cover. Place units on minimum 4 inches high wood blocking. Avoid use of non-vented plastic or canvas shelters which could create humidity chamber. If cardboard wrapper on door becomes wet, remove carton immediately. Provide 1/4-inch spaces between stacked doors to promote air circulation.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering standard steel doors and frames which may be incorporated in the work include; but are not limited to, the following:

1. Standard Steel Doors and Frames:

    a. Amweld Building Products, Inc.
    b. Ceco Corp.
    c. Curries Company.
    d. Fenestra Corp.
    e. Pioneer Industries.
    f. Republic Builders Products.
    g. Steelcraft Manufacturing Co.

2.02 MATERIALS

A. Galvanized Steel Sheets: Zinc-coated carbon steel sheets of commercial quality, complying with ASTM A 653/A 653, or drawing quality, stretcher leveled, free of defects, hot dipped galvanized in accordance with ASTM A 924, with A60 or G60 coating designation, mill phosphatized.

B. Supports and Anchors: Fabricate of not less than 16-gage sheet steel; galvanized after fabrication.

C. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Hot-dip galvanize in compliance with ASTM A 153, Class C or D as applicable.

D. Zinc-Rich Touch-Up Primer: 95 percent metallic zinc dust primer in a vehicle compatible with the specified painting system.

E. Shop Applied Paint: Apply after fabrication.

1. Primer: Rust-inhibitive enamel or paint, either air-drying or baking, suitable as a base for specified finish paints complying with ANSI A224.1, "Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames."

2.03 DOORS

A. Provide metal doors of SDI grades and models specified below or as indicated on drawings or schedules:

1. Exterior Doors: ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level: Level 4 and Physical Performance Level A (Maximum Duty), Model 2 (Seamless).
2. Interior Doors: ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level: Level 4 and Physical Performance Level A (Maximum Duty), Model 2 (Seamless).

B. Provide flush design doors, seamless hollow construction, unless otherwise indicated.

1. Exterior Doors: 1 3/4 inch thick.
2. Interior Doors: 1 3/4 inch thick.

C. For single-acting swing doors, bevel vertical edges 1/8 inch in 2 inches.

D. Provide filler of mineral-wool, honeycomb, polyurethane, polystyrene, rigid mineral fiber core or other approved insulating material solidly packed to full door height filling all voids

between inner core reinforcing members on inside of face sheets where appropriate in accordance with SDI standards. No asbestos products will be allowed.

E. Fabricate faces of doors with steel sheets galvanized all sides. Construct doors with smooth, flush surfaces without visible joints or seams on exposed surfaces. Provide weep hole openings in the bottom of doors to permit escape of entrapped moisture.

1. Exterior Doors: 14-gauge.
2. Interior Doors: 16-gauge.
3. Reinforce inside of doors with vertical sheet steel sections not less than 18-gauge. Space vertical reinforcing 6 inches o.c. and extend full door height. Spot-weld at not more than 5 inches o.c. to both face sheets.

F. Reinforce tops and bottoms of doors with 12-gauge horizontal galvanized steel channels spot welded to outer sheets. Reinforce at openings for louvers and/or glazing with 12-gauge galvanized steel channels. Reinforce for hardware installation with 12-gauge galvanized steel channels and plates. Close top and bottom edges to provide a weather seal, as integral part of door construction or by addition of inverted steel channels.

2.04 FRAMES

A. Provide metal frames for doors of types and styles as shown on drawings and schedules. Frames with transoms shall have an intermediate horizontal member with stops top and bottom. Conceal fastenings, unless otherwise indicated.

B. Fabricate frames of galvanized steel, minimum gauge as noted below.

1. Frames for Exterior Doors: 12-gauge.
2. Frames for Interior Doors: 14-gauge.

C. Fabricate frames of full welded construction, with corners mitered, reinforced, continuously welded full depth and width of frame.

D. Provide closed or tubular mullions and transom bars where indicated. Fasten mullions and transom bars at crossings and to jambs by butt welding. Reinforce joints between frame members with concealed clip angles or sleeves of same metal and thickness as frame.

E. Jamb anchors: Furnish jamb anchors as required to secure frames to adjacent construction, formed of not less than 16-gauge galvanized steel.

F. Fire-Rated Jamb Anchors: Provide anchors for fire-rated frames as required by the authority having jurisdiction. In masonry construction, provide UL rated adjustable anchors consisting of welded strap and adjustable corrugated or perforated anchors. Material and thickness of strap and anchor is same as frame. Minimum anchor size is 2 inches wide by 10 inches long. Provide 2 anchors per jamb up to 5 feet-0 inches jamb height, plus 1 additional anchor for each additional 30 inch height or fraction thereof.

G. Floor Anchors: Provide floor anchors for each jamb and mullion which extends to floor, formed of not less than 14-gauge galvanized steel sheet, as follows:

1. Monolithic Concrete Slabs: Clip type anchors, with two holes to receive fasteners, welded to bottom of jambs and mullions.

H. Spreader Bars: Provide removable spreader bar across bottom of frames, tack welded to jambs and mullions.

I. Door Silencers: Except on weather-stripped frames, drill stops to receive 3 silencers on strike jambs of single-door frames and 2 silencers on heads of double-door frames.

J. Plaster Guards: Provide minimum 26-gauge galvanized steel plaster guards or mortar boxes at back of hardware cutouts where mortar or other materials might obstruct hardware operation and to close off interior of openings.

K. Form fixed stops integral with frame, unless noted otherwise.

2.05 LOUVERS IN DOOR OR AT TRANSOM

A. Provide louvers for doors where indicated on the drawings or schedules. Louvers to be fabricated from minimum 20-gauge galvanized steel. Fixed louver blades and louver frame shall be fabricated as an assembly and factory welded together. Louver assembly to be welded into a matching opening in the door, flush or welded into the door frame as a transom. Reinforce door all sides at louver opening. Louvers, frames, door reinforcement, etc. shall be of galvanized sheet metal to match door and frame or be hot dip galvanized after fabrication. Comply with ANSI/SDI- 100 requirements.

1. Standard Louvers: Provide sight-proof stationary louvers where indicated, constructed of V-shaped or Y-shaped blades, 20-gauge galvanized steel.
2. UL listed louvers: For louvers in fire-rated doors, provide UL listed louvers with operable blades and 135 deg F. fusible links.
3. Bird Screen for Louvers: Provide bird screen where indicated, fabricated of 16 gauge galvanized, 1/2 inch square steel mesh, held in folded frames.

2.06 FABRICATION

A. Fabricate steel door and frame units to be rigid, neat in appearance and free from defects, warp or buckle. Wherever practicable, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory-assembled before shipment, to assure proper assembly at project site. Comply with ANSI/SDI-100 requirements.

1. Clearances: Not more than 1/8 inch at jambs and heads except between non-fire-rated pairs of doors not more than 1/4 inch. Not more than 3/4 inch at bottom.
2. Tolerances: Comply with SDI 117 "Manufacturing Tolerances Standard Steel Doors and Frames."

B. Fabricate doors and frames from galvanized sheet steel in accordance with SDI-112. Close top and bottom edges of doors as integral part of door construction or by addition of galvanized inverted steel channels. Fabricate concealed stiffeners, reinforcement, edge channels, moldings from galvanized steel.

C. Weld exposed joints continuously; grind, dress, and make smooth, flush, and invisible.

D. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat or oval heads for exposed screws and bolts.

E. Thermal-Rated (Insulating) Assemblies: Provide doors fabricated as thermal insulating door and frame assemblies and tested in accordance with ASTM C 236 or ASTM C 976 on fully operable door assemblies.

1. Unless otherwise indicated, provide thermal-rated assemblies with U factor of 0.41 Btu/(hr x sq. ft. x deg F.) or better.

F. Hardware Preparation: Prepare doors and frames to receive mortised and concealed hardware in accordance with final Door Hardware Schedule and templates provided by hardware supplier. Comply with applicable requirements of ANSI A 115 Series Specifications for door and frame preparation for hardware. For concealed overhead door closers, provide space, cutouts, reinforcing and provisions for fastening in top rail of doors or head of frames, as applicable.

G. Reinforce doors and frames to receive surface applied hardware. Reinforce interior of doors for installation of hinges, closer and lockset and panic hardware. Drilling and tapping for surface applied hardware may be done at project site.

H. Locate hardware as indicated on final shop drawings or, if not indicated, in accordance with "Recommended Locations for Builder's Hardware on Standard Steel Doors and Frames," published by Door and Hardware Institute.

I. Shop Painting Galvanized Steel Door and Frame Fabrications:

1. Extent: Clean, treat and paint surfaces of fabricated metal door and frame work, inside and out, whether to be exposed or concealed in the construction.
2. Preparation: Thoroughly clean metal surfaces to remove loose scale, shavings, filings, dirt and other deleterious materials, by use of wire brushes or other effective means. Remove grease and oil by one of the methods specified in SSPC-SP-1 "Solvent Cleaning". Fill as required to fill seams in edges. Chemically treat surfaces to assure adhesion of paint. Primer shall be compatible with galvanized metal.
3. Painting: Apply primer to obtain uniformly smooth coating on inside and outside surfaces. Provide not less than the minimum coating thickness as recommended by the paint manufacture

PART 3 - EXECUTION

3.01 INSTALLATION

A. General: Install standard steel doors, frames, and accessories in accordance with final shop drawings, manufacturer's data, and as herein specified.

B. Placing Frames: Comply with provisions of SDI-105 "Recommended Erection Instructions for Steel Frames," unless otherwise indicated.

1. Except for frames located at existing concrete or masonry installations, place frames prior to construction of enclosing walls and ceilings. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders leaving surfaces smooth and undamaged.
2. In masonry construction, locate three (3) wall anchors adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb.
3. At existing walls, secure frames to adjacent construction with bolts and anchorage devices.

C. Set frames in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces and spreaders leaving surfaces smooth and undamaged.

D. In masonry construction, coordinate frame setting with the building of masonry walls. Fill frames with grout. Remove spreader bars only after frames or bucks have been properly set and secured.

E. Door Installation: Fit hollow metal doors accurately in frames, within clearances specified in ANSI/SDI-100.

F. Transoms to be framed all four sides. Fit and weld to framing louver assembly at transom location.

G. Install fire-rated frames in accordance with NFPA Standard No. 80.

H. Finish Hardware: Apply hardware in accordance with hardware manufacturer's instructions and the Finish Hardware section of these specifications. Drill and tap for machine screws as required. Do not use self-tapping sheet metal screws. Adjust door installation to provide uniform clearance at head and jambs, and to contact stops uniformly. Remove and replace doors which are found to be warped, bowed or otherwise damaged and cannot be properly fitted in frames. Demonstrate that doors operate freely without binding, and latch properly when closed with moderate force.

3.02 ADJUST AND CLEAN

A. Prime Coat Touch-up: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touch-up of compatible air-drying primer.

B. Final Adjustments: Check and readjust operating hardware items, leaving steel doors and frames undamaged and in complete and proper operating condition. Remove and replace defective work, including doors or frames which are warped, bowed or otherwise unacceptable.

3.03 PROTECTION

A. Protect each unit during construction to leave clean and free from defects at time of acceptance.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 08 11 00, Standard Steel Doors and Frames shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 08 11 00, Standard Steel Doors and Frames shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 08 13 00
STAINLESS STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following products manufactured in accordance with SDI Recommended Standards:

1. Doors and Frames: Seamless, hollow or composite construction stainless steel doors, sidelights and frames.
2. Assemblies: Provide door and frame assemblies as required for thermal rated (insulated).
3. Louvers: Stainless steel louvers set in the door or in the frame as a transom.

B. Related work specified elsewhere:

1. Section 04 80 00, Unit Masonry.
2. Section 07 90 00, Joint Sealers.
3. Section 08 71 00, Door Hardware.
4. Section 08 80 00, Glass and Glazing.

1.03 REFERENCES

A. ANSI/NFPA 80 - Fire Doors and Windows.

B. ANSI A250.4 – Test procedure and Acceptance Criteria for Physical Endurance for Steel Doors and Hardware Reinforcings.

C. ANSI/ASTM A167 – Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.

D. ASTM A 480 – Standard Specification for General Requirements for Flat-Rolled Stainless and Heat- Resisting Steel Plate, Sheet and Strip.

E. ASTM E152 - Methods of Fire Tests of Door Assemblies.

F. NAAMM CHM-1-74 - Recommended Architectural Specifications for Custom Hollow Metal Doors and Frames.

G. NAAMM Hollow Metal Technical and Design Manual - Section 6: Installation of Doors and Frames.

H. NAAMM Hollow Metal Technical and Design Manual - Section 8: Fire Rated Door and Frames.

I. NFPA 252 - Fire Tests of Door Assemblies.

J. SDI 100 - Steel Door Institute Recommended Specifications - Standard Steel Door and Frames.

K. SDI 117 – Manufacturing Tolerances Standard Steel Doors and Frames.

L. UL 10B - Fire Tests of Door Assemblies.

M. ASTM C578 – Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.

N. ASTM E2074 – Standard Test Method for Fire Tests of Door Assemblies, Including Positive Pressure Testing of Side-Hinged and Pivoted Swinging Door Assemblies.

O. DHI A115.IG – Installation Guide for Doors and Hardware.

P. NAAMM CHM-1-74 – Recommended Architectural Specifications for Custom Hollow Metal Doors and Frames.

1.04 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.05 OORDINATION

A. Coordinate anchorage installation for frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, masonry and concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

B. Coordinate requirements for installation of door hardware, electrified door hardware, and access control and security systems.

1.06 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.07 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.

B. Product data for each type of door, frame and louver specified, including details of construction, materials, profiles, dimensions, hardware preparation, core, label compliance, sound ratings, and fire ratings.

1. Provide sample of stainless steel finish.

C. Door and Frame Schedule

1. Door and Frame Schedule shall indicate the hardware set to be used for each location and condition.
2. The Door and Frame Schedule and the Hardware Schedule shall be coordinated by the Contractor, shall be submitted simultaneously by the Contractor and the Contractor shall certify in writing that he has coordinated each door and frame location and condition with a specified hardware set.

3. The Door and Frame Schedule, the Hardware Schedule and the Door and Frame

D. Shop Drawings:

1. Shop drawings showing fabrication and installation of stainless steel doors, frames and louvers. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, location and installation requirements of door and frame hardware and reinforcements, and details of joints and connections. Show anchorage and accessory items. Show locations, elevations, sizes, and details for louvers.
2. Provide schedule of doors and frames using same reference numbers for details and openings as those on contract drawings.
3. Shop Drawings shall indicate the type, size and locations of reinforcements in the doors and in the frames and other reinforcements required for the installation and support of the hinges, closers, brackets and other door hardware.

E. Manufacturer's and Installer's qualifications and experience as required by the Quality Assurance requirements of this section.

F. A copy of the warranty for the doors and frames for the manufacture and installation of the stainless steel doors and frames.

1. Include a copy of the warranty for the manufacture and installation of hardware items included with this door and frame system.

1.08 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing custom steel doors and frames similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

B. Installer Qualifications: A firm experienced in installing custom steel doors and frames similar to those indicated for this Project and with a record of successful in-service performance, as well as approved by the manufacturer to install their units.

C. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252.

1. Test Pressure: Test at atmospheric pressure.
2. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies provide certification by a testing agency acceptable to authorities having jurisdiction that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
3. Temperature-Rise Rating: Where indicated, provide doors that have a temperature-rise rating of 450 deg F (250 deg C) maximum in 30 minutes of fire exposure.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames cardboard-wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to finish of factory-finished doors and frames.

B. Inspect doors and frames upon delivery for damage. Minor damages may be repaired provided refinished items are equal in all respects to new work and acceptable to the Authority; otherwise, remove and replace damaged items as directed.

C. Store doors and frames at building site under cover. Place units on minimum 4-inches high wood blocking. Avoid use of non-vented plastic or canvas shelters which could create humidity chamber. If cardboard wrapper on door becomes wet, remove carton

immediately. Provide 1/4-inches spaces between stacked doors to promote air circulation.

1.10 WARRANTY

A. The stainless steel doors and frames to be warrantied to be free from material or workmanship defects for a period of two (2) years from the date of substantial completion.

B. Defects of the door and frame include delamination, warpage, cracking, visible seams, separations, rust, pitting, dents, corrosion, and other defects.

C. Doors and frames that are defective within the warranty period to be repaired or replaced as directed and approved by the Authority and at no cost to the Authority.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering standard steel doors and frames which may be incorporated in the work include; but are not limited to, the following:

1. Stainless-Steel Doors and Frames:

a. Curries Company.
b. Emerson Engineering Co., Inc.
c. Fenestra Corporation.
d. Next Door Co.
e. Approved Equal.

2.02 MATERIALS

A. Stainless Steel for Frame, Sidelights and Door: ASTM A480, rollable temper steel, Type 316, non-directional satin finish to match approved sample.

B. Frame Reinforcement: ASTM A525 sheet steel with 1.25 oz/sq ft galvanized coating.

C. Supports and Anchors: Fabricate of not less than 16-gage stainless steel

D. Inserts, Bolts, and Fasteners: Manufacturer's standard units, stainless steel.

2.03 DOORS

A. Provide metal doors consisting of stainless steel face sheets each side, 16 gauge thickness each.

B. Provide flush design doors, 1-3/4" thick, seamless hollow construction, unless otherwise indicated.

C. For single-acting swing doors, bevel both vertical edges 1/8" in 2".

D. Construct doors with smooth, flush surfaces without visible joints or seams on exposed surfaces.

E. Core:

1. Metallic core construction: Steel-Stiffened Core: 0.026" stainless steel vertical stiffners extending full-door height, spaced not more than 6" o.c. and bonded to both face sheets using a continuous bead of epoxy. Epoxy supplied by or approved by the door manufacturer. Fill spaces between stiffners with insulation of minimum 0.6-lb/cu. Ft. density.
2. Nonmetallic Core Construction: Polystyrene Core, minimum 0.9-lb/cu.ft. Density with not less than 18-psi shear strength, rigid, foam polystyrene core board complying with ASTM C 578, Type I; laminate with waterproof adhesive to both door faces. Vertical stainless steel stiffners.

F. Reinforce tops and bottoms of doors with inverted 18 gauge horizontal stainless steel channels spot welded not more than 6" o.c. to outer sheets; webs of channels flush with the top or bottom of the door. Seal joints in top edge of door to provide a weather seal. Provide weep hole openings in the bottom of doors to permit escape of entrapped moisture.

2.04 PANELS

A. Provide panels of same material, construction, and finish as specified for doors.

2.05 FRAMES

A. Provide stainless steel frames for doors and louver transoms of types and styles as shown on drawings and schedules. Conceal fastenings, unless otherwise indicated.

B. Fabricate frames of minimum 14 gauge, Type 316 stainless steel with non-directional satin finish to match approved sample.

C. Fabricate frames of full welded construction, with corners mitered, reinforced, continuously welded full depth and width of frame.

D. Mullions and transom bars: Provide closed or tubular mullions and transom bars of same material and thickness as frame where indicated. Fasten mullions and transom bars at crossings and to jambs by butt welding. Reinforce joints between frame members with concealed clip angles or sleeves of same metal and thickness as frame.

E. Where installed in masonry, leave vertical mullions in frames open at top for grouting.

F. Jamb anchors: Furnish jamb anchors as required to secure frames to adjacent construction, formed of not less than 16 gauge stainless steel.

1. Masonry construction: Adjustable, flat, corrugated, or perforated, t-shaped to suit frame size, with leg not less than 2" wide by 10" long. Furnish at least three anchors per jamb up to 7'-6" height and four elsewhere.
2. Existing masonry or concrete construction: Expansion anchors, size as recommended by frame manufacturer.

G. Floor anchors: Provide floor anchors for each jamb and mullion which extends to floor, formed of not less than 14 gauge galvanized steel sheet, as follows:

1. Monolithic concrete slabs: Clip type anchors, with two holes to receive fasteners, welded to bottom of jambs and mullions.

H. Spreader bars: Provide removable spreader bar across bottom of frames, tack welded to jambs and mullions.

I. Door Silencers: Except on weatherstripped frames, drill stops to receive 3 silencers on strike jambs of single-door frames and 2 silencers on heads of double-door frames.

J. Plaster Guards: Provide minimum 26-gage stainless steel plaster guards or mortar boxes at back of hardware cutouts where mortar or other materials might obstruct hardware operation and to close off interior of openings.

K. Form fixed stops integral with frame, unless noted otherwise.

2.06 LOUVERS

A. Door Louvers: Provide sightproof and weatherproof stationary louvers for doors where indicated, 85 percent free area, flush style frame with tamperproof fasteners; constructed of inverted V blade or Z-shaped blades formed of 16-gauge roll formed stainless steel set into U-shaped stainless steel frame. Blades to be 1 3/8" wide and spaced not more than 2" o.c. Assemble units by welding. Louver assembly to be set into door as shown on shop drawings or into transom portion of stainless steel frame and secured with tamperproof fasteners.

B. Where shown or required, provide operable damper for louver. Louver to be operable manually or automatically by thermostat as indicated.

C. Fire-Rated Automatic Louvers: Louvers constructed with movable blades or damper closed by actuating fusible links at 150 degrees F and labeled and listed for use in fire-rated door assemblies of type and fire-resistance rating indicated by the same inspecting and testing agency who established fire-resistance rating of door assembly.

D. Provide insect screen and frame for exterior louvers. Install screen on interior side of louver frame, consisting of 18-by-14 mesh formed with 0.011" diameter stainless steel wire in rigid, formed stainless steel frame.

2.07 FABRICATION

A. Fabricate stainless steel door, sidelight and frame units to be rigid, neat in appearance and free from defects, warp or buckle. Wherever practicable, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory-

assembled before shipment, to assure proper assembly at project site. Comply with ANSI A250.4 requirements.

1. Clearances: Not more than 1/8 inch at jambs and heads except between non- fire-rated pairs of doors
   not more than 1/4 inch. Not more than 3/4 inch at bottom.
2. Tolerances: Comply with SDI 117 "Manufacturing Tolerances Standard Steel Doors and Frames."

B. Fabricate doors, panels, louvers, and frames from stainless steel. Close top and bottom edges of doors as integral part of door construction or by addition of stainless steel inverted channels. Fabricate concealed stiffners, reinforcement, edge channels, moldings from stainless steel.

C. For doors with metallic core construction, bond cores or stiffners to both face sheets using a continuous bead of epoxy. Epoxy to be supplied or approved by the door manufacturer. Epoxy shall be approved for three (3) hour fire rated doors. Provide polystyrene insulation between the stiffners. For doors with nonmetallic core construction, laminate core material to both door face sheets with waterproof adhesive.

D. Weld exposed joints continuously; grind, dress, and make smooth, flush, and invisible.

E. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat or oval heads for exposed screws and bolts.

F. Thermal-Rated (Insulating) Assemblies: Provide doors fabricated as thermal insulating door and frame assemblies and tested in accordance with ASTM C 236 or ASTM C 976 on fully operable door assemblies.

1. Unless otherwise indicated, provide thermal-rated assemblies with U factor of 0.41 Btu/(hr x sq ft x deg F.) or better.

G. Hardware Preparation: Prepare doors and frames to receive mortised and concealed hardware in accordance with final Door Hardware Schedule and templates provided by hardware supplier. Comply with applicable requirements of ANSI A 115 Series Specifications for door and frame preparation for hardware.

1. For concealed overhead door closers, provide space, cutouts, reinforcing and provisions for fastening in top rail of doors or head of frames, as applicable.

H. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at project site.

I. Locate hardware as indicated on final shop drawings or, if not indicated, in accordance with "Recommended Locations for Builder's Hardware on Standard Steel Doors and Frames," published by Door and Hardware Institute. Conform to ANSI A117.1 for positioning requirements for the handicapped.

J. Glass and Glazing: Reference Glazing section of these specifications.

2.08 STAINLESS-STEEL FINISHES

A. Remove tool and die marks and stretch lines or blend into finish.

1. Stainless steel shall be Type 316 non-directional satin finish, to match approved sample.

PART 3 - EXECUTION

3.01 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces. Touch up factory-applied finishes where spreaders are removed.

B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.02 INSTALLATION

A. General: Install standard steel doors, frames, and accessories in accordance with final shop drawings, manufacturer's data, DHI A115.IG, and as herein specified.

B. Placing Frames:

1. Except for frames located at existing concrete or masonry installations, place frames prior to construction of enclosing walls and ceilings. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders leaving surfaces smooth and undamaged.
2. In masonry construction, locate wall anchors adjacent to hinge locations on hinge jamb and at corresponding heights on strike jamb, minimum three per side.
3. At existing walls, secure frames to adjacent construction with bolt and anchorage devices.

C. Set frames in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces and spreaders leaving surfaces smooth and undamaged.

D. Shim frames as required with steel shims, insulate shim space.

E. In masonry construction, coordinate frame setting with the building of masonry walls. Remove spreader bars only after frames or bucks have been properly set and secured.

F. Door Installation: Fit stainless steel doors accurately in stainless steel frames, within clearances specified in ANSI A250.8.

G. Install fire-rated frames in accordance with NFPA Standard No. 80.

3.03 ADJUST AND CLEAN

A. Stainless-Steel Touchup: Immediately after erection, smooth any abraded areas of stainless steel and polish to match undamaged finish.

B. Final Adjustments: Check and readjust operating hardware items, leaving steel doors and frames undamaged and in complete and proper operating condition. Remove and

replace defective work, including doors or frames which are warped, bowed or otherwise unacceptable.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 08 13 00, Stainless Steel Doors and Frames shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 08 13 00, Stainless Steel Doors and Frames shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 08 31 13
ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes access doors and frames for walls and ceilings.

B. Related Requirements:

1. Section 05 42 00, Cold-Formed Metal Framing.
2. Section 07 72 00, Roof Accessories.
3. Section 09 21 00, Gypsum Board Assemblies.

1.03 SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, fire ratings, material descriptions, dimensions of individual components and profiles, and finishes.

B. Samples: For each type of access door and frame and for each finish specified, complete assembly minimum 6 by 6 inches in size.

C. Product Schedule: For access doors and frames. Use same designations indicated on Drawings.

D. Qualification Data: For manufacturer, installer, and testing and inspecting agency.

1. Fire-Rated Door Inspector: Submit documentation of compliance with NFPA 80, section 5.2.3.1.
2. Submit copy of DHI Fire and Egress Door Assembly Inspector (FDAI) certificate.

E. Record Documents: For fire-rated doors, list of applicable room name and number in which access door is located.

1.04 QUALITY ASSURANCE

A. Fire-Rated Door Inspector Qualifications: Inspector for field quality control inspections of fire-rated door assemblies shall meet the qualifications set forth in NFPA 80, section 5.2.3.1 and the following:

1. Door and Hardware Institute Fire and Egress Door Assembly Inspector (FDAI) certification.

B. Materials to be provided by a manufacturer continuously and regularly in business manufacturing access doors and frames of the type and scope similar to this project for a period of at least five (5) years.

C. Installation to be provided by a firm in the business of installing similar products for at least two (2) consecutive years.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect materials during delivery, storage, and handling to comply with manufacturer's directions and as required to prevent scratching and damage from effects of moisture, including condensation, as temperature changes, or direct exposure to sun and from other causes.

B. Deliver materials to site in manufacturer's original, unopened containers and packaging with labels clearly identifying product name, manufacturer, location of installation, type, size, and finish.

1.06 PROJECT CONDITIONS

A. Environmental conditions: Do not proceed with the installation when ambient and substrate temperature conditions are outside the manufacturer's limits, or when substrates are wet due to wet, rain, frost, condensation, or materials not cured or dry.

B. Verify all conditions for installation, locations, and dimensions in the field.

1.07 WARRANTY

A. Manufacturer and installer to warrant the materials and installation for a period of one (1) year after the date of substantial completion. If found defective, the work is to be repaired or replaced to the Authority's satisfaction and at no cost to the Authority.

1. Defects include loosening of the installation, sagging, failure of hardware, manufacturing defects, and defective finishes including fading, pitting, peeling, discoloring, or other deterioration.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Fire-Rated Access Doors and Frames: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection and temperature-rise limit ratings indicated, according to NFPA 252 or UL 10B.

1. Independent testing agency to be hired and paid for by the Contractor and approved by the Authority.

2.02 ACCESS DOORS AND FRAMES

A. Flush Access Doors with Exposed Flanges:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Acudor Products, Inc.
b. Babcock-Davis.
c. Cendrex Inc.
d. Elmdor/Stoneman Manufacturing Company; a division of Acorn Engineering Company.
e. JL Industries, Inc.; a division of the Activar Construction Products Group.
f. Karp Associates, Inc.
g. Lane-Aire Manufacturing Corp.
h. Larsens Manufacturing Company.
i. Maxam Metal Products Limited.
j. Metropolitan Door Industries Corp.
k. MIFAB, Inc.
l. Milcor; Commercial Products Group of Hart & Cooley, Inc.
m. Nystrom, Inc.
n. Williams Bros. Corporation of America (The).
o. Approved equal.

2. Description: Face of door flush with frame, with exposed flange and concealed hinge.
3. Locations: Wall, ceiling, or wall and ceiling.
4. Door Size: As shown on the drawings
5. Uncoated Steel Sheet for Door: Nominal 0.060 inch, 16 gage; thickness as shown on the drawings; factory primed or finished, as noted.
6. Metallic-Coated Steel Sheet for Door: Nominal 0.064 inch, 16 gage; thickness as shown on the drawings; factory primed or finished, as noted.
7. Stainless Steel Sheet for Door: Nominal 0.062 inch, 16 gage; thickness as shown on the drawings; ASTM A480 No. 4 finish.
8. Frame Material: Same material, thickness, and finish as door.

9. Latch and Lock: Cam latch, screwdriver operated; cam latch, key operated; cam latch, hex-head wrench operated; cam latch, pinned-hex-head wrench operated; cam latch, spanner-head wrench operated; latch bolt, knurled-knob operated or latch bolt, key operated, prepared for mortise cylinder as indicated on the drawings.

B. Flush Access Doors with Concealed Flanges:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. Acudor Products, Inc.
   b. Babcock-Davis.
   c. Cendrex Inc.
   d. Elmdor/Stoneman Manufacturing Company; a division of Acorn Engineering Company.
   e. JL Industries, Inc.; a division of the Activar Construction Products Group.
   f. Karp Associates, Inc.
   g. Lane-Aire Manufacturing Corp.
   h. Larsens Manufacturing Company.
   i. Maxam Metal Products Limited.
   j. Metropolitan Door Industries Corp.
   k. MIFAB, Inc.
   l. Milcor; Commercial Products Group of Hart & Cooley, Inc.
   m. Nystrom, Inc.
   n. Williams Bros. Corporation of America (The).
   o. Approved equal.

2. Description: Face of door flush with frame; with concealed flange for gypsum board or plaster installation and concealed hinge.
3. Locations: Wall, ceiling, or wall and ceiling.
4. Door Size: As shown on the drawings.
5. Uncoated Steel Sheet for Door: Nominal 0.060 inch, 16 gage; thickness as shown on the drawings; factory primed or finished, as noted.
6. Metallic-Coated Steel Sheet for Door: Nominal 0.064 inch, 16 gage; thickness as shown on the drawings; factory primed or finished, as noted.
7. Stainless Steel Sheet for Door: Nominal 0.062 inch, 16 gage; thickness as shown on the drawings; ASTM A480 No. 4 finish.
8. Frame Material: Same material and thickness as door.
9. Latch and Lock: Cam latch, screwdriver operated; cam latch, key operated; cam latch, hex-head wrench operated; cam latch, pinned-hex-head wrench operated; cam latch, spanner-head wrench operated; llatch bolt, knurled-knob operated; or latch bolt, key operated, prepared for mortise cylinder as indicated on the drawings.

C. Recessed Access Doors with Exposed Flanges:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Acudor Products, Inc.
    b. Babcock-Davis.
    c. Cendrex Inc.
    d. Elmdor/Stoneman Manufacturing Company; a division of Acorn Engineering Company.
    e. JL Industries, Inc.; a division of the Activar Construction Products Group.
    f. Karp Associates, Inc.
    g. Lane-Aire Manufacturing Corp.
    h. Larsens Manufacturing Company.
    i. Maxam Metal Products Limited.
    j. Metropolitan Door Industries Corp.
    k. MIFAB, Inc.
    l. Milcor; Commercial Products Group of Hart & Cooley, Inc.
    m. Nystrom, Inc.
    n. Williams Bros. Corporation of America (The).
    o. Approved equal.

2. Description: Door face recessed 1/2 inch, 5/8 inch, or 1 inch for gypsum board, plaster, or acoustical tile infill; as shown on the drawings; with exposed flange and concealed hinge.
3. Locations: Wall, ceiling, or wall and ceiling.
4. Door Size: As shown on the drawings,
5. Uncoated Steel Sheet for Door: Nominal 0.060 inch, 16 gage; thickness as shown on the drawings; factory primed or finished, as noted.
6. Metallic-Coated Steel Sheet for Door: Nominal 0.064 inch, 16 gage; thickness as shown on the drawings; factory primed or finished, as noted.
7. Stainless Steel Sheet for Door: Nominal 0.062 inch, 16 gage; thickness as shown on the drawings; ASTM A480 No. 4 finish.
8. Frame Material: Same material and thickness as door.
9. Latch and Lock: Cam latch, screwdriver operated; cam latch, key operated; cam latch, hex-head wrench operated; cam latch, pinned-hex-head wrench operated; cam latch, spanner-head wrench operated; latch bolt, knurled-knob operated; or latch bolt, key operated, prepared for mortise cylinder as indicated on the drawings.

D. Recessed Access Doors with Concealed Flanges:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Acudor Products, Inc.
b. Babcock-Davis.
c. Cendrex Inc.
d. Elmdor/Stoneman Manufacturing Company; a division of Acorn Engineering Company.
e. JL Industries, Inc.; a division of the Activar Construction Products Group.
f. Karp Associates, Inc.
g. Lane-Aire Manufacturing Corp.
h. Larsens Manufacturing Company.
i. Maxam Metal Products Limited.
j. Metropolitan Door Industries Corp.
k. MIFAB, Inc.
l. Milcor; Commercial Products Group of Hart & Cooley, Inc.
m. Nystrom, Inc.
n. Williams Bros. Corporation of America (The).
o. Approved equal.

2. Description: Door face recessed 1/2 inch, 5/8 inch, or 1 inch for gypsum board, plaster, or acoustical tile infill; as shown on the drawings; with concealed flange for gypsum board, plaster, or no bead for acoustical tile installation and concealed hinge.
3. Locations: Wall, ceiling, or wall and ceiling.
4. Door Size: As shown on the drawings.
5. Uncoated Steel Sheet for Door: Nominal 0.060 inch, 16 gage; thickness as shown on the drawings; factory primed or finished, as noted.
6. Metallic-Coated Steel Sheet for Door: Nominal 0.064 inch, 16 gage; thickness as shown on the drawings; factory primed or finished.
7. Stainless Steel Sheet for Door: Nominal 0.062 inch, 16 gage; thickness as shown on the drawings; ASTM A480 No. 4 or ASTM A480 No. 2b finish.
8. Latch and Lock: Cam latch, screwdriver operated; cam latch, key operated; cam latch, hex-head wrench operated; cam latch, pinned-hex-head wrench operated; cam latch, spanner-head wrench operated; latch bolt, knurled-knob operated; or latch bolt, key operated, prepared for mortise cylinder as indicated on the drawings.

E. Aluminum Flush Access Doors:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Acudor Products, Inc.
b. Cendrex Inc.
c. Lane-Aire Manufacturing Corp.
d. Metropolitan Door Industries Corp.
e. MIFAB, Inc.
f. Williams Bros. Corporation of America (The).
g. Approved equal.

2. Description: Face of door flush with frame, with exposed flange and concealed hinge.
3. Locations: Wall, ceiling, or wall and ceiling.
4. Door Size: As shown on the drawings
5. Aluminum Sheet for Door: Nominal 0.045 inch; thickness as shown on the drawings; with mill, or manufacturer's standard baked-enamel or powder-coat finish, as noted.
6. Frame Material: Same material, thickness, and finish as door.
7. Latch and Lock: Cam latch, screwdriver operated; cam latch, key operated; cam latch, hex-head wrench operated; cam latch, pinned-hex-head wrench operated; cam latch, spanner-head wrench operated; latch bolt, knurled-knob operated; or latch bolt, key operated, prepared for mortise cylinder as indicated on the drawings.

F. Lightweight Flush Access Doors:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Access Panel Solutions.
    b. Acudor Products, Inc.
    c. Babcock-Davis.
    d. Cendrex Inc.
    e. JL Industries, Inc.; a division of the Activar Construction Products Group.
    f. Karp Associates, Inc.
    g. Larsens Manufacturing Company.
    h. Maxam Metal Products Limited.
    i. Metropolitan Door Industries Corp.
    j. MIFAB, Inc.
    k. Nystrom, Inc.
    l. Williams Bros. Corporation of America (The).
    m. Approved equal.
2. Description: Face of door flush with exposed flange, with exposed piano hinge; frameless for surface installation.
3. Locations: Wall, ceiling, or wall and ceiling.
4. Door Size: As shown on the drawings
5. Uncoated Steel Sheet for Door: Nominal 0.018 inch, 26 gage; thickness as shown on the drawings; factory primed or finished, as noted.
6. Metallic-Coated Steel Sheet for Door: Nominal 0.022 inch; thickness as shown on the drawings; 26 gage, factory primed or finished, as noted.
7. Frame Material: Aluminum, nominal 0.045 inch, mill finish, as shown on the drawings.
8. Latch and Lock: Cam latch, screwdriver operated; cam latch, key operated; cam latch, hex-head wrench operated; cam latch, pinned-hex-head wrench operated; cam latch, spanner-head wrench operated; latch bolt, knurled-knob

operated; or latch bolt, key operated, prepared for mortise cylinder, as indicated on the drawings.

G. Exterior Flush Access Doors:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Babcock-Davis.
    b. JL Industries, Inc.; a division of the Activar Construction Products Group.
    c. Karp Associates, Inc.
    d. Larsens Manufacturing Company.
    e. Maxam Metal Products Limited.
    f. MIFAB, Inc.
    g. Nystrom, Inc.
    h. Williams Bros. Corporation of America (The).
    i. Approved equal.

2. Description: Weatherproof assembly, with face of door fit flush with frame and with exposed frame. Include extruded door gaskets and minimum 2-inch-thick fiberglass insulation.
3. Locations: Wall.
4. Door Size: As shown on the drawings
5. Metallic-Coated Steel Sheet for Door: Nominal 0.064 inch, 16 gage; thickness as shown on the drawings; factory primed or finished, as noted.
6. Aluminum Sheet for Door: Nominal 0.045 inch, with mill, or manufacturer's standard baked-enamel or powder-coat finish, as noted.
7. Stainless Steel Sheet for Door: Nominal 0.062 inch, 16 gage; thickness as shown on the drawings; ASTM A480 No. 4 or ASTM A480 No. 2b finish.
8. Frame Material: Same material, thickness, and finish as door, as shown on the drawings.
9. Latch and Lock: Cam latch operated by handle, without lock, with keyed lock in handle, with separate mortise lock, or with preparation for mortise lock as indicated on the drawings.

H. Interior Flush GFRG Access Doors with Concealed Flanges:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Acudor Products, Inc.
    b. Babcock-Davis.
    c. Cendrex Inc.
    d. Elmdor/Stoneman Manufacturing Company; a division of Acorn Engineering Company.

e. JL Industries, Inc.; a division of the Activar Construction Products Group.
f. MIFAB, Inc.
g. Milcor; Commercial Products Group of Hart & Cooley, Inc.
h. Williams Bros. Corporation of America (The).
i. Approved equal.

2. Description: Face of drop-in or concealed-hinge door flush with frame, with concealed flange for gypsum board installation.
3. Locations: Wall, ceiling, or wall and ceiling.
4. Door Size: As shown on the drawings.
5. Door Type Drop in, radius corner; drop in, square corner; concealed-hinge, radius corner; or concealed-hinge, square corner, as shown on the drawings.
6. Door and Frame Material: Unpainted glass-fiber-reinforced gypsum, with frames reinforced for hardware and fastenings.
7. Latch and Lock: Cam latch, screwdriver operated, cam latch, key operated, as indicated on Drawings, or as indicated in schedule.

I. Exterior Flush GFRC Access Doors with Concealed Flanges:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Acudor Products, Inc.
b. Cendrex Inc.
c. JL Industries, Inc.; a division of the Activar Construction Products Group.
d. Karp Associates, Inc.
e. MIFAB, Inc.
f. Milcor; Commercial Products Group of Hart & Cooley, Inc.
g. Williams Bros. Corporation of America (The).
h. Approved equal.

2. Description: Face of door flush with frame, neoprene gasketed, with concealed flange for gypsum board installation.
3. Locations: Wall, ceiling, or wall and ceiling.
4. Door Size: As shown on the drawings
5. Door Type: Drop in, radius corner; drop in, square corner; concealed-hinge, radius corner; or concealed-hinge, square corner; as shown on the drawings
6. Door and Frame Material: Unpainted glass-fiber-reinforced cement, with frames reinforced for hardware and fastenings.
7. Latch and Lock: Cam latch, screwdriver operated; cam latch, key operated; cam latch, hex-head wrench operated; or cam latch, pinned-hex-head wrench operated as indicated on the drawings.

2.03 FIRE-RATED ACCESS DOORS AND FRAMES

A. Fire-Rated, Flush Access Doors with Exposed Flanges:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. Acudor Products, Inc.
   b. Babcock-Davis.
   c. Cendrex Inc.
   d. Elmdor/Stoneman Manufacturing Company; a division of Acorn Engineering Company.
   e. JL Industries, Inc.; a division of the Activar Construction Products Group.
   f. Karp Associates, Inc.
   g. Lane-Aire Manufacturing Corp.
   h. Larsens Manufacturing Company.
   i. Maxam Metal Products Limited.
   j. Metropolitan Door Industries Corp.
   k. MIFAB, Inc.
   l. Milcor; Commercial Products Group of Hart & Cooley, Inc.
   m. Nystrom, Inc.
   n. Williams Bros. Corporation of America (The).
   o. Approved equal.

2. Description: Door face flush with frame, with a core of mineral-fiber insulation enclosed in sheet metal or uninsulated; with exposed flange, self-closing door, and concealed hinge.
3. Locations: Wall, ceiling, or wall and ceiling.
4. Door Size: As shown on the drawings.
5. Fire-Resistance Rating: Not less than that indicated, that of adjacent construction, 45 minutes, 1 hour, 1-1/2 hours, 2 hours, or 3 hours; as noted on the drawings.
6. Temperature-Rise Rating: 450 deg F or 250 deg F at the end of 30 minutes.
7. Uncoated Steel Sheet for Door: Nominal 0.036 inch, 20 gage; thickness as shown on the drawings; factory primed or finished.
8. Metallic-Coated Steel Sheet for Door: Nominal 0.040 inch, 20 gage; thickness as shown on the drawings; factory primed or finished.
9. Stainless Steel Sheet for Door: Nominal 0.038 inch, 20 gage; thickness as shown on the drawings; ASTM A480 No. 4 finish.
10. Frame Material: Same material, thickness, and finish as door.
11. Latch and Lock: Self-latching door hardware, operated by knurled-knob, operated by key, or prepared for mortise cylinder as indicated on the drawings.

B. Fire-Rated, Flush Access Doors with Concealed Flanges:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Acudor Products, Inc.
    b. Babcock-Davis.
    c. Cendrex Inc.
    d. JL Industries, Inc.; a division of the Activar Construction Products Group.
    e. Karp Associates, Inc.
    f. Maxam Metal Products Limited.
    g. Metropolitan Door Industries Corp.
    h. MIFAB, Inc.
    i. Nystrom, Inc.
    j. Williams Bros. Corporation of America (The).
    k. Approved equal.

2. Description: Door face flush with frame, with a core of mineral-fiber insulation enclosed in sheet metal or uninsulated; with concealed flange for gypsum board or plaster installation, self-closing door, and concealed hinge.
3. Locations: Wall, ceiling, or wall and ceiling.
4. Door Size: As shown on the drawings.
5. Fire-Resistance Rating: Not less than that indicated, that of adjacent construction, 45 minutes, 1 hour, 1-1/2 hours, 2 hours, or 3 hours; as noted on the drawings.
6. Temperature-Rise Rating: 450 deg F or 250 deg F at the end of 30 minutes.
7. Uncoated Steel Sheet for Door: Nominal 0.036 inch, 20 gage; thickness as shown on the drawings; factory primed or finished.
8. Metallic-Coated Steel Sheet for Door: Nominal 0.040 inch, 20 gage; thickness as shown on the drawings; factory primed or finished.
9. Stainless Steel Sheet for Door: Nominal 0.038 inch, 20 gage; thickness as shown on the drawings; ASTM A480 No. 4 finish.
10. Frame Material: Same material, thickness, and finish as door.
11. Latch and Lock: Self-closing, self-latching door hardware, operated by knurled- knob, operated by key, or prepared for mortise cylinder as indicated on the drawings.

2.04 MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A36.

B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A879, with cold-rolled steel sheet substrate complying with ASTM A1008, Commercial Steel (CS), exposed.

C. Metallic-Coated Steel Sheet: ASTM A653, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating, as noted.

D. Stainless Steel Sheet, Strip, Plate, and Flat Bars: ASTM A666, Type 304 or Type 316. Remove tool and die marks and stretch lines, or blend into finish.

E. Aluminum Extrusions: ASTM B221, Alloy 6063.

F. Aluminum Sheet: ASTM B209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

G. Frame Anchors: Same material as door face.

H. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A153 or ASTM F2329.

2.05 FABRICATION

A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish mounting holes, attachment devices and fasteners of type required to secure access doors to types of supports indicated.

1. For concealed flanges with drywall bead, provide edge trim for gypsum panels securely attached to perimeter of frames.
2. For concealed flanges with plaster bead for full-bed plaster applications, provide zinc-coated expanded-metal lath and exposed casing bead welded to perimeter of frames.

D. Recessed Access Doors: Form face of panel to provide recess for application of applied finish. Reinforce panel as required to prevent buckling. Provide access sleeves for each latch operator and install in holes cut through finish.

1. For recessed doors with plaster infill, provide self-furring expanded-metal lath attached to door panel.

E. Latch and Lock Hardware:

1. Quantity: Furnish number of latches and locks required to hold doors tightly closed.
2. Keys: Furnish two keys per lock and key all locks alike.
3. Mortise Cylinder Preparation: Where indicated, prepare door panel to accept cylinder specified in Section 08 71 00 "Door Hardware."

F. Aluminum: After fabrication, apply manufacturer's standard protective coating on aluminum that will come in contact with concrete.

2.06 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Authorityural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Painted Finishes: Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

1. Factory Primed: Apply manufacturer's standard, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.
2. Factory Finished: Apply manufacturer's standard baked-enamel or powder-coat finish immediately after cleaning and pretreating, with minimum dry-film thickness of 1 mil for topcoat.

a. Color: As indicated by manufacturer's designations, match Authority's sample or as selected by Authority from full range of industry colors.

E. Stainless Steel Finishes:

1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
2. Polished Finish: ASTM A480 No. 4 finish. Grind and polish surfaces to produce uniform finish, free of cross scratches.

a. Run grain of directional finishes with long dimension of each piece.
b. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

3. Bright, Cold-Rolled, Unpolished Finish: ASTM A480 No. 2B.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. Field verify all locations, dimensions, and conditions.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

B. Use approved fasteners and hardware for installation.

C. Installation to be tight to the substrate and secure. Joints to be minimal, tight, straight, and even. Where required, joints to be water tight.

D. Install doors and frames plumb, true in alignment and flush with substrate.

E. Protect against galvanic action. Avoid contact between dissimilar metals, including fasteners, or provide protection between dissimilar metals.

3.03 FIELD QUALITY CONTROL

A. Inspection Agency: Contractor to hire and pay for a qualified inspector to perform inspections and to furnish reports to the Authority.

B. Inspections:

1. Fire-Rated Door Inspections: Inspect each fire-rated access door in accordance with NFPA 80, section 5.2.

C. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.

D. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.

E. Prepare and submit separate inspection report for each fire-rated access door indicating compliance with each item listed in NFPA 80 and NFPA 101.

3.04 ADJUSTING AND CLEANING

A. Adjust doors and hardware, after installation, for proper operation.

B. Clean surface finishes of dirt, dust, and smudge marks.

C. Touch up minor scratches or nicks to finishes.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 08 31 13, Access Doors and Frames shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 08 31 13, Access Doors and Frames shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 08 31 13.S
ACCESS PANELS AND FRAMES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes floor access panels (doors) and frames.

B. Related Requirements:

1. Section 03 30 00, “Cast-In-Place Concrete”.
2. Section 05 50 00, “Metal Fabrications”.
3. Section 09 60 10.S, “Stone Flooring and Trim”.

1.03 SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, fire ratings, material descriptions, dimensions of individual components and profiles, and finishes.

B. Samples: For each type of access door and frame and for each finish specified, complete assembly minimum 6 by 6 inches in size.

C. Product Schedule: For access doors and frames. Use same designations indicated on Drawings.

D. Qualification Data: For manufacturer, installer, and testing and inspecting agency.

1.04 QUALITY ASSURANCE

A. Materials to be provided by a manufacturer continuously and regularly in business manufacturing access doors and frames of the type and scope similar to this project for a period of at least five (5) years.

B. Installation to be provided by a firm in the business of installing similar products for at least two (2) consecutive years.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect materials during delivery, storage, and handling to comply with manufacturer's directions and as required to prevent scratching and damage from effects of moisture, including condensation, as temperature changes, or direct exposure to sun and from other causes.

B. Deliver materials to site in manufacturer's original, unopened containers and packaging with labels clearly identifying product name, manufacturer, location of installation, type, size, and finish.

1.06 PROJECT CONDITIONS

A. Environmental conditions: Do not proceed with the installation when ambient and substrate temperature conditions are outside the manufacturer's limits, or when substrates are wet due to wet, rain, frost, condensation, or materials not cured or dry.

B. Verify all conditions for installation, locations, and dimensions in the field.

1.07 WARRANTY

A. Manufacturer and installer to warrant the materials and installation for a period of one (5) years after the date of substantial completion. If found defective, the work is to be repaired or replaced to the Authority's satisfaction and at no cost to the Authority.

1. Defects include loosening of the installation, sagging, failure of hardware, manufacturing defects, and defective finishes including fading, pitting, peeling, discoloring, or other deterioration.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

2.02 ACCESS DOORS AND FRAMES

A. Recessed Access Doors with Exposed Flanges:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Acudor Products, Inc.
b. Babcock-Davis.
c. Cendrex Inc.
d. Elmdor/Stoneman Manufacturing Company; a division of Acorn Engineering Company.
e. JL Industries, Inc.; a division of the Activar Construction Products Group.
f. Karp Associates, Inc.
g. Lane-Aire Manufacturing Corp.
h. Larsens Manufacturing Company.

i. Maxam Metal Products Limited.
j. Metropolitan Door Industries Corp.
k. MIFAB, Inc.
l. Milcor; Commercial Products Group of Hart & Cooley, Inc.
m. Nystrom, Inc.
n. Williams Bros. Corporation of America (The).
o. Approved equal.

2. Description: Door face recessed 1 1/2 inch deep net minimum above door panel, for stone paver infill; as shown on the drawings; with exposed flange and concealed hinge.
3. Locations: Cast-in-place concrete floors.
4. Door Size: As shown on the drawings,
5. Stainless Steel Sheet for Door: Nominal 10 gage minimum.
6. Frame Material: Angle style framing; stainless steel; min. ¼" flange thickness; with shop fabricated anchoring devices suitable for placement in concrete.
7. Frame edges, exposed: Square edges, flush with finished infill.
8. Latch and Lock: Cam latch, key operated; prepared for mortise cylinder as indicated on the drawings.
9. Hold Open: Stainless steel automatic hold open arm with safety color rubber grip. Hold open springs to be stainless steel.
10. Hinge: Continuous piano style hinge; stainless.

2.03 MATERIALS

A. Stainless Steel Sheet, Strip, Plate, and Flat Bars: ASTM A666, Type 316. Remove tool and die marks and stretch lines, or blend into finish.

B. Frame Anchors: Same material as door face.

C. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A153 or ASTM F2329.

2.04 FABRICATION

A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish mounting holes, attachment devices and fasteners of type required to secure access doors to types of supports indicated.

D. Recessed Access Doors: Form face of panel to provide recess for application of applied finish. Reinforce panel as required to prevent buckling. Provide access sleeves for each latch operator and install in holes cut through finish.

1. For recessed doors with stone paver infill, provide door panel of sufficient

strength for weight of infill.

2. Provide expanded steel mesh, 1/8” deformed, welded on panel face for mortar lock surface.

E. Latch and Lock Hardware:

1. Quantity: Furnish number of latches and locks required to hold doors tightly closed.
2. Keys: Furnish two keys per lock and key all locks alike.
3. Mortise Cylinder Preparation: Where indicated, prepare door panel to accept cylinder specified in Section 08 71 00 "Door Hardware."

2.05 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Stainless Steel Finishes:

1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
2. Polished Finish: ASTM A480 No. 4 finish. Grind and polish surfaces to produce uniform finish, free of cross scratches.

a. Run grain of directional finishes with long dimension of each piece.
b. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

3. Bright, Cold-Rolled, Unpolished Finish: ASTM A480 No. 2B.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Coordinate frame depth and placement depth in concrete slabs.
B. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. Field verify all locations, dimensions, and conditions.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

B. Use approved fasteners and hardware for installation.

C. Installation to be tight to the substrate and secure. Joints to be minimal, tight, straight, and even. Where required, joints to be water tight.

D. Install doors and frames plumb, true in alignment and flush with substrate.

E. Protect against galvanic action. Avoid contact between dissimilar metals, including fasteners, or provide protection between dissimilar metals.

3.03 FIELD QUALITY CONTROL

A. Inspection Agency: Contractor to hire and pay for a qualified inspector to perform inspections and to furnish reports to the Authority.

B. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.

C. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.

3.04 ADJUSTING AND CLEANING

A. Adjust doors and hardware, after installation, for proper operation.

B. Clean surface finishes of dirt, dust, and smudge marks.

C. Touch up minor scratches or nicks to finishes.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of ACCESS PANELS AND FRAMES shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of ACCESS PANELS AND FRAMES shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000.

END OF SECTION

SECTION 08 44 33
CANOPY SLOPED GLAZING ASSEMBLY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this section.

1.02 SUMMARY

A. Work Included: Work under this section is the sole single source responsibility of the Specialty Contractor and consists of furnishing everything necessary for and incidental to the execution and completion of the Canopy Sloped Glazing Assembly as shown on the Drawings, including all AESS structural steel supporting these glazing assemblies, and including, but not limited to the following custom fabricated elements considered an integral part of the canopy and enclosure systems: custom snow guards, façade access system mounting structures, gutters and related custom downspouts, membranes, flashings, gratings, and maintenance access catwalks.

B. Single Source Responsibility: The entire scope described being engineered, fabricated, and installed by an approved Specialty Contractor with all design elements submitted in one comprehensive shop drawing submittal, stamped and signed by a structural engineer Licensed in the State of Illinois, including shop drawings and structural calculations as required for the contractor to procure required permits. The complete system shall be purchased from one approved Specialty Contractor as a single source as listed in this specification and the splitting of any components (including but not limited to the Canopy Sloped Glazing Assembly and AESS steel) is not allowed under this contract.

C. Related Requirements:

1. Section 01 43 41, Special Mockups.
2. Section 05 12 50, Architecturally Exposed Structural Steel (AESS).
3. Section 08 80 00, Glass and Glazing.

1.03 REFERENCES

A. American Architectural Manufacturers Association (AAMA): AAMA 2605, “Superior Performing Organic Coatings on Aluminum Extrusions and Panels".

B. American Welding Society (AWS): AWS D1.1 “Structural Welding Code, Steel", and AWS D1.2 “Structural Welding Code, Aluminum".

C. Standard for Safety Glazing: Federal Standard 16 CFR 1201, Consumer Product Safety Commission (CPSC) “Safety Standard for Architectural Glazing Materials", as published in the Code of Federal Regulations (CFR).

D. National Association of Architectural Metal Manufacturers (NAAMM): “Metal Finishes Manual".

1.04 SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Submit Shop Drawings and structural calculations for the fabrication and installation of all the components of the work signed and sealed by a licensed State of Illinois Structural Engineer stating compliance with all specified requirements and design criteria for this specific installation. Show dimensions, profiles, anchors, attachments to substrates, joint system, expansion provisions and other components including but not limited to those listed under Summary, as required to provide a complete system.

1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
2. Include full-size isometric details of each intersection of sloped glazing assemblies to adjacent work, showing the following.

    a. Joinery, including concealed welds.
    b. Anchorage.
    c. Expansion provisions.
    d. Glazing.
    e. Flashing and drainage.

3. Show connection to and continuity with adjacent thermal, weather, air and water barriers.
4. Installation Drawings: After approval of shop drawings, provide a detailed set of field installation drawings and a written installation procedure. Identify each part in sequence with unique identifier system, indicated in drawings and on part to be installed in field.

C. Samples for Verification: Label samples to indicate product, characteristics, and locations in the Work. Samples will be reviewed for color and appearance only. Compliance with all other requirements is the exclusive responsibility of the Contractor. Furnish samples for each finish and color required. Furnish sample finishes on the required metal, in 12 inch lengths of extrusion or 12 inch squares of sheet or plate, showing maximum range or variation in color and shade, and matching the Commissioner's sample.

D. Delegated Design Submittal: For Canopy Sloped Glazing Assembly to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified structural engineer licensed in the State of Illinois, responsible for their preparation.

E. Certification: Submit written certifications, signed by manufacturer, attesting that system conforms to each of the “Quality Assurance” requirements and “Performance Requirements” of this Specification section where the manufacturer’s standard system has been tested in accordance with specified tests and meets performance requirements specified. Where such testing has not been accomplished, perform required tests through a recognized testing laboratory or agency and provide certified test results.

F. Qualification Data: For Installer and field testing agency.

G. Test Reports: For Sloped Glazing Assembly, for tests performed by a qualified testing agency.

H. Quality-Control Program: Developed specifically for Project, including fabrication and installation. Include periodic quality-control reports.

I. Closeout Submittals: Submit for Owner's documentation.

1. Warranties: Furnish specified warranties.
2. Maintenance Data: Furnish complete manuals describing the materials, devices, and procedures to be followed in cleaning and maintaining the Work. Include manufacturers' brochures and parts lists describing the actual materials used in the Work, including metal alloys, finishes, glass, sealants, hardware and other major components. Assemble manuals for component parts into single binders identified for each system.
3. Maintenance Instruction: Instruct Owner's personnel who will be responsible for window washing after the time of final acceptance. Demonstrate and train Owner's personnel, for a period not less than 2 working days, in the proper methods of cleaning and maintaining the entire sloped glazing assembly.

1.05 QUALITY ASSURANCE

A. Specialty Contractor's Quality Control Responsibilities: Specialty Contractor is solely responsible for quality control of the Work.

B. Specialty Contractor Qualifications:

1. Specialty Contractor shall provide in-house services to include design, engineering, fabrication and installation for scope of work specified in this section.
2 General Contractor shall contract this Work directly from one of the listed acceptable Specialty Contractors. Contracting through an intermediary is not acceptable. The Work shall be tendered by, contracted for and managed directly by the Specialty Contractor. Tenders or project management by a sales agent, intermediary, glazing contractor, agent or distributor of the Specialty Contractor is not acceptable.
3. Bidding: Only preapproved listed acceptable Specialty Contractors, or other companies demonstrating equivalence in every aspect of these Contract Documents, shall be allowed to bid the Work. The Specialty Contractor bidding for the work must submit proposed details, preliminary engineering analysis confirming proposed sizes of glass and structural members and all loading reactions to the perimeter structure adjacent to this scope of work.
4. Equivalence Requirements: To be considered for acceptance, Specialty Contractors not listed under Article 2.01.A, shall provide proof of relevant equal experience no later than ten (10) days prior bid. Provide a list of a minimum of five (5) projects completed within the last five (5) years, using the specified systems or equivalent. Projects must demonstrate the project delivery under a single contract including design, engineering, fabrication and installation. Each contract must have a minimum contract value of $25 million. For each project, provide photographs to illustrate detail characteristics and complexity of installations.
5. Commissioner’s determination to allow approved equal Specialty Contractors to bid shall be final. All approvals shall be made in writing and evidence shall be provided via addenda prior to bid.
6. Specialty Contractor shall comply with the Federal Transit Administration’s Buy America requirements. Refer to Book 1 for additional details.

C. Testing Agency Qualifications: Qualified according to ASTM E699 for testing indicated.

D. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assembly. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.

1. Do not change intended aesthetic effects, as judged solely by Commissioner, except with Commissioner's approval. If changes are proposed, submit comprehensive explanatory data to Commissioner for review.

E. Mockups: Build mockups to verify selections made under sample and based on drawing submittals to demonstrate aesthetic effects and set quality standards for fabrication and installation. Also refer to 01 43 41, Special Mockups.

1. Build mockup of areas indicated on Drawings, or as directed by Authority.
2. Each area indicated on Drawings requires one (1) complete mockup for Commissioner review. Each mockup is to be installed onsite. Alternatively, the mockups may be installed at an offsite location if contractor includes travel expenses as outlined below.
3. Include travel expenses for four Commissioner Representatives to visit and review offsite mockups. Assume two site reviews per off-site mockup.
4. Contractor is responsible for the design and fabrication of any temporary supports for mockups.
5. Each mockup is to include all components and systems representative of the final assembly conditions.
6. Allow for a minimum of 8 finish color options at exterior exposed face of the “Compensating Extrusions” during the mockup review process, as noted on Drawings. All other surfaces of extrusions finished to match PT-2.
7. Contractor is responsible for trade coordination to provide a complete mockup.
8. Testing shall be performed on mockups according to the requirements set forth herein.
9. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless the Authority specifically approves such deviations in writing.

F. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals from all such authorities.

G. Specialty Contractor and General Contractor shall assume joint responsibility for coordination of Specialty Contractors work with the work of adjacent trades.

1.06 DELIVERY, STORAGE, AND HANDLING

A. General: Deliver fabricated units and component parts to project site completely identified in accordance with erection diagrams. Store in dry protected location off ground in accordance with manufacturer's instructions. Protect from damage, including from weather and construction activities.

1.07 WARRANTY

A. General Warranty by both General Contractor and Specialty Contractor: Manufacturer agrees to repair or replace components of sloped glazing assembly that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including, but not limited to, excessive deflection.
b. Noise or vibration created by wind and thermal and structural movements.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

d. Sealant failures.
d. Water penetration through fixed glazing and framing areas.
f. Glass cracking or breakage.
e. Loosening or weakening of fasteners, attachments and other components.

2. Warranty Period: Ten years from the date of substantial completion.
3. Provide contact information for Specialty Contractor.

B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Warranty Period: Twenty years from date of Substantial Completion.
3. Provide contact information for Specialty Contractor.

PART 2 - PRODUCTS

2.01 SPECIALTY CONTRACTOR

A. Acceptable Specialty Contractors:

1. Gartner / Permasteelisa North America Corp.
2. Novum Structures
3. Seele
4. Enclos
5. Approved equal as defined under Article 1.05 B.

2.02 PERFORMANCE AND DESIGN CRITERIA

A. General Performance: Comply with performance requirements specified, as determined by testing of Sloped Glazing Assembly representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Sloped glazing assemblies shall withstand movements of supporting structure including, but not limited to, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
2. Failure also includes the following.

a. Thermal stresses transferring to building structure.
b. Glass cracking or breakage.
c. Noise or vibration created by wind and thermal and structural movements.
d. Loosening or weakening of fasteners, attachments, and other components.

B. Deflections: At design wind pressures Sloped Glazing Assembly component members and their connections are to withstand, within acceptable deflection limitations specified, their

own weight, and the weight of the glass. Assemblies shall not deflect under loads sufficient to cause noise, breaking of glass, adhesive or sealant to cause components to touch other components which they are not designed to contact. Base calculations for such deflections upon the combination of maximum direct loadings, building deflections, thermal stresses, and erection tolerances. Do not permit any permanent deflections in the Work.

1. In a direction, perpendicular to the plane of the glass, 1/175 of the clear span of the component part, or 3/4 inch, whichever is less.
2. In a direction, parallel to the plane of the glass, 1/360 of clear span of the component part, or 1/8 inch, whichever is less. Amount not to exceed that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components to less than 1/8 inch.

C. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes.

1. 120 deg. F ambient; 180 deg. F, material surfaces.
2. Thermal Cycling: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.

D. Water Penetration: Leakage of water is defined as the appearance of uncontrolled water, other than condensation, on any interior part of the glazing assemblies at 20 percent of the design wind load or 720 Pa, whichever is greater.

2.02 MATERIALS

A. Glazing: Comply with Section 08 80 00 Glass and Glazing

B. Aluminum Extrusions: ASTM B221/B221M. Shapes and thickness as required to fulfill performance requirements, but not less than 1/8 inch thick unless otherwise shown. 6063, or alloy and temper as recommended by the manufacturer for strength, corrosion resistance, and application of required finish and control of color.

B. Aluminum Sheet: ASTM B209/B209M. Thickness as required to fulfill performance requirements, but not less than 0.125 inch. for formed members and flat panels and 0.040 inch for formed stops. 5005-H16, or alloy and temper as recommended by manufacturer.

C. Stainless Steel: Provide Type 316, and low carbon Type 316L for components to be welded, unless otherwise noted.

1. Stainless Steel Plate and Sheet: ASTM A666.
2. Stainless Steel Bars and Shapes: ASTM A276.
3. Stainless Steel Welded Tubing: ASTM A554.

2.03 FASTENERS AND CONNECTIONS

A. Do not use exposed fasteners. Fasteners, anchors, and connection devices are to be concealed from view to greatest extent possible.

B. Tamper resistant fasteners are to be used where within reach of public.

C. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.

D. Stainless Steel Fasteners: Stainless steel type 300 series, selected to prevent galvanic action with the components fastened. Where exposed in finished surfaces, use oval-head countersunk Phillips heads with finish and color to match adjacent surfaces. Do not use self-tapping or self-drilling screws.

E. Steel Angles, Plates, Bars, Rods and Accessories: Provide as required to join or reinforce assemblies of aluminum components. ASTM A36/A36M and ASTM A123/A123M, hot-dip galvanized, or, if galvanizing is not compatible with alloy of component parts, shop coated with epoxy paint in minimum 2.0 mil dry film thickness after cutting to size.

F. Aluminum Angles, Plates, Bars, and Accessories: As required to join or reinforce assemblies of aluminum components. Alloys recommended by manufacturer or fabricator to develop required strength of assemblies.

D. Sealants and Gaskets: Provide sealants and gaskets in the fabrication, assembly and installation of the Work, which are recommended by the manufacturer.

2.04 FABRICATION

A. Workmanship: Fabricate the Work to the design and dimensions shown. Take field measurements where coordination with adjoining work is necessary. Form components straight and true, corners square, joints coped or mitered and in proper alignment. Make exposed surfaces free from visible seams, warp, wave, buckle, oil-canning, pillowing, or other irregularities in appearance. Carefully fit and match all Work with continuity of line and design. Rigidly secure joints with hairline contact, unless otherwise indicated. Reinforce members and joints with steel plates, bars, rods or angles for rigidity and strength as needed to fulfill performance requirements. Complete the welding cutting, drilling and fitting of joints prior to the application of finishes. Fit and assemble all Work in the shop insofar as practicable. Mark and disassemble units which are too large for shipment to project site, retaining units in sizes as large as possible for shipment and erection.

B. Welding: Use electrodes and methods recommended by manufacturer of material being welded, and in accordance with applicable AWS standards. Use only methods which prevent distortion and discoloration of exposed faces. Grind weld areas smooth, using only clean equipment and materials free of iron or iron compounds. Restore finish of component parts after welding and grinding.

C. Fastenings: Conceal all fastenings unless otherwise indicated. Use concealed stainless steel fasteners for jointing which cannot be welded.

D. Dissimilar Materials: Separate dissimilar materials with a heavy coating of epoxy paint in minimum 2.0 mil dry film thickness or other suitable permanent separation as required to prevent galvanic action.

E. Flashings and Trim: Provide closures, corners, flashings, caps, edge and joint covers, sill members, and similar items as indicated on the Drawings or otherwise required for complete installation. Fabricate of material and finish to match the adjacent components.

F. Copings: Provide copings of shapes, sizes and profiles as shown. Provide units with mitered, one-piece corners units and transitions. Provide units of sizes as shown or as required, complete with non-corrosive fasteners, hold-down clips, reinforcements and concealed joint plates with internal gutters at each joint to catch water infiltration and

conduct it safely to the exterior; do not rely exclusively on sealant joints to prevent water entry in the wall system. Provide units of 3mm minimum thickness.

1. Provide copings and accessories capable of being used by personnel from roof access or from scaffolding capable of supporting a minimum additional concentrated live loading of 300 lbs. or a uniform load of 100 lb./sq. ft. (whichever is greater) without permanent deflection, deformation or leakage of air or water in to conditioned spaces. Include stiffeners and supports as required for strength and rigidity. Include brackets, plates and straps in the assemblies for support of contiguous work.
2. Provide copings with 12 inch minimum sleeves with connections to allow for thermal expansion.
3. Fabricate copings, related parapets and upstands to allow for a coordinated installation of contiguous materials including roofing and setback roofing assemblies.
4. Coping assemblies shall be designed fabricated and installed to comply with applicable specified performance criteria including resistance to wind uplift.

G. Aluminum Panels: Fabricate in profiles, face dimensions and patterns as indicated, minimum 3/16-inch thick aluminum plate rigidized with concealed aluminum stiffeners as required to prevent oil-canning or other visible distress. Finish panels to match exterior curtain wall finish.

H. Protective Coatings or Coverings: Temporary coating and coverings may be furnished at manufacturer's or Contractor's option to protect the Work during shipment and construction. Such protection shall avoid development of non-uniformity in finishes, shall not impart a residue which would adversely affect the adhesion of sealants, nor cause other deleterious effects in the Work. Temporarily remove such protection when requested by Commissioner for inspection of finishes, and completely remove protection when no longer required.

2.05 ALUMINUM FINISHES

A. PVDF Finish Coating: (Three-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coatings; Organic Coating: manufacturer's standard three-coat, thermocured system consisting of specially formulated inhibitive primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2605 and with coating and resin manufacturers' written instructions.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine the areas to receive the Work and the conditions under which the Work would be performed. Remedy conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. General: Provide in accordance with the manufacturer's printed instructions and recommendations. Coordinate installation with the Work of other trades. Provide inserts and other anchorage devices at the proper time to avoid delays. Install the Work level,

plumb, and true to line, with uniform joints. Support on shims and secure in place by bolting to clip angles and similar supports anchored to supporting structure. Use only the types of equipment, wedges, spacers, shims and other items during installation which will not corrode nor stain or mar the finish surfaces.

B. Fitting: Cut and trim component parts during installation only with the approval of the manufacturer and in accordance with his recommendations. Restore finishes completely to protect the material and remove evidence of cutting or trimming. Remove and replace members where cutting and trimming has impaired strength or appearance. Do not cut through reinforcing members.

C. Welding: Use electrodes and methods recommended by manufacturer of material being welded, and in accordance with applicable AWS standards. Use only methods which prevent distortion and discoloration of exposed faces. Grind exposed welds smooth, using only clean equipment and materials free of iron or iron compounds. Restore finish of component parts after welding and grinding.

D. Protective Coating: Paint the contact surfaces of dissimilar materials including metal in contact with masonry or concrete work, with a heavy coating of epoxy paint in minimum 2.0 mil dry film thickness, or provide other suitable permanent separation as required to prevent galvanic action. Paint steel clip angles, and other ferrous metal parts which will be concealed, using epoxy paint in minimum 2.0 mil dry film thickness.

E. Damaged Components: Do not erect members which are warped, bowed, deformed, or otherwise damaged or defaced to such extent as to impair strength or appearance. Remove and replace members which have been damaged.

F. Erection Tolerances:

1. Variations from Plumb or Indicated Angle: ±1/8-inch maximum variation in story height or 10 feet run, noncumulative.
2. Variations from Level or Indicated Slope: ±1/8-inch maximum variation in any column-to-column space or 10 feet run, noncumulative.
3. Variations from Position in Plan or Elevation: Variations from theoretical calculated position as located in plan or elevation in relation to established floor lines, column lines and other fixed elements of the structure, including variations from plumb, level, straight, and member size.

    a. 1/8-inch maximum variation in any column-to-column space, or floor-to-floor height, or 10 feet.
    b. 3/8-inch maximum total variation at any location.

4. Offsets in End-to-End or Edge-to-Edge Alignment of Consecutive Members: 1/16-inch maximum offset in any alignment.

3.03 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Field Quality Control Testing: Perform the following test on final installed Work:

1. Water-Spray Test: Areas (minimum two areas) designated by the Commissioner shall be tested according to AAMA 501.2 and shall not evidence water penetration.
2. Canopy Sloped Glazing Assembly will be considered defective if they do not pass tests and inspections.

3. Prepare test and inspection reports.
4. Repair or remove work if test results and inspections indicate that it does not comply with specified requirements.

3.04 PROTECTION AND CLEANING

A. Protect exposed work from damage by construction. Use temporary coatings or films only if totally removable without damage to finish. Remove protection and clean metal and glass surfaces immediately before acceptance of building.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 08 44 33, Canopy Sloped Glazing Assembly shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 08 44 33, Canopy Sloped Glazing Assembly shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 08 71 00
DOOR HARDWARE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions and Division 1 Specification sections, apply to this section.

1.02 SUMMARY

A. Definition: "Door Hardware" includes items known commercially as finish hardware which are required for swing, sliding and folding doors, except special types of unique and
non-matching hardware specified in the same section as the door and door frame.

B. Extent of door hardware required is indicated on drawings and in schedules.

C. Types of door hardware required include, but may not be limited to, the following:

1. Hinges, Continuous Hinges.
2. Lock cylinders and keys
3. Lock and latch sets
4. Bolts
5. Closers and other door control devices.
6. Overhead holders
7. Exit door hardware.
8. Door trim units
9. Protection plates
10. Weatherstripping for doors
11. Thresholds
12. Stops
13. Astragals or meeting seals on pairs of doors.
14. Automatic door hardware.
15. Actuators and Bollards
16. Lock Guard
17. Alarmed exit device.

D. Related Sections: The following sections contain requirements that relate to this Section.

1. Section, 05 50 10 Barriers, High Barriers, Gates
2. Section, 08 13 00 Stainless Steel Doors and Frames
3. Section, 13 06 00 Customer Assistance Kiosk
4. Division 26 Sections, Electrical

1.03 REFERENCES

A. AAA DM – American Association of Automatic Door Manufacturers.

B. AAMA 701/702 – Combined Voluntary Specifications for Pile Weatherstripping and

Replaceable Fenestration Weatherseals, American Architectural Manufacturers Association.

C. ANSI A117.1 – Accessible and Usable Buildings and Facilities.

D. ANSI A156.1 (BHMA 101) - Butts and Hinges.

E. ANSI A156.2 (BHMA 601) - Bored and Preassembled Locks and Latches.

F. ANSI A156.3 (BHMA 701) - Exit Devices.

G. ANSI A156.4 (BHMA 301) - Door Controls-Closers.

H. ANSI A156.5 (BHMA 501) - Auxiliary Locks and Associated Products.

I. ANSI A156.6 (BHMA 1001) - Architectural Door Trim.

J. ANSI A156.7 - Template Hinge Dimensions.

K. ANSI A156.8 (BHMA 311) - Door Controls-Overhead Holders.

L. ANSI A156.13 (BHMA 621) - Mortise Locks and Latches.

M. ANSI A156.15 (BHMA 321) - Closer Holder Release Devices.

N. ANSI A156.16 - Auxiliary Hardware.

O. ANSI A156.17 - Self Closing Hinges & Pivots.

P. ANSI A156.18 - Materials and Finishes.

Q. ANSI A156.21 – Thresholds.

R. ANSI A156.22 – Door Gasketing.

S. ANSI A156.26, ANSI A8134 - Continuous Hinges.

T. ASTM D2000 – Standard Classification System for Rubber Products in Automotive Applications.

U. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

V. BHMA – Builders Hardware Manufacturers Association.

W. BHMA A156.10 – Power Operated Pedestrian Doors.

X. NFPA 70 - National Electrical Code.

Y. NFPA 80 – Standard for Fire Doors and Fire Windows.

Z. NFPA 101 – Safety to Life from Fire in Buildings and Structures.

AA. NFPA 252 – Standard Methods of Fire Tests of Door Assemblies.

BB. UL 305 - Standard for Safety for Panic Hardware.

CC. UL 325 - Standard for Safety for Door, Drapery, Gate, Louver, and Window Operators and Systems.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data for each item of hardware in accordance with the Division One Section, "Submittals".. Include whatever information may be necessary to show compliance with requirements, and include instructions for installation and for maintenance of operating parts and finishes.

B. Hardware Schedule: Submit final hardware schedule in manner indicated below. Coordinate hardware with doors, frames and related work to ensure proper size, thickness, hand, function and finish of hardware.

C. Final Hardware Schedule Content: Based on door hardware indicated, organize hardware schedule into "hardware sets" indicating complete designations of every item required for each door or opening. Include the following information:

1. Type, style, function, size and finish of each hardware item.
2. Name and manufacturer of each item.
3. Fastenings and other pertinent information.
4. Location of hardware set cross-referenced to indications on Drawings both on floor plans and in door and frame schedule.
5. Explanation of all abbreviations, symbols, codes, etc. contained in schedule.
6. Mounting locations for hardware.
7. Door and frame sizes and materials.
8. Keying information.

D. Submittal Sequence: Submit schedule at earliest possible date particularly where acceptance of hardware schedule must precede fabrication of other work (e.g., hollow metal frames) which is critical in the project construction schedule. Include with schedule the product data, samples, shop drawings of other work affected by door hardware, and other information essential to the coordinated review of hardware schedule.

E. Keying Schedule: Submit separate detailed schedule indicating clearly how the Authority's final instructions on keying of locks has been fulfilled.

F. Samples: Prior to submittal of the final hardware schedule and prior to final ordering of door hardware, submit one sample of each type of exposed hardware unit, finished as required, and tagged with full description for coordination with schedule. Samples will be returned to the supplier. Units which are acceptable and remain undamaged through submittal, review and field comparison procedures may, after final check of operation, be used in the work, within limitations of keying coordination requirements.

G. Templates: Furnish hardware templates to each fabricator of doors, frames and other work to be factory-prepared for the installation of hardware. Upon request, check shop drawings of such other work, to confirm that adequate provisions are made for proper location and installation of hardware.

H. Maintenance Data: For each type of door hardware to include in maintenance manuals specified in Division 01.

I. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

J. Coordinate layout and installation of recessed pivots and closers with floor construction. Cast anchoring inserts into concrete. Concrete, reinforcement, and formwork requirements are specified in 03 Section, Cast-in-Place Concrete.

K. Provide product data, shop drawings, layout, roughing-in diagrams, installation instructions, maintenance data, parts list for all components of power, automatic and alarmed door and gate systems including operators, actuators, bollards, electrical components, power supply, alarm devices, conduit and other hardware and equipment.

1. Provide copies of product warranties.
2. Provide certification that system meets applicable accessibility codes and requirements.
3. Provide a sample of the push-plate activation device with the actual symbol and words engraved (and painted) in the actual selected finish.
4. Wiring Diagrams: For power, signal, and control wiring and including the following:

    a) Details of interface of electrified door hardware and building safety and security systems.
    b) Schematic diagram of systems that interface with electrified door hardware.

        1) Point-to-point wiring.
        2) Risers.

    c) Elevations of doors controlled by electrified door hardware.
    d) All equipment, power transfers and operators for power or automatic door systems.
    e) All equipment for alarmed door or gate systems.

5. Shop drawings shall indicate locations of equipment, power supplies and conduit; installation and support of the equipment; power and control wiring and means of access to the concealed equipment for maintenance, repair and replacement.
6. Provide shop drawings for the actuators and bollards indicating type, location, size and installation details for actuators and bollards.

L. Operation Narrative: Describe the operation of doors controlled by electrified door hardware.

M. Hardware schedule shall reference the door and frame shop drawings and both the hardware submittal and the door and frame submittal shall indicate the type of reinforcement and locations of reinforcement in the doors and frames required for the installation and support of hinges, closers, locksets and other door hardware.

N. Provide a copy of the Warranty for all hardware items from the manufacturer and installer of the hardware items for the Authority's review and approval.

1.05 QUALITY ASSURANCE

A. Manufacturer: Obtain each type of hardware (latch and lock sets, hinges, closers, etc.) from a single manufacturer, although several may be indicated as offering products

complying with requirements.

B. Supplier: A recognized architectural finish hardware supplier, with warehousing facilities, who has been furnishing hardware in the project's vicinity for a period of not less than 2 years, and who is, or who employs an experienced architectural hardware consultant who is available, at reasonable times during the course of the work, for consultation about project's hardware requirements, to Authority and Contractor.

C. Installer Qualifications: Engage experienced installers who are authorized representatives of the product manufacturers for both installation and maintenance of hardware required for this Project.

D. Fire-Rated Openings: Provide hardware for fire-rated openings in compliance with NFPA Standard No. 80 and local building code requirements. Provide only hardware which has been tested and listed by UL or FM for types and sizes of doors required and complies with requirements of door and door frame labels. Where emergency exit devices are required on fire-rated doors, (with supplementary marking on doors' UL or FM labels indicating "Fire Door to be Equipped with Fire Exit Hardware") provide UL or FM label on exit devices indicating "Fire Exit Hardware".

1. Test Pressure: Test at atmospheric pressure.

E. Smoke and Draft-Control Door Assemblies: Where smoke and draft-control door assemblies are required, provide door hardware that meet requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.

1. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at the tested pressure differential of 0.3-inch wg (75 Pa) of water.

F. ADA and Illinois Accessibility Code Compliance: Unless noted and approved otherwise, all hardware to be in compliance with the requirements of the Americans with Disabilities Act of 1990 (ADA). All public spaces to have an entrance/exit that is ADA and IAC accessible and compliant.

1. Handles, Pulls, Latches, Locks, and other Operating Devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.
2. Door Closures: Comply with the following maximum opening-force requirements indicated:

a. Interior Hinged Doors: 5 lbf applied perpendicular to door.
b. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.

3. Thresholds: Not more than 1/2 inch high. Bevel raised thresholds with a slope of not more than 1:2.
4. NFPA 101: Comply with the following for means of egress doors:

a. Latches, Locks, and Exit Devices: Not more than 15 lbf to release the latch. Locks shall not require the use of a key, tool, or special knowledge for operation.
b. Delayed-Egress Locks: Lock released within 15 seconds after applying a force not more than 15 lbf for not more than 3 seconds.
c. Door Closers: Not more than 30 lbf to set door in motion and not more than 15 lbf to open door to minimum required width.
d. Thresholds: Not more than 1/2 inch high.

G. Power Door Operators:

1. ANSI Standard: Provide power door operator system that meets all requirements of ANSI A117.1, Accessible and Useable Buildings and Facilities.
2. BHMA Standard: Provide power door operators that comply with applicable requirements of BHMA A156.19, "Power Assist and Low Energy Power Operated Doors."
3. UL Standard: Provide power door operators that comply with UL 325.
4. Fire-Rated Doors and Emergency-Exit Openings: Provide door operators that comply with NFPA 80 requirements for doors as emergency exits and that do not interfere with fire ratings.
5. Size, type, location of actuators and bollards as required by ADA and codes.

H. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1. UL Standard: Comply with UL 325.
2. Electrical System Roughing-in: Coordinate layout and installation of automatic door operators with connections to power supplies.

I. Preinstallation Conference: Conduct conference at Project Site.

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Inspect and discuss preparatory work performed by other trades.
3. Inspect and discuss electrical roughing-in for electrified door hardware.
4. Review sequence of operation for each type of electrified door hardware.
5. Review required testing, inspecting, and certifying procedures.
6. Review keying items.

1.06 PRODUCT HANDLING

A. Tag each item or package separately, with identification related to final hardware schedule, and include basic installation instructions with each item or package.

B. Packaging of hardware is responsibility of supplier. As material is received by hardware supplier from various manufacturers, sort and repackage in containers clearly marked with appropriate hardware set number to match set numbers of approved hardware schedule. Two or more identical sets may be packaged in same container.

C. Inventory hardware jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.

D. Deliver individually packaged hardware items at the proper times to the proper locations (shop or project site) for installation.

E. Provide secure lock-up for hardware delivered to the project, but not yet installed. Control handling and installation of hardware items which are not immediately replaceable, so that completion of the work will not be delayed by hardware losses, both before and after installation.

1.07 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings to receive hardware and door components by field measurements before fabrication. Verify locations, dimensions and conditions for installation of components including bollards.

1.08 COORDINATION

A. Contractor shall coordinate the work of this section with the door and frame section(s) for the project to substantiate that the correct type and number of hardware is provided and reinforcement for the reinstallation and support of the hinges, closer, lockset and other door hardware is provided with the doors and frames as shown on the drawings, specified herein and otherwise required for doors in a heavy duty usage environment.

B. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.

C. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

D. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.

E. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

F. Coordinate the location of all remote hardware related items including power supply cabinet, alarm, ADA Actuators, bollards, ADA fare gates, etc.

1. Coordinate the requirements for electrical power supply to electrified hardware components, connections, conduits, devices, wiring.

2. Coordinate the work required to be performed by the electrical contractor for the hardware installation and operation.

3. Templates: Obtain templates for doors, frames, and other work specified to be factory prepared for installing automatic door operators. Shop drawings to indicate dimensions and locations for installing power door operator equipment.

4. Coordinate hardware with doors, frames and related work to ensure proper size, thickness, hand, function, and finish. Coordinate hardware for power door operators with hardware required for the rest of the project.

5. Electrical System Roughing-in: Coordinate layout and installation of power door operators with connections to power supplies.

G. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

H. Hardware and trim items to be of the same metal as the metal it is being attached to or welded to as required to avoid galvanic action. If the metal cannot be changed, provide separation material between the dissimilar metals as required to avoid galvanic action.

1.09 WARRANTY

A. The materials and installation of all the work of this section shall be warrantied for a period of at least One (1) Year from the date of Final Acceptance by the Authority. The warranty shall encompass defects in materials or workmanship; defects in the installation; and/or failure of the hardware item or installation in performing as specified within the warranty period.

1. Roton continuous hinges shall have a life-time warranty.

B. Special Warranty: Submit a written warranty, executed by the manufacturer, agreeing to repair or replace components of the power door operator system that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:

1. Faulty operation of operator or controls.
2. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
3. Warranty Period: Three (3) years from date of Final Completion of the total project.

C. Any hardware item or installation that fails within the warranty period shall be repaired or replaced to the Authority's satisfaction and at no cost to the Authority.

1.10 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

B. Maintenance Service: Beginning at Substantial Completion, provide six (6) months' full maintenance by skilled employees of door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door and door hardware operation. Provide parts and supplies that are the same as those used in the manufacture and installation of original products.

PART 2 - PRODUCTS

2.01 SCHEDULED DOOR HARDWARE

A. Provide door hardware for each door as scheduled to comply with requirements in this Section.

1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and products equivalent in function and comparable in quality to named products as well as products complying with BHMA designations referenced.

B. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.

C. Hardware and trim items to be of the same metal as the metal it is being attached to or welded to as required to avoid galvanic action. If the metal cannot be changed, provide separation material between the dissimilar metals as required to avoid galvanic action.

2.02 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following; or an approved equal:

1. Butts and Continuous Hinges:

a. Ives Hardware, Div. of Allegion.
b. McKinney Products Co. Div. of ASSA ABLOY.
c. Stanley Hardware, Div. of Stanley Works.

2. Electrical Power Transfer:

a. Von Duprin

3. Cylinders and Locks (All locks must accept interchangeable Best cylinders):

a. Schlage Lock, Div. of Allegion.
b. Sargent Lock, Div. of ASSA ABLOY.
c. Best Lock, Div. of Stanley Works.

4. Overhead Closers:

   a. LCN 4040XP, Div. of Allegion.
   b. Norton 9500 without PRV, Div. of ASSA ABLOY.
   c. Sargent 281 without PRV, Div. of ASSA ABLOY.

5. Exit Door Hardware:

   a. Von Duprin 98 Series. Div. of Allegion.
   b. Sargent 80 Series. Div. of ASSA ABLOY.
   c. Precision Apex Series. Div of Stanley Works.

6. Door Trim, Kick, Mop, and Armor Plates:

   a. Ives Hardware. Div. of Allegion.
   b. Hiawatha. Div. of Activar Industries.
   c. Rockwood, Div of ASSA ABLOY

7. Door Stripping, Seals and Astragal:

   a. National Guard Products, Inc.
   b. Pemko Manufacturing Co., Inc.
   c. Reese Enterprises, Inc.
   d. Zero International, Inc.

8. Thresholds:

   a. National Guard Products, Inc.
   b. Pemko Manufacturing Co., Inc.
   c. Reese Enterprises, Inc.
   d. Zero International, Inc.

9. Lock Guard:

   a. Ives Hardware. Div. of Allegion.
   b. Hiawatha. Div. of Activar Industries.
   c. Rockwood, Div of ASSA ABLOY

10. Actuators:

    b. LCN

11. Bollards

    a. LCN
    b. Wikk Industries, Inc.

12. Peepholes:

    a. Ives

2.03 SCHEDULED HARDWARE

A. Requirements for design, grade, function, finish, size and other distinctive qualities of each type of door hardware is indicated in the Hardware Schedule at the end of this

section. Products are identified by using hardware designation numbers of the following:

1. Manufacturer's Product Designations: One or more manufacturers are listed for each hardware type required. Manufacturer's name indicated used in the Hardware Schedule is for purposes of establishing minimum requirements. Provide either the product designated, or, where more than one manufacturer is listed, the comparable product of one of the other manufacturers which comply with requirements including those specified elsewhere in this section.
2. ANSI/BHMA designations used elsewhere in this section or in schedules to describe hardware items or to define quality or function are derived from the following standards. Provide products complying with these standards and requirements specified elsewhere in this section.

2.04 HINGES

A. Hinges: BHMA A156.1. Provide template-produced hinges for hinges installed on hollow- metal doors and hollow-metal frames.

1. Manufacturers: Subject to compliance with requirements available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Allegion plc.
b. Baldwin Hardware Corporation.
c. Bommer Industries, Inc.
d. Cal-Royal Products, Inc.
e. Design Hardware.
f. Don-Jo Mfg., Inc.
g. Hager Companies.
h. Ives Architectural Hardware Products
i. Lawrence Hardware Inc.
j. McKinney Products Company; an ASSA ABLOY Group company.
k. PBB, Inc.
l. Stanley Commercial Hardware; a division of Stanley Security Solutions.
m. Approved equal

B. Quantity: Provide the following, unless otherwise indicated:

1. Two Hinges: For doors with heights up to 60 inches.
2. Three Hinges: For doors with heights 61 to 90 inches.
3. Four Hinges: For doors with heights 91 to 120 inches.
4. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.

C. Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

		Metal Thickness (inches)	
Maximum Door Size	Hinge Height	Standard Duty	Heavy Duty
32 by 84 by 1-3/4	4-1/2	0.134	

36 by 84 by 1-3/4	4-1/2	0.134	0.180
42 by 90 by 1-3/4	5	0.134	0.180
48 by 120 by 1-3/4	5	0.146	0.190

D. Template Requirements: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.

E. Hinge Applications: Unless otherwise indicated, provide the following:

1. Exterior and Entrance Doors: Heavy-weight hinges.
2. Doors with Closers: Antifriction-bearing hinges.
3. Interior Doors: Heavy-weight hinges for metal doors.

F. Hinge Base Metal: Unless otherwise indicated, provide the following:

1. Exterior Hinges: Stainless steel, with stainless-steel pin.
2. Interior Hinges: Stainless steel, with stainless-steel pin.
3. Hinges for Fire-Rated Assemblies: Stainless steel, with stainless-steel pin.

G. Hinge Options: Comply with the following where indicated in the Door Hardware Schedule or on Drawings:

1. Maximum Security Pin: Fix pin in hinge barrel after it is inserted.
2. Nonremovable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the following applications:

   a. Outswinging exterior doors.
   b. Outswinging corridor doors with locks.

3. Raised Barrel: Offset both leaves to raise barrel off door jamb.
4. Corners: 1/4 inch radius.

H. All Leaf Hinges: Full Mortise Hinges, Five Knuckle, Ball Bearing.

I. Fasteners: Comply with the following:

1. Machine TORX Screws: For metal doors and frames. Install into drilled and tapped holes.
2. Wood Screws: For wood doors and frames.
3. Threaded-to-the-Head Wood Screws: For fire-rated wood doors.
4. Screws: Phillips flat-head screws; machine screws (drilled and tapped holes) for metal doors and wood screws for wood doors and frames. Finish screw heads to match surface of hinges.

2.05 SELF-CLOSING HINGES AND PIVOTS

A. Self-Closing Hinges and Pivots: BHMA A156.17.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Allegion plc.
    b. Bommer Industries, Inc.
    c. Cal-Royal Products, Inc.
    d. Design Hardware.
    e. Don-Jo Mfg., Inc.
    f. Hager Companies.
    g. McKinney Products Company; an ASSA ABLOY Group company.
    h. PBB, Inc.
    i. Stanley Commercial Hardware; a division of Stanley Security Solutions.
    j. Approved equal

2.06 CENTER-HUNG AND OFFSET PIVOTS

A. Center-Hung and Offset Pivots: BHMA A156.4.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Accurate Lock & Hardware Co.
    b. Allegion plc.
    c. Architectural Builders Hardware Mfg., Inc.
    d. DORMA Architectural Hardware; a division of DORMA Group North America.
    e. Hager Companies.
    f. Rixson Specialty Door Controls; an ASSA ABLOY Group company.
    g. Approved equal

2.07 CONTINUOUS HINGES

A. Continuous Hinges: BHMA A156.26; minimum 0.120-inch- thick, hinge leaves with minimum overall width of 4 inches; fabricated to full height of door and frame and to template screw locations; with components finished after milling and drilling are complete.

1. Use stainless steel pin and barrel continuous hinges unless shown or noted otherwise and approved by the Authority.

B. Pin-and-Barrel-Type Hinges:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Hager Companies.
    b. Ives Architectural Hardware Products
    c. Lawrence Hardware Inc.
    d. Markar Architectural Products, Inc; an ASSA ABLOY Group company.
    e. McKinney Products Company; an ASSA ABLOY Group company.
    f. Select Products Limited.

g. Approved equal.

2. Provide a heavy duty stainless steel pin and barrel continuous hinge in a 630 (US32D) satin finish.
3. Fasten with stainless steel security type fasteners.

C. Continuous, Gear-Type Hinges: Extruded-aluminum, heavy duty, pinless, geared hinge leaves joined by a continuous extruded-aluminum channel cap; with concealed, self- lubricating thrust bearings.

1. Manufacturers: Subject to compliance with requirements available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Allegion plc.
b. Architectural Builders Hardware Mfg., Inc.
c. Bommer Industries, Inc.
d. Cal-Royal Products, Inc.
e. Hager Companies.
f. Ives Architectural Hardware Products.
g. McKinney Products Company; an ASSA ABLOY Group company.
h. PBB, Inc.
i. Pemko Manufacturing Co.
j. Select Products Limited.
k. Stanley Commercial Hardware; a division of Stanley Security Solutions.
l. Zero International, Inc.
m. Approved equal

2. Continuous gear hinges shall be clear or bronze anodized aluminum to match the door and frame and as selected by the Authority.
3. Fasten with stainless steel security type fasteners.

2.08 MECHANICAL LOCKS AND LATCHES

A. Lock Functions: As indicated in door hardware schedule.

B. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:

1. Mortise Locks: Minimum 3/4-inch latchbolt throw.
2. Deadbolts: Minimum 1.25-inch bolt throw.

C. Lock Backset: 2-3/4 inches, unless otherwise indicated.

D. Lock Trim:

1. Description: As selected by Authority.
2. Levers
3. Knobs
4. Escutcheons (Roses)
5. Dummy Trim: Match lever lock trim and escutcheons.
6. Operating Device: Lever with escutcheons (roses).

E. Provide knurled lever handles for doors leading to potentially hazardous areas as required by ADA.

F. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch.

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
3. Aluminum-Frame Strike Box: Manufacturer's special strike box fabricated for aluminum framing.
4. Rabbet Front and Strike: Provide on locksets for rabbeted meeting stiles.
5. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Allegion plc.
    b. Arrow USA; an ASSA ABLOY Group company.
    c. Best Access Systems; Stanley Security Solutions, Inc.
    d. Cal-Royal Products, Inc.
    e. Corbin Russwin, Inc.; an ASSA ABLOY Group company.
    f. Design Hardware.
    g. Hager Companies.
    h. Lawrence Hardware Inc.
    i. Marks USA.
    j. PDQ Manufacturing.
    k. SARGENT Manufacturing Company; ASSA ABLOY.
    l. Schlage
    m. Stanley Commercial Hardware; a division of Stanley Security Solutions.
    n. Weiser Lock Corp.
    o. Yale Security Inc; an ASSA ABLOY Group company.
    p. Approved equal

G. Mortise Locks: BHMA A156.13; Security Grade 1; stainless steel with steel or brass parts; Series 1000.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Accurate Lock & Hardware Co.
    b. Adams Rite Manufacturing Co; an ASSA ABLOY Group company.
    c. Allegion plc.
    d. Arrow USA; an ASSA ABLOY Group company.
    e. Best Access Systems; Stanley Security Solutions, Inc.
    f. Brink, R. R. Locking Systems, Inc.
    g. Cal-Royal Products, Inc.
    h. Corbin Russwin, Inc.; an ASSA ABLOY Group company.
    i. Design Hardware.
    j. Hager Companies.
    k. Lawrence Hardware Inc.
    l. Marks USA.
    m. PDQ Manufacturing.
    n. SARGENT Manufacturing Company; ASSA ABLOY.
    o. Schlage
    p. Approved equal

H. Push-Pull Latches: Mortise, BHMA A156.13; Grade 1; with paddle handles that retract latchbolt; capable of being mounted vertically or horizontally.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Adams Rite Manufacturing Co; an ASSA ABLOY Group company.
b. Architectural Builders Hardware Mfg., Inc.
c. Corbin Russwin, Inc.; an ASSA ABLOY Group company.
d. Rockwood Manufacturing Company; an ASSA ABLOY Group company.
e. SARGENT Manufacturing Company; ASSA ABLOY.
f. Schlage
g. Trimco.
h. Approved equal

2.09 AUXILIARY LOCKS

A. Bored Auxiliary Locks: BHMA A156.5: Grade 1; stainless steel with strike that suits frame.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Arrow USA; an ASSA ABLOY Group company.
b. Best Access Systems; Stanley Security Solutions, Inc.
c. Cal-Royal Products, Inc.
d. Hager Companies.
e. Marks USA.
f. Medeco Security Locks; an ASSA ABLOY Group company.
g. PDQ Manufacturing.
h. SARGENT Manufacturing Company; ASSA ABLOY.
i. Schlage
j. Weiser Lock Corp.
k. Yale Security Inc; an ASSA ABLOY Group company.
l. Approved equal

B. Mortise Auxiliary Locks: BHMA A156.5; Grade 1; with strike that suits frame.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Accurate Lock & Hardware Co.
b. Adams Rite Manufacturing Co; an ASSA ABLOY Group company.
c. Allegion plc.
d. Arrow USA; an ASSA ABLOY Group company.
e. Best Access Systems; Stanley Security Solutions, Inc.
f. Brink, R. R. Locking Systems, Inc.
g. Cal-Royal Products, Inc.
h. Hager Companies.
i. SARGENT Manufacturing Company; ASSA ABLOY.
j. Schlage
k. Stanley Commercial Hardware; a division of Stanley Security Solutions.
l. Yale Security Inc; an ASSA ABLOY Group company.
m. Approved equal

C. Narrow Stile Auxiliary Locks: BHMA A156.5; Grade 1; with strike that suits frame.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Accurate Lock & Hardware Co.
    b. Adams Rite Manufacturing Co; an ASSA ABLOY Group company.
    c. Approved equal

2.10 ELECTRIC STRIKES

A. Electric Strikes: BHMA A156.31; Grade 1; with faceplate to suit lock and frame.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Adams Rite Manufacturing Co; an ASSA ABLOY Group company.
    b. Dortronics Systems, Inc.
    c. DynaLock Corp.
    d. HES, Inc.; an ASSA ABLOY Group company.
    e. Rutherford Controls Int'l. Corp.
    f. Security Door Controls.
    g. Trine Access Technology.
    h. Approved equal

2.11 ELECTROMAGNETIC LOCKS

A. Electromagnetic Locks: BHMA A156.23; electrically powered; with electromagnet attached to frame and armature plate attached to door; full-exterior or full-interior type, as required by application indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Allegion plc.
    b. Door Controls International, Inc.
    c. Dortronics Systems, Inc.
    d. DynaLock Corp.
    e. Rutherford Controls Int'l. Corp.
    f. Securitron Magnalock Corporation; an ASSA ABLOY Group company.
    g. Security Door Controls.
    h. Approve equal

2.12 ELECTROMECHANICAL LOCKS

A. Electromechanical Locks: BHMA A156.25; Grade 1; motor or solenoid driven; mortise deadbolt; with strike that suits frame.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Allegion plc.
    b. Best Access Systems; Stanley Security Solutions, Inc.
    c. Brink, R. R. Locking Systems, Inc.
    d. DynaLock Corp.
    e. Lawrence Hardware Inc.

f. Marks USA.
g. PDQ Manufacturing.
h. Rutherford Controls Int'l. Corp.
i. SARGENT Manufacturing Company; ASSA ABLOY.
j. Security Door Controls.
k. Stanley Commercial Hardware; a division of Stanley Security Solutions.
l. Weiser Lock Corp.
m. Yale Security Inc; an ASSA ABLOY Group company.
n. Approved equal

2.13 SELF-CONTAINED ELECTRONIC LOCKS

A. Self-Contained Electronic Locks: BHMA A156.25, mortise; with internal, battery-powered, self-contained electronic locks; consisting of complete lockset, motor-driven lock mechanism, and actuating device; enclosed in zinc-dichromate-plated, wrought-steel case, and strike that suits frame. Provide key override, low-battery detection and warning, LED status indicators, and ability to program at the lock.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allegion plc.
b. Best Access Systems; Stanley Security Solutions, Inc.
c. Kaba Ilco Corp.
d. Marks USA.
e. SARGENT Manufacturing Company; ASSA ABLOY.
f. Yale Security Inc; an ASSA ABLOY Group company.
g. Approved equal

2.14 EXIT LOCKS AND EXIT ALARMS

A. Exit Locks and Alarms: BHMA A156.29, Grade 1.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Arrow USA; an ASSA ABLOY Group company.
b. Detex Corporation.
c. Precision Hardware, Inc.; a Stanley company.
d. SARGENT Manufacturing Company; ASSA ABLOY.
e. Schlage
f. Approved equal

2.15 SURFACE BOLTS

A. Surface Bolts: BHMA A156.16.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allegion plc.
b. Burns Manufacturing Incorporated.
c. Don-Jo Mfg., Inc.
d. Door Controls International, Inc.

e. Hiawatha, Inc; a division of the Activar Construction Products Group.
f. Trimco.
g. Approved equal

B. Fire-Rated Surface Bolts: 8 inch steel bolt with 2 steel guides; minimum 1 inch throw; listed and labeled for fire-rated doors; with universal strike.

2.16 MANUAL FLUSH BOLTS

A. Manual Flush Bolts: BHMA A156.16; minimum 3/4-inch (19-mm) throw; designed for mortising into door edge.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Adams Rite Manufacturing Co; an ASSA ABLOY Group company.
b. Allegion plc.
c. Burns Manufacturing Incorporated.
d. Don-Jo Mfg., Inc.
e. Door Controls International, Inc.
f. Hiawatha, Inc; a division of the Activar Construction Products Group.
g. Trimco.
h. Approved equal

B. Manual-Extension Flush Bolts: Fabricated from extruded brass or aluminum, with 12 inch rod actuated by flat lever**;** listed and labeled for fire-rated doors. Provide matching strike.

C. Slide Flush Bolts: Cast brass, with rod actuated by slide. Provide matching strike.

D. Strikes: Provide dust proof strikes at all thresholds and floors than engage bolts.

2.17 FLUSH BOLTS

A. Flush bolts where indicated for top and/or bottom of doors to be Ives (or equal) Series FB458, 12" rod length, ½" square bolt head, 3/4" throw.

B. Standards: Comply with the following:

1. Surface Bolts:
2. Manual Flush Bolts: ANSI A156.16.

C. Surface Bolts: ANSI A156.16., L54161 – Stainless steel, Grade 1.

D. Flush Bolts: ANSI A156.16., L1408, 409, 410, 426 or 427 as appropriate – Stainless steel, Grade 1.

1. Flush Bolt Heads: Minimum of 1/2 inch diameter rods of brass, bronze, or stainless steel with minimum 12 inch long rod for doors up to 84 inches in height. Provide longer rods as necessary for doors exceeding 84 inches.

2.18 AUTOMATIC AND SELF-LATCHING FLUSH BOLTS

A. Automatic and Self-Latching Flush Bolts: BHMA A156.16; minimum 3/4-inch (19-mm) throw; designed for mortising into door edge.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allegion plc.
b. Burns Manufacturing Incorporated.
c. Cal-Royal Products, Inc.
d. Don-Jo Mfg., Inc.
e. Door Controls International, Inc.
f. Rutherford Controls Int'l. Corp.
g. Trimco.
h. Approved equal

2.19 EXIT DEVICES AND AUXILIARY ITEMS

A. Exit Devices and Auxiliary Items: BHMA A156.3.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Adams Rite Manufacturing Co; an ASSA ABLOY Group company.
b. Allegion plc.
c. Arrow USA; an ASSA ABLOY Group company.
d. Cal-Royal Products, Inc.
e. Corbin Russwin, Inc.; an ASSA ABLOY Group company.
f. Design Hardware.
g. Detex Corporation.
h. Door Controls International, Inc.
i. DORMA Architectural Hardware; a division of DORMA Group North America.
j. Hager Companies.
k. Lawrence Hardware Inc.
l. Precision Hardware, Inc.; a Stanley company.
m. Rutherford Controls Int'l. Corp.
n. SARGENT Manufacturing Company; ASSA ABLOY.
o. Stanley Commercial Hardware; a division of Stanley Security Solutions.
p. Von Duprin
q. Yale Security Inc; an ASSA ABLOY Group company.
r. Approved equal

B. On all station exit doors, provide panic-type exit devices, with concealed vertical rod or cable device; except surface mounted vertical rod may be used on wood doors. Exit device to comply with ANSI A 156.3, Grade I. Panic bar to span across glass door lite. Finish shall be Type 304, Stainless Steel.

D. Exit devices to have cylinder dogging feature, keyed alike to building system, which will keep the exit devices from latching, allowing free access in both directions at all times when the station is open. When this feature is activated, the exit device becomes a push bar from the interior and there is a latch-less pull from the exterior.

E. When the station is closed and locked, both doors (active and inactive) of the pair can be locked into latch mode, allowing panic exit anytime from either door from the interior. The doors would then be inaccessible from the exterior, except by unlocking the active side of the pair of doors with a key.

F. For those exterior entrance doors designated to also have automatic door hardware, provide the electric latch retraction feature for the exit devices.

F. Certified Products: Provide one of specified exit devices listed in BHMA's "Directory of Certified Exit Devices." Devices must be independently certified to 2,500,000 cycles with static load testing up to 2,000 lbs.

G. Panic Exit Devices: Listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.

H. Fire Exit Devices: Complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252.

I. Outside Trim: Provide manufacturers standard pull plate.

J. TORX type Through Bolts: For exit devices and trim on metal doors.

K. Concealed Vertical Rod or Cable Exit Devices.

L. Electrified Exit Device Options: Types and functions indicated as follows:

1. Request-for-Exit Function: Signal initiated when push bar is actuated.
2. Electric Latch Retraction: Remote signal activates continuous-duty solenoid that retracts latch. Manufacturer to supply required power supply.

M. Alarmed Exit Devices: Alarm sounds when exit device activated. Signage in English and Brail: "EMERGENCY EXIT ONLY – ALARM WILL SOUND". Alarmed exit devices to be hard wired. Alarm system to be alarmed/disarmed by key switch located in the CA kiosk. Alarm to be 100 decibels. Horn for alarm to be remotely located at ceiling as directed by the Authority. Activation of the alarm shall also activate an alarm with indicator in the console located in the Customer Assistant's kiosk for the station. Alarm to be automatically silenced when the door or gate returns to its closed position. Exit device to have an indicator light indicating proper operation. Alarmed exit device to comply with NFPA 101 Life Safety Code, UL listed for Panic Exit Hardware (UL 305) and tested in accordance with ANSI A 156.3 Grade 1 Panic Hardware.

1. Exit alarm to be an electric horn designed for use as an immediate local audible deterrent device that will sound an "air horn sound" different from a fire alarm type

   sound. Device to allow various combinations of volume, tone and code configurable by the user. Alarm shall not include a strobe.
2. Alarm devices shall be flush and surface mountable using standard electrical boxes.
3. Alarm devices shall be suitable for installation at exterior locations.

4. All hardware, equipment and power supply for alarmed doors shall be concealed in the door, frame and building construction to the greatest extent possible. Shop drawings shall indicate locations of equipment, power supply, conduit and access to equipment for maintenance on the shop drawings for the Authority's review and approval.

2.20 AUTOMATIC DOOR HARDWARE

A. For entrance doors noted to be automatic or power assisted, for handicap accessiblity, provide the following additional hardware:

1. Instead of the manual closer, provide and install a low energy electro-hydraulic operator. Closer to have all-weather fluid; a arm will allow the door to open slowly to 90 degrees; allowing manual operation or using the power to automatically open the door. Closer to be top jamb (push side) mounted, non-handed, non- sized.
2. Provide and install a self-contained control box or power supply. Location as indicated on drawings or as directed by engineer. Provide all required mounting accessories and electrical connections.
3. Provide and surface mount two actuators for each automatic door. One actuator to be located at the interior and one actuator at the exterior. Locations as shown on drawings or as directed by the Authority. Mounting height as required by code. Where indicated on the drawings or required by ADA or code, provide and install a stainless steel bollard for the actuator. Provide all wiring and connections.

B. Automatic door system, all hardware, and installation to conform to ADA, local codes, and ANSI A 156.19.

C. Acceptable Manufacturers:

1. Besam.
2. Norton Closers, Div. of ASSA ABLOY.
3. LCN Closers, Div. of Allegion.
4. Approved equal.

D. Capacity: Provide operators of size recommended by manufacturer for door size, weight, and movement; for condition of exposure; and for long-term, maintenance-free operation under heavy duty traffic load and use.

E. Adjustment Features: Operators shall be fully adjustable. Provide adjustment for opening, closing, and checking speeds, as well as length of time door remains open.

F. Door Operators: Provide door operators of size recommended by manufacturer for door size, weight and movement; for condition of exposure; and for long-term, maintenance- free operation under normal traffic load for type of occupancy indicated.

G. Electromechanical Operators for Swinging Doors: Manufacturer's standard electromechanical unit with doors power opened and spring closed, with closing speed controlled mechanically by gear train and dynamically by braking action of electric motor, with solid-state microprocessor controller and with easy manual operation including spring

closing with power off. Operator to be concealed, self-contained, overhead unit powered by fractional-horsepower, permanent-magnet dc motor. Provide operator action as indicated and mounting as follows:

1. Power-Assisted and Low-Energy Operators: Provide power-assisted and low- energy operators meeting requirements of BHMA A156.19 and ADA's "Accessibility Guidelines for Buildings and Facilities (ADAAG),"Appendix B, Article 4.13.12, "Automatic Doors and Power-Assisted Doors."
2. Power-Assisted Closing: Provide power-assisted spring closing for overcoming wind and static pressures.
3. When not activated, door operator must act as closer.

H. Adjustments: Power door operation to be adjustable for opening speed, hold-open time, closing speed, latching, obstruction recycling, and to counter wind.

I. Manual Opening for Power-Operated Swinging Doors: Provide hardware that in the event of a power failure allows door to open with a manual force not to exceed 30 lbf according to BHMA A156.10.

J. All hardware, equipment, power supply, power transfers and operators for automatic door systems shall be concealed in the door, frame and building construction to the greatest extent possible. Shop drawings shall indicate locations and installation details of equipment, power supplies, conduit and access to equipment for maintenance, repair and replacement on the shop drawings for the Authority’s review and approval.

2.21 OPERATOR CONTROL SYSTEMS

B. Push-Plate Activation Device: Manufacturer's standard semi-flush, jamb, wall- or pedestal-mounted (as indicated on drawings), door-control switch plate for operation by touch of elbow by occupants familiar with door operating system. Provide an activation device on each side of the door. Activation device to have a 2 inch X 4 inch junction box. Shape of device to be square unless selected otherwise by the Authority.

1. Push-plate to be 4.5” square stainless steel with engraved and painted black message: International symbol of accessibility and “Push to Open” in words.

2.22 BOLLARDS FOR ACTUATORS

A. Bollard: When shown on the drawings, provide a stainless steel bollard for installation of the door actuator plate. Height and location required by code. Size as shown on the drawings and as required for installation of the actuator.

B. Bollards to be constructed of 304 type stainless steel all sides and top with satin finish US32D (630), All seems to be continuously welded then ground smooth with no sharp edges, protrusions or rough areas. Top to be welded stainless steel cap, sloped. Corner radius 15/64” typical.

C. Mounting: Surface mount to concrete or other finished floor using a U-shaped stainless steel bracket at base with access hole for wiring conduit. Secure bracket with minimum 4–1/2” x 2-3/4” length masonry anchors and secure

bollard with minimum 4 -.1/4 -.20 stainless steel flat head tamper proof machine screws.

D. Sizes of bollards:

1. 6 x 6 x 1/8" wall for actuator(s) only. Height 42" above finished floor.
2. 6 x 18 x 1/8" wall for actuator(s) and CTA Braille sign where indicated on the drawings. Height 64" above finished floor. Provide an access panel with tamper proof screws.

2.23 LOCK CYLINDERS

A. Lock Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allegion plc.
b. Arrow USA; an ASSA ABLOY Group company.
c. ASSA, Inc.
d. Best Access Systems; Stanley Security Solutions, Inc.
e. Cal-Royal Products, Inc.
f. Corbin Russwin, Inc.; an ASSA ABLOY Group company.
g. Hager Companies.
h. Medeco Security Locks; an ASSA ABLOY Group company.
i. PDQ Manufacturing.
j. SARGENT Manufacturing Company; ASSA ABLOY.
k. Stanley Commercial Hardware; a division of Stanley Security Solutions.
l. Yale Security Inc; an ASSA ABLOY Group company.
m. Approved equal

B. Standard Lock Cylinders: BHMA A156.5; Grade 1; permanent cores that are interchangeable and removable; face finished to match lockset.

C. High-Security Lock Cylinders: BHMA A156.30; Grade 1; Type M, mechanical; permanent cores that are removable; face finished to match lockset.

D. Construction Master Keys: Provide cylinders with feature that permits voiding of construction keys without cylinder removal. Provide 10 construction master keys.

E. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.

2.24 KEYING

A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, Appendix A. Verify keying system with Authority and incorporate decisions made in keying conference.

1. No Master Key System: Only change keys operate cylinder.
2. Master Key System: Change keys and a master key operate cylinders.

3. Grand Master Key System: Change keys, a master key, and a grand master key operate cylinders.
4. Great-Grand Master Key System: Change keys, a master key, a grand master key, and a great-grand master key operate cylinders.
5. Existing System:

    a. Master key or grand master key locks to Authority's existing system.
    b. Re-key Owner's existing master key system into new keying system.
    c. Obtain instructions from the Authority in writing.

B. Cylinders:

1. Equip locks with cylinders and/or interchangeable-core pin tumbler inserts. Furnish only temporary cylinders or cores for construction, remove these when directed. Provide final cylinders or cores uncombinated, the Authority will combinate and install final units.
2. All final cylinders to be BEST cylinders conforming to existing CTA cylinders. Provide uncombinated cylinders or cores of the type so that the Authority can masterkey.
3. Metals: Construct lock cylinder parts from brass/bronze, stainless steel or nickel silver as indicated.
4. Temporary and final cylinders to be high-security, complying with performance requirements for Grade 1 cylinders as listed in ANSI/BHMA A156.5.

C. Keys and Keying:

1. Provide individual blank change keys for each lock which is noted below. Each key blank to be permanently inscribed with the notation "DO NOT DUPLICATE" and will be permanently inscribed with a number or lock that identifies cylinder manufacturer key symbol.
2. Key Material: Provide blank keys of nickel silver only.
3. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:

    a. Notation: Information to be furnished by the Authority.

4. Key Quantity: Furnish three (3) blank change keys for each lock; five (5) blank master keys for each master system; five (5) blank grandmaster keys for each grandmaster system; and five (5) blank great-grandmaster keys for each great- grandmaster system.

    a. Furnish one extra blank for each lock.
    b. Deliver blank keys to the Authority's representative.

D. Provide a key control system including envelopes, labels, tags with self-locking key clips, temporary markers, for the number of locks required for the project.

2.25 OPERATING TRIM

A. Operating Trim: BHMA A156.6; stainless steel, unless otherwise indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allegion plc.
b. Burns Manufacturing Incorporated.
c. Don-Jo Mfg., Inc.
d. Forms+Surfaces.
e. Hager Companies.
f. Hiawatha, Inc; a division of the Activar Construction Products Group.
g. Rockwood Manufacturing Company; an ASSA ABLOY Group company.
h. Trimco.
i. Approved equal

2.26 ACCESSORIES FOR PAIRS OF DOORS

A. Coordinators: BHMA A156.3; consisting of active-leaf, hold-open lever and inactive-leaf release trigger; fabricated from steel with nylon-coated strike plates; with built-in, adjustable safety release.

B. Carry-Open Bars: BHMA A156.3; prevent the inactive leaf from opening before the active leaf; provide polished brass or bronze carry-open bars with strike plate for inactive leaves of pairs of doors unless automatic or self-latching bolts are used.

C. Astragals: BHMA A156.22.

2.27 SURFACE CLOSERS

A. Surface Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allegion plc.
b. Arrow USA; an ASSA ABLOY Group company.
c. Cal-Royal Products, Inc.
d. Corbin Russwin, Inc.; an ASSA ABLOY Group company.
e. Design Hardware.
f. DORMA Architectural Hardware; a division of DORMA Group North America.
g. Hager Companies.
h. LCN
i. Norton Door Controls; an ASSA ABLOY Group company.
j. Rixson Specialty Door Controls; an ASSA ABLOY Group company.
k. SARGENT Manufacturing Company; ASSA ABLOY.
l. Stanley Commercial Hardware; a division of Stanley Security Solutions.
m. Yale Security Inc; an ASSA ABLOY Group company.
n. Approved equal

B. Size of Units: Except as otherwise specifically indicated, comply with the manufacturer's specifications for size of door control unit, depending upon size of door, exposure to weather and anticipated frequency of use.

1. Where parallel arms are indicated for closers, provide closer unit one size larger than specified for use with standard arms.
2. Provide parallel arms for all overhead closers, except as otherwise indicated.

C. Access-Free Manual Closers: Where manual closers are indicated for doors required to be accessible to the physically handicapped, provide adjustable units complying with ANSI A 117.1 provisions for door opening force and delayed action closing.

D. Provide grey resilient parts for exposed bumpers.

E. All closers to be heavy duty, surface mounted, modern type (covered) conforming to ANSI/BHMA 156.4., Grade 1

1. Rack-and-pinion hydraulic type; with adjustable sweep and latch speeds controlled by key-operated valves; with forged-steel main arm.
2. Mounting: Parallel arm.
3. Type: Regular arm.
4. Backcheck: Adjustable.
5. Cover Material: Aluminum.
6. Closing Power Adjustment: At least 50 percent more than minimum tested value.
7. Closers have been independently certified for 10 million cycles.

F. Provide all-weather fluid.

G. Coordinate closer type, size and location with door and frame manufacturer. Doors required to be internally reinforced for closer installation.

H. Closer to be installed using TORX type thru bolts unless specified and/or approved otherwise.

2.28 CONCEALED CLOSERS

A. Concealed Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves. Comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allegion plc.
b. DORMA Architectural Hardware; a division of DORMA Group North America.
c. Norton Door Controls; an ASSA ABLOY Group company.
d. Rixson Specialty Door Controls; an ASSA ABLOY Group company.
e. SARGENT Manufacturing Company; ASSA ABLOY.
f. Approved equal

2.29 CLOSER HOLDER RELEASE DEVICES

A. Closer Holder Release Devices: BHMA A156.15; Grade 1; closer connected with separate or integral releasing and fire- or smoke-detecting devices. Door shall

become self-closing on interruption of signal to release device. Automatic release is activated by smoke detection system.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Allegion plc.
    b. Corbin Russwin, Inc.; an ASSA ABLOY Group company.
    c. DORMA Architectural Hardware; a division of DORMA Group North America.
    d. Norton Door Controls; an ASSA ABLOY Group company.
    e. Rixson Specialty Door Controls; an ASSA ABLOY Group company.
    f. SARGENT Manufacturing Company; ASSA ABLOY.
    g. Stanley Commercial Hardware; a division of Stanley Security Solutions.
    h. Approved equal

2.30 MECHANICAL STOPS AND HOLDERS

A. Wall- and Floor-Mounted Stops: BHMA A156.16; stainless steel base metal, unless approved otherwise.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Allegion plc.
    b. Architectural Builders Hardware Mfg., Inc.
    c. Baldwin Hardware Corporation.
    d. Burns Manufacturing Incorporated.
    e. Cal-Royal Products, Inc.
    f. Don-Jo Mfg., Inc.
    g. Door Controls International, Inc.
    h. Hager Companies.
    i. Hiawatha, Inc; a division of the Activar Construction Products Group.
    j. Ives
    k. Rockwood Manufacturing Company; an ASSA ABLOY Group company.
    l. Trimco.
    m. Approved equal

2.31 ELECTROMAGNETIC STOPS AND HOLDERS

A. Electromagnetic Door Holders: BHMA A156.15, Grade 1; wall-mounted electromagnetic single or floor-mounted electromagnet single or floor-mounted electromagnet double as shown or required unit with strike plate attached to swinging door; coordinated with fire detectors and interface with fire alarm system for labeled fire-rated door assemblies.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Allegion plc.
    b. Architectural Builders Hardware Mfg., Inc.
    c. DORMA Architectural Hardware; a division of DORMA Group North America.
    d. Hager Companies.

e. Lawrence Hardware Inc.
f. SARGENT Manufacturing Company; ASSA ABLOY.
g. Approved equal

2.32 OVERHEAD STOPS AND HOLDERS

A. Overhead Stops and Holders: BHMA A156.8.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allegion plc.
b. Architectural Builders Hardware Mfg., Inc.
c. Rixson Specialty Door Controls; an ASSA ABLOY Group company.
d. SARGENT Manufacturing Company; ASSA ABLOY.
e. Approved equal

2.33 DOOR GASKETING AND WEATHERSTRIPPING

A. Door Gasketing: BHMA A156.22; air leakage not to exceed 0.50 cfm per foot (0.000774 cu. m/s per m) of crack length for gasketing other than for smoke control, as tested according to ASTM E 283; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Hager Companies.
b. M-D Building Products, Inc.
c. National Guard Products, Inc.
d. Pemko Manufacturing Co.
e. Reese Enterprises, Inc.
f. Sealeze.
g. Zero International, Inc.
h. Approved equal

B. Provide continuous weather-strip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated or scheduled. Provide type, sizes and profiles shown or scheduled. Provide non-corrosive fasteners as specified by manufacturer for application indicated.

1. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame. Where head seals are used with parallel arm mounted closers, provide a head seal to match an NGP 700SA closer.
2. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
3. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

C. Air Leakage: Not to exceed 0.50 cfm per foot (0.000774 cu. m/s per m) of crack length for gasketing other than for smoke control, as tested according to ASTM E283.

D. Smoke-Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke-control ratings indicated, based on testing according to UL 1784.

1. Provide smoke-labeled gasketing on all smoke- and fire-rated doors requiring fire- label gasketing.

E. Fire-Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL 10B or NFPA 252. Where required by NFPA.

F. Gasketing Materials: Comply with ASTM D2000 and AAMA 701/702.

G. Replaceable Seal Strips: Provide only those unites where resilient or flexible seal strip is easily replaceable and readily available from manufacturers stock.

H. Weatherstripping at Jambs and Heads: Provide bumper-type resilient insert and metal retainer strips, surface-applied unless shown as mortised or semi-mortised, of metal, finish and resilient bumper material as indicated in hardware.

I. Weatherstripping at Door Bottoms: Provide threshold consisting of contact type resilient insert and metal housing of design and size shown; of metal, finish, and resilient seal strip indicated in hardware schedule.

J. Adjustable, Housed Perimeter Gasketing: Screw-adjustable gasket material held in place by metal housing; fastened to frame stop with screws.

1. Gasket Material: Polyurethane bulb or Vinyl bulb.
2. Housing Material: Stainless steel.

K. Meeting Gasket double doors with not astragal or center post: Gasket material held in place by metal housing; mounted with screws.

1. Gasket Material: Neoprene bulb or Vinyl bulb.
2. Housing Material: Stainless steel.
3. Mounting: Mortised or Semimortised into edge of each door.

2.34 THRESHOLDS

A. Thresholds: BHMA A156.21; fabricated to full width of opening indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Hager Companies.
b. M-D Building Products, Inc.
c. National Guard Products, Inc.
d. Pemko Manufacturing Co.
e. Reese Enterprises, Inc.

f. Rixson Specialty Door Controls; an ASSA ABLOY Group company.
g. Sealeze.
h. Zero International, Inc.
i. Approved equal

B. General: Except as otherwise indicated provide a threshold at every door, handicap accessible, stainless steel threshold unit of type, size and rabbeted profile as shown or scheduled.

C. Provide units not less than 4" wide, formed to accommodate change in floor elevation where indicated, fabricated to accommodate door hardware and to fit door frames, and as scheduled.

D. Saddle Thresholds for: Fluted top; type and base metal as follows:

1. Conforming to ANSI/BHMA 156.21, J52130 – Fluted top; Barrier free.
2. Base Metal: Stainless steel.

E. Neoprene Gasket: Unless indicated otherwise, all thresholds shall have a continuous neoprene gasket at the vertical ledge of the rabbeted threshold facing the opening side of the door.

2.35 METAL PROTECTIVE TRIM UNITS

A. Metal Protective Trim Units: BHMA A156.6; fabricated from 0.050-inch thick stainless steel; with manufacturer's standard machine or self-tapping screw fasteners.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allegion plc.
b. Burns Manufacturing Incorporated.
c. Don-Jo Mfg., Inc.
d. Hiawatha, Inc; a division of the Activar Construction Products Group.
e. InPro Corporation (IPC).
f. Ives
g. Pawling Corporation.
h. Rockwood Manufacturing Company; an ASSA ABLOY Group company.
i. Trimco.
j. Approved equal

B. Fasteners: Provide manufacturer's standard exposed fasteners for door trim units (kick plates, mop plates, edge trim, viewers, knockers, mail drops and similar units); either TORX type machine screws or self-tapping screw.

C. Fabricate edge trim of stainless steel, not more than 1/2" nor less than 1/16" smaller in length than door dimension.

D. Provide kickplates at both sides of door. Fabricate kick plates and mop plates not more than 2" less than door width on stop side and not more than 1" less than door width on pull side, x 8" high unless otherwise indicated. Metal plates shall be stainless steel, 0.050" (U.S. 16 ga.).

E. Standards: Comply with the following:

1. Door Trim: ANSI A156.6.
2. Stops and Bumpers: ANSI A156.16.
3. Door Silencers: ANSI A156.16

F. Stops: Provide each door with a convex, rubber wall stop or floor stop, with satin stainless steel base, similar as indicated in the schedule. Exterior and unusual door locations shall receive overhead stop integral with closer as indicated or required.

1. Stops and Bumpers: BHMA Grade 1.
2. Floor mounted dome stop: Ives FS438 or approved equal.
3. Wall mounted bumber : Ives WS406/407 CVX or approved equal.

2.36 LOCK GUARD

A. To deter insertion of tools, picking, or forcing of latch at opening between door and frame for doors in public areas that open outward. Lock guard to be non-handed, suitable for mortise locks, have an offset that permits use on hollow metal installations and allow clearance for lip of lock strike. Lock guard to be of 16 gauge stainless steel, satin finish. Lock guard to be 1 ½" wide X 9 ½" long.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Ives.
   b. Approved equal

2.37 AUXILIARY DOOR HARDWARE

A. Auxiliary Hardware: BHMA A156.16.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Allegion plc.
   b. Baldwin Hardware Corporation.
   c. Cal-Royal Products, Inc.
   d. Don-Jo Mfg., Inc.
   e. Hager Companies.
   f. Rockwood Manufacturing Company; an ASSA ABLOY Group company.
   g. Trimco.
   h. Approved equal

2.38 AUXILIARY ELECTRIFIED DOOR HARDWARE

A. Auxiliary Electrified Door Hardware:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Allegion plc.
   b. Door Controls International, Inc.
   c. DynaLock Corp.
   d. GE Security, Inc.
   e. PDQ Manufacturing.

f. Precision Hardware, Inc.; a Stanley company.
g. Rutherford Controls Int'l. Corp.
h. SARGENT Manufacturing Company; ASSA ABLOY.
i. Securitron Magnalock Corporation; an ASSA ABLOY Group company.
j. Security Door Controls.
k. Approved equal

2. All hardware, equipment, power supply, power transfers and operators for electrified door systems shall be concealed in the door, frame and building construction to the greatest extent possible. Shop drawings shall indicate locations and installation details of equipment, power supplies, conduit and access to equipment for maintenance on the shop drawings for the Authority's review and approval.

2.39 FASTENERS

A. Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to commercially recognized industry standards for application intended. Provide Phillips flat- head screws with finished heads to match surface of door hardware, unless otherwise indicated.

1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use

through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.

2. Steel TORX type Machine or Wood Screws: For the following fire-rated applications:

a. Mortise hinges to doors.
b. Strike plates to frames
c. Closers to doors and frames.

3. Steel TORX type Through Bolts: For the following fire-rated applications, unless door blocking is provided:

a. Surface hinges to doors.
b. Closers to doors and frames.
c. Surface-mounted exit devices.

4. Spacers or Sex Bolts: For through bolting of hollow metal doors.
5. Fasteners for Wood Doors: Comply with requirements of DHI WDHS.2, "Recommended Fasteners for Wood Doors."

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. The designations used in schedules and elsewhere to indicate hardware finishes are those listed in ANSI A 156.18 "Materials & Finishes Standard", including coordination with the traditional U.S. finishes shown by certain manufacturers for their products.

D. Fire-Rated Surface Bolts: 8 inch steel bolt with 2 steel guides; minimum 1 inch throw; listed and labeled for fire-rated doors; with universal strike.

2.40 FABRICATION

A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rated labels and as otherwise approved by Commissioner.

1. Manufacturer's identification is permitted on rim of lock cylinders only.

B. Base Metals: Produce door hardware units of base metal indicated, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMAA156.18.

1. Dissimilar Metals: Hardware and trim items to be of the same metal as the metal it is being attached to or welded to as required to avoid galvanic action. If the metal cannot be changed, provide separation material between the dissimilar metals as required to avoid galvanic action.

C. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.

1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.

2. Fire-Rated Applications:

a. Wood or Machine Screws: For the following:

1) Hinges mortised to doors or frames; use threaded-to-the-head wood screws for wood doors and frames.
2) Strike plates to frames.
3) Closers to doors and frames.

b. Steel Through Bolts: For the following unless door blocking is provided:

1) Surface hinges to doors.
2) Closers to doors and frames.
3) Surface-mounted exit devices.

2. Spacers or Sex Bolts: For through bolting of hollow-metal doors.

3. Fasteners for Wood Doors: Comply with requirements in DHI WDHS.2, "Recommended Fasteners for Wood Doors."

4. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

2.41 FINISHES

A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

1. Butts and Hinges: ANSI A 156.1 (BHMA 101).
2. Locks and Lock Trim: ANSI A 156.2 (BHMA 601).
3. Exit Devices: ANSI A 156.3 (BHMA 701).
4. Door Controls - Closers: ANSI A 156.4 (BHMA 301).
5. Auxiliary Locks: ANSI A 156.5 (BHMA 501).
6. Architectural Door Trim: ANSI A 156.6 (BHMA 1001).
7. Template Hinge Dimensions: ANSI A 156.7.
8. Door Controls - Overhead Holders: ANSI A 156.8 (BHMA 311).
9. Mortise Locks & Latches: ANSI A 156.13 (BHMA 621).
10. Closer Holder Release Devices: ANSI A 156.15 (BHMA 321).
11. Auxiliary Hardware: ANSI A 156.16 (BHMA 1201).
12. Materials & Finishes: ANSI A 156.18 (BHMA 1301).
13. Continuous Geared Hinges: BHMA A156.26.

D. Finish shall be satin stainless steel ANSI/BHMA A156.18 Finish Number 630 or US32D, unless noted or approved otherwise. Provide matching finishes for hardware units at each door or opening, to the greatest extent possible, and except as otherwise indicated. Reduce differences in color and textures as much as commercially possible where the base metal or metal forming process is different for individual units of hardware exposed at the same door or opening. In general, match items to the manufacturer's standard finish for the latch and lock set (or push pull units if no latch lock sets) for color and texture.

2.42 MATERIALS AND FABRICATION

A. Hand of door: Drawings show direction of slide, swing or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.

B. Manufacturer's Name Plate: Do not use manufacturer's products which have manufacturer's name or trade name displayed in a visible location (omit removable nameplates), except in conjunction with required UL labels and as otherwise acceptable to Engineer. Manufacturer's identification will be permitted on rim of lock cylinders only.

C. Base Metals: Produce hardware units of basic metal and forming method indicated, using manufacturer's standard metal alloy, composition, temper and hardness, but in no case of lesser (commercially recognized) quality than specified for applicable hardware units by applicable ANSI A 156 series standard for each type hardware item and with ANSI A
156.18 for finish designations indicated. Do not furnish "optional" materials or

forming methods for those indicated, except as otherwise specified.

D. Fasteners: Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation. Do not provide hardware which has been prepared for self-tapping sheet metal screws, except as specifically indicated.

E. Furnish screws for installation, with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match hardware finish or, if exposed in surfaces of other work, to match finish of such other work as closely as possible, including "prepared for paint" in surfaces to receive painted finish.

F. Provide concealed fasteners for hardware units which are exposed when door is closed, except to extent no standard units of type specified are available with concealed fasteners or specified otherwise. Unless specified otherwise, do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work, except where it is not feasible to adequately reinforce the work. In such cases, provide sleeves for each
thru-bolt or use hex screw fasteners.

1. Use thru-bolts for installation of closers in all cases unless specified and/or approved otherwise or not permitted on fire rated doors. Finish of thru-bolts to match closer. Size of thru-bolts as required for hardware and door and recommended by manufacturer of door closer.

G. Tools and Maintenance Instructions for Maintenance: Furnish a complete set of specialized tools and maintenance instructions as needed for Authority's continued adjustment, maintenance, and removal and replacement of finish hardware.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Determine that doors and frames have been properly reinforced to receive the hardware and the reinforcing is properly located. Reinforcing to be concealed within the door and frame. Coordinate with door and frame supplier.

C. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.

B. Wood Doors: Comply with DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."

3.03 INSTALLATION

A. Mount Hardware units at heights indicated in recommendations by the Door and Hardware Institute, except as specifically indicated or required to comply with governing regulations, and except as may be otherwise directed by the Authority.

1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
2. Custom Steel Doors and Frames: HMMA 831.
3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

B. Install each hardware item in compliance with the manufacturer's instructions and specifications. Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted or finished in another way, coordinate removal, storage and reinstallation or application of surface protection with finishing work specified in the Division 09 sections. Do not install surface-mounted items until finishes have been completed on the substrate.

C. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

D. Drill and countersink units which are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

E. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.

F. Intermediate Offset Pivots: Where offset pivots are indicated, provide intermediate offset pivots in quantities indicated in door hardware schedule but not fewer than one intermediate offset pivot per door and one additional intermediate offset pivot for every 30 inches of door height greater than 90 inches.

G. Lock Cylinders: Install construction cores to secure building and areas during construction period.

1. Replace construction cores with permanent cores as directed by the Authority.
2. Furnish permanent cores to the Authority for installation.

H. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.

I. Boxed Power Supplies: Locate power supplies as indicated or, if not indicated, Verify location with Authority.

1. Configuration: Provide one power supply for each door opening or least number of power supplies required to adequately serve doors as approved by the Authority with electrified door hardware.
2. Provide conduit and power to hardware power supply, door frame, and devices.

J. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.

K. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

L. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

M. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

N. Set thresholds for doors in full bed of butyl-rubber or polyisobutylene mastic sealant.

O. Weatherstripping and Seals: Comply with manufacturer's instructions and specifications to the extent installation requirements are not otherwise indicated.

P. Examine roughing-in for electrical systems to verify actual locations of power connections before automatic door operator installation.

Q. Proceed with installation only after unsatisfactory conditions have been corrected.

3.04 INSTALLATION OF POWER DOOR OPERATORS

A. General: Install complete power door operator system according to manufacturer's written instructions, including controls, control wiring, and remote power units.

1. Refer to Division 26 Sections for power connection.

B. After repeated operation of completed installation equivalent to 3 days' use by normal traffic (100 to 300 cycles), readjust door operators and controls for optimum operating condition, safety, and weathertight closure. Lubricate hardware, operating equipment, and other moving parts.

C. Engage a certified inspector to train Authority’s representative to adjust, operate, and maintain the power door opener equipment.

D. All hardware, equipment, power supply, power transfers and operators for power door systems shall be concealed in the door, frame and building construction to the greatest

extent possible and installed as shown, located and detailed on the approved shop drawings.

E. Install actuactors at locations indicated, as indicated on hardware schedule and to meet ADA and codes. Type of actuator as listed in hardware schedule. Height of actuator per ADA and codes. Verify all locations dimensions and conditions.

3.05 INSTALLATION OF BOLLARDS

A. Install complete power door operator system according to manufacturer’s written instructions including conduit and wiring.

B. Install bollards at locations including, as indicated on hardware schedule and meet ADA and codes. Type and size of bollard as shown on the drawings or listed in the

hardware schedule. Height of bollard as required for required height of actuator. Verify all locations dimensions and conditions.

C. Secure bollard to concrete or other surface with manufacturer supplied and recommended bracket and bolts. Follow manufacturer's installation instructions. Bollard to be straight and level. Installation to be tight and secure with no "wobble". Provide continuous sealant where bollard meets pavement.

3.06 ADJUST AND CLEAN

A. Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly as intended for the application made.

1. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
2. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

B. Clean adjacent surfaces soiled by hardware installation.

C. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy of a space or area, return to the work during the week prior to acceptance or occupancy, and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

D. Instruct Authority's Personnel in proper adjustment and maintenance of hardware and hardware finishes, during the final adjustment of hardware.

E. Continued Maintenance Service: Approximately six months after the acceptance of hardware in each area, the Installer, accompanied by the representative of the latch and lock manufacturer, shall return to the project and re-adjust every item of hardware to restore proper function of doors and hardware. Consult with and instruct Authority's personnel in recommended additions to the maintenance procedures. Replace hardware items which have deteriorated or failed due to faulty design, materials or installation of hardware units. Prepare a written report of current and predictable problems (of substantial nature) in the performance of the hardware.

F. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain automatic door operators. Refer to Division

01 Section, Closeout Procedures.

3.07 HARDWARE SCHEDULE

A. Provide hardware for each door to comply with requirements indicated in this section. The following hardware sets as listed in this Schedule are for locations indicated on the drawings.

B. Keying system per the Authority's requirements. Refer to Drawings for door handing and sizes. Provide size of hinges as specified above.

C. Hardware groups 01 thru 10 are to be included, but not limited to, the following types of doors and frames, unless indicated otherwise:

1. Hollow Metal Doors and Frames
2. Stainless Steel Doors and Frames
3. Aluminum (Aluminum and Glass) Doors and Frames
4. Fiberglass Doors in Hollow Metal Frames

D. Wood doors and frames, gates, access panels, roll up grilles, window locks have their own specialized hardware groups.

E. Refer to Section 13 06 00, Customer Assistant's Kiosk for kiosk door hardware requirements.

Hardware Set No. 09

For use on mark/door #(s):
JANITOR CLOSET, STORAGE CLOSET

Provide each SGL door with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	700SF Series	630	IVE
1	EA	STOREROOM LOCK	L9080L 07N TORX	630	SCH
1	EA	SFIC MORTISE CYL	1E74 C265 RP3 WITH CONST CORE	626	BES
1	EA	LOCK GUARD	LG12	630	IVE
1	EA	OH STOP	90S SOC	630	GLY
1	EA	SURFACE CLOSER	4040XP EDA SRI ST-2730 TBTORX	689	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B4E TORX	630	IVE
1	EA	FLOOR STOP	FS438	626	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	RAIN DRIP	142A	AL	ZER
1	SET	SEALS	700SA	CL	NGP
1	SET	SEALS	328AA	AL	ZER
1	EA	DOOR SWEEP	39A	AL	ZER
1	EA	THRESHOLD	65A MSLA-10	AL	ZER
	EA	SILENCER	SR64	GRY	IVE

Notes:
1) Mount 700SA head seal prior to mounting closer.
2) Provide appropriate closer and closer arm based on door swing either an LCN 4010 or LCN 4110. Prior to bidding, consult with Authority via official RFI to verify.
3) Provide reinforcing in HM frame for both a parallel arm mount or standard mount closer.
4) Provide an Ives FS438 Floor stop if a wall stop is not applicable and the location is acceptable for a floor stop. Prior to bidding, consult with Authority via official RFI to verify.
5) Provide a Glynn Johnson 90S OH stop if a wall or floor stop is not applicable. Prior to bidding, consult with Authority via official RFI to verify.
6) Keying to be determined by owner. Prior to bidding, consult with Authority via official RFI to verify.
7) Provide TORX type screws at all weatherstripping.
8) When this hardware group is used on a stainless steel door, provide an Ives 700 pin and barrel hinge with security screws in a 630 finish in lieu of the 224HD hinge.

Hardware Set No. 10

For use on mark/door #(s):
COMMUNICATION ROOM

Provide each SGL door with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	700SF Series	630	IVE
1	EA	STOREROOM LOCK	L9080L 07N TORX	630	SCH
1	EA	SFIC MORTISE CYL	1E74 C265 RP3 WITH CONST CORE	626	BES
1	EA	LOCK GUARD	LG12	630	IVE
1	EA	OH STOP	90S SOC	630	GLY
1	EA	SURFACE CLOSER	4040XP EDA SRI ST-2730 TBTORX	689	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B4E TORX	630	IVE
1	EA	FLOOR STOP	FS438	626	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	RAIN DRIP	142A	AL	ZER
1	SET	SEALS	700SA	CL	NGP
1	SET	SEALS	328AA	AL	ZER
1	EA	DOOR SWEEP	39A	AL	ZER
1	EA	THRESHOLD	65A MSLA-10	AL	ZER
3	EA	SILENCER	SR64	GRY	IVE

Notes:
1) Mount 700SA head seal prior to mounting closer.
2) Provide appropriate closer and closer arm based on door swing. Either an LCN 4010 or LCN 4110. Prior to bidding, consult with Authority via official RFI to verify.
3) Provide reinforcing in HM frame for both a parallel arm mount or standard mount closer.
4) Provide an Ives FS438 Floor stop if a wall stop is not applicable and the location is acceptable for a floor stop. Prior to bidding, consult with Authority via official RFI toverify.
5) Provide a Glynn Johnson 90S OH stop if a wall or floor stop is not applicable. Prior to bidding, consult with the Authority via official RFI to verify.
6) Provide TORX type screws at all weatherstripping.
7) Keying to be determined by the Authority. Prior to bidding, consult with Authority via official RFI to verify.
8) When this hardware group is used on a stainless steel door, provide an Ives 700 pin and barrel hinge with security screws in a 630 finish in lieu of the 224HD hinge.

Hardware Set No. 11

For use on mark/door #(s):

ELEVATOR OR ESCALATOR MACHINE ROOM DOOR

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	700SF Series	630	IVE
1	EA	STOREROOM LOCK	L9080L 807L 07L TORX	630	SCH
1	EA	SFIC MORTISE CYL	1E74 C265 RP3 WITH CONST CORE	626	BES
1	EA	LOCK GUARD	LG12	630	IVE
1	EA	OH STOP	90S SOC	630	GLY
1	EA	SURFACE CLOSER	4040XP EDA SRI ST-2730 TBTORX	689	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B4E TORX	630	IVE

1	EA	FLOOR STOP	FS438	626	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	RAIN DRIP	142A	AL	ZER
1	SET	SEALS	700SA	CL	NGP
1	SET	SEALS	328AA	AL	ZER
1	EA	DOOR SWEEP	39A	AL	ZER
1	EA	THRESHOLD	65A MSLA-10	AL	ZER
3	EA	SILENCER	SR64	GRY	IVE

Notes:

1) Provide appropriate closer and closer arm based on door swing. Either an LCN 4010 or LCN 4110. Prior to bidding, consult with Authority via official RFI to verify.
2) Provide reinforcing in HM frame for both a parallel arm mount or standard mount closer.
3) Provide an Ives FS438 Floor stop if a wall stop is not applicable and the location is acceptable for a floor stop. Prior to bidding, consult with Authority via official RFI toverify.
4) Provide a Glynn Johnson 90S OH stop if a wall or floor stop is not applicable. Prior to bidding, consult with Authority via official RFI to verify.
5) Provide TORX type screws at all weatherstripping.
6) Keying to be determined by owner. Prior to bidding, consult with Authority via official RFI to verify.
7) When this hardware group is used on a stainless steel door, provide an Ives 700 pin and barrel hinge with security screws in a 630 finish in lieu of the 224HD hinge.
8) Provide knurled handles for doors to hazardous areas per ADA.

Hardware Set No. 12

For use on mark/door #(s):
ELECTRICAL ROOM, COMMONWEALTH EDISON ROOM DOOR

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	700SF Series	630	IVE
1	EA	PANIC HARDWARE	LD-9875-L-NL-07--SEC	626	VON
1	EA	SFIC MORTISE CYL	1E74 C128 WITH CONST CORE	626	BES
1	EA	LOCK GUARD	LG12	630	IVE
1	EA	OH STOP	90S SOC	630	GLY
1	EA	SURFACE CLOSER	4040XP EDA SRI ST-2730 TBTORX	689	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B4E TORX	630	IVE
1	EA	FLOOR STOP	FS438	626	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	RAIN DRIP	142A	AL	ZER
1	SET	SEALS	700SA	CL	NGP
1	SET	SEALS	328AA	AL	ZER
1	EA	DOOR SWEEP	39A	AL	ZER
1	EA	THRESHOLD	65A MSLA-10	AL	ZER
3	EA	SILENCER	SR64	GRY	IVE

Notes:

1) Mount 700SA head seal prior to mounting closer.
2) Provide appropriate closer and closer arm based on door swing. Either an LCN 4010 or LCN 4110. Prior to bidding, consult with Authority via official RFI to verify.
3) Provide reinforcing in HM frame for both a parallel arm mount or standard mount closer.
4) Provide an Ives FS438 Floor stop if a wall stop is not applicable and the location is acceptable for a floor stop. Prior to bidding, consult with Authority via official RFI toverify.

5) Provide a Glynn Johnson 90S OH stop if a wall or floor stop is not applicable. Prior to bidding, consult with Authority via official RFI to verify.
6) Provide TORX type screws at all weatherstripping.
7) Keying to be determined by owner. Prior to bidding, consult with Authority via official RFI to verify.
8) When this hardware group is used on a stainless steel door, provide an Ives 700 pin and barrel hinge with security screws in a 630 finish in lieu of the 224HD hinge.
9) Provide knurled handles for doors to hazardous areas per ADA.

Hardware Set No. 14

For use on mark/door #(s):
TOILET ROOM DOOR

Provide each SGL door with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	700SF Series	630	IVE
1	EA	PRIVACY W/DB & IND	L9496L 07L TORX	630	SCH
1	EA	SFIC MORTISE CYL	1E74 C265 RP3 WITH CONST CORE	626	BES
1	EA	LOCK GUARD	LG12	630	IVE
1	EA	OH STOP	90S SOC	630	GLY
1	EA	SURFACE CLOSER	4040XP EDA SRI ST-2730 TBTORX	689	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B4E TORX	630	IVE
1	EA	FLOOR STOP	FS438	626	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	SET	SEALS	700SA	CL	NGP
1	SET	SEALS	328AA	AL	ZER
1	EA	DOOR SWEEP	39A	AL	ZER
1	EA	THRESHOLD	65A MSLA-10	AL	ZER
3	EA	SILENCER	SR64	GRY	IVE

Notes:
1) Mount 700SA head seal prior to mounting closer.
2) Provide appropriate closer and closer arm based on door swing 4010 or 4110. Prior to bidding, consult with Authority via official RFI to verify.
3) Provide reinforcing in HM frame for both a parallel arm mount or standard mount closer.
4) Provide an Ives FS438 Floor stop if a wall stop is not applicable and the location is acceptable for a floor stop. Prior to bidding, consult with Authority via official RFI to verify.
5) Provide a Glynn Johnson 90S OH stop if a wall or floor stop is not applicable. Prior to bidding, consult with Commissioner via official RFI to verify.
6) Keying to be determined by owner. Prior to bidding, consult with Authority via official RFI to verify.
7) Provide TORX type screws at all weatherstripping.
8) When this hardware group is used on a stainless steel door, provide an Ives 700 pin and barrel hinge with security screws in a 630 finish in lieu of the 224HD hinge.

Hardware Set No. 16

For use on mark/door #(s):
MESH GATES, STAINLESS STEEL GATES, SECURITY GATES

Provide each SGL gate with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	DEADLOCK	MS1850S	628	ADA
2	EA	SFIC MORTISE CYL	1E74 C265 RP3 WITH CONST CORE	626	BES

Notes:
1) Keying to be determined by owner. Prior to bidding, consult with Authority via official RFI to verify.
2) At gates indicated to receive top and bottom flush bolts provide Adams Rite 1870 or 1861, double gates each gate receive Best cylinders. Gates shall lock in open position.
3) Remainder of hardware by gate manufacturer. Hardware for platform end gates is indicated on the drawings.
4) Provide mesh or additional bars secured to gate or other means of same material as gate and as approved by the Authority to prevent reaching thru the gate to access the hardware and obtain unauthorized entry.

Hardware Set No. 17

For use on mark/door #(s):
SWING DOOR, SLIDING DOOR FOR WIRE MESH PARTITION

Provide each SGL door with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA ADA	DEADLOCK	MS1850S	628	
2	EA	SFIC MORTISE CYL	1EJ74 (HIGH SEC UL 437) C265 RP3 WITH CONST CORE	626	BES

Notes:
1) Keying to be determined by owner. Prior to bidding, consult with Authority via official RFI to verify.
2) Remainder of hardware by swinging/sliding wire mesh partition manufacturer.
3) Provide appropriate locking device depending on swinging door versus sliding door.

Hardware Set No. 18

For use on mark/door #(s):
AUXILIARY ENTRY – EXIT
GATES

Provide each SGL gate with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	PANIC HARDWARE	98-L-NL-07-WH-SNB-SEC	630AM	VON
1	EA	SFIC RIM CYL	1E72 WITH CONST CORE	626	BES
1	EA	SURFACE CLOSER	4040XP SCUSH SRI TBTORX	689	LCN
1	EA	MOUNTING PLATE	4110-18	689	LCN
1	EA	CUSH SHOE SUPPORT	4110-30	689	LCN

1	EA	GATE BOX	KEEDEX K-BXEDV992L2	PRI	KEE

Notes:
1) Keying to be determined by owner. Prior to bidding, consult with Authority via official RFI to verify.
2) All other hardware required for gate to work properly is to be supplied by the gate supplier.
3) Provide mesh or additional bars secured to gate or other means of same material as gate and as approved by the Authority to prevent reaching thru the gate to access the hardware and obtain unauthorized entry.

Hardware Set No. 19

For use on mark/door #(s):
SECURITY GATES

Provide each SGL gate with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	PANIC HARDWARE	98-EO-WH-SNB-SEC	630AM	VON
1	EA	SURFACE CLOSER	4040XP SCUSH SRI TBTORX	689	LCN
1	EA	MOUNTING PLATE	4110-18	689	LCN
1	EA	CUSH SHOE SUPPORT	4110-30	689	LCN
1	EA	GATE BOX	KEEDEX K-BXEDV992L2	PRI	KEE

Notes:
1) All other hardware required for gate to work properly is to be supplied by the gate supplier.
2) Provide mesh or additional bars secured to gate or other means of same material as gate and as approved by the Authority to prevent reaching thru the gate to access the hardware and obtain unauthorized entry.

Hardware Set No. 20

For use on mark/door #(s):
ALARMED EXIT SINGLE
GATE

Provide each SGL gate with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	700SF Series	630	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC PANIC HARDWARE	RX-SS-98-NL-SNB-SEC	630	VON
1	EA	SFIC RIM CYL	1E72 WITH CONST CORE	626	BES
1	EA	SFIC MORTISE CYL	1E74 C128 WITH CONST CORE	626	BES
1	EA	SURFACE CLOSER	4040XP EDA SRI ST-2730 TBTORX	689	LCN
1	EA	HORN	1910-1	WHT	SCE
1	EA	POWER SUPPLY	PS-902-4RL	LGR	VON
1	EA	DOOR SENSOR	7766 SURFACE MOUNTED DOOR POSITION SWITCH		SCE
1	EA	KEY SWITCH	653-04-L2		SCE
1	EA	FLEXIBLE LOOP	788 ARMORED DOOR CORD SCE CONNECTION		

Operation:

1) Connect the "SS" Signal Switch latch and push pad monitor switches to the security console in the CA Kiosk to notify the CA as well as the remote horn and power supply. Unauthorized egress triggers alarm. Alarm silenced when gate returns to its closed position. CA to be able to deactivate the alarm when needed.

Notes:

1) Provide reinforcing for both a parallel arm mount or standard mount closer.
2) Keying to be determined by owner. Prior to bidding, consult with Authority via official RFI to verify.
3) Power for the "SS" Signal Switch inside the exit device and the remote horn is by the PS904 power supply.
4) Use Von Duprin wiring diagram.
5) Red silk screen lettering “Emergency Exit Only – Push to Open and Sound Alarm” to be provided on exit device touchpad trim.
6) Provide TORX type screws at all weatherstripping.
7) When this hardware group is used on a stainless steel door, provide an Ives 700 pin and barrel hinge with security screws in a 630 finish in lieu of the 224HD hinge.
8) Provide mesh or additional bars secured to gate or other means of same material as gate and as approved by the Authority to prevent reaching thru the gate to access the hardware and obtain unauthorized entry.

Hardware Set No. 21

For use on mark/door #(s):
GATE AT END OF
PLATFORM

Provide each SGL gate with the following:

Qty		Description		Finish
1 PR.	EA.	Spring Hinges	Self-Closing, Adjustable Tension	Same as gate
1	EA.	Latch	Self-Latching, Non-Lockable	material (Ptd.
1	EA.	Drop Rod/Cane Bolt	L-Shaped rod, 24” high, held in place with 3” tubes welded top and btm of gate frame	mtl., galv. mtl., stainless stl.)

Notes:

1) Drill hole in platform to receive drop rod/cane bolt.

Hardware Set No. 22

For use on mark/door #(s):
SECURITY ROLL UP
GRILLE

Provide each SGL grille with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	SFIC CYL	1W7K4 WITH CONST CORE	626	BES

Notes:

1) Keying to be determined by Authority. Prior to bidding, consult with Authority via official RFI to verify.

2) Remainder or hardware by security roll up grille manufacturer, including switch and electric operator.

Hardware Set No. 23

For use on mark/door #(s):
ELEVATOR WINDOW
LOCKS

Provide each SGL window with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	SFIC CYL	1E7E4 WITH CONST CORE	626	BES

Notes:
1) Keying to be determined by Authority. Prior to bidding, consult with Authority via official RFI to verify.
2) Remainder or hardware by elevator window manufacturer.

Hardware Set No. 24

For use on mark/door #(s):
WALL AND CEILING ACCESS PANELS

Provide each SGL panel with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	SFIC CYL	1E7D4 WITH CONST CORE	626	BES

Notes:
1) Keying to be determined by Authority. Prior to bidding, consult with Authority via official RFI to verify.
2) Remainder or hardware by wall and ceiling access panel manufacturer.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 08 71 00, Door Hardware shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 08 71 00, Door Hardware shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 08 71 00.S
DOOR HARDWARE

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions and Division 1 Specification sections, apply to this section.

1.02 SUMMARY

A. Definition: "Door Hardware" includes items known commercially as finish hardware which are required for swing, sliding and folding doors, except special types of unique and non-matching hardware specified in the same section as the door and door frame.

B. Extent of door hardware required is indicated on drawings and in schedules.

C. Types of door hardware required include, but may not be limited to, the following:

1. Hinges, Continuous Hinges
2. Lock cylinders and keys
3. Lock and latch sets
4. Bolts
5. Closers and other door control devices
6. Overhead holders
7. Exit door hardware
8. Door trim units
9. Protection plates
10. Weatherstripping for doors
11. Thresholds
12. Stops
13. Astragals or meeting seals on pairs of doors
14. Automatic door hardware
15. Actuators and Bollards
16. Lock Guard
17. Alarmed exit device

D. Related Sections: The following sections contain requirements that relate to this Section.

1. Division 04 Section, “Unit Masonry”.
2. Division 8 Section, “Stainless Steel Doors and Frames”.
3. Division 8 Section, “Access Doors and Frames”.

1.03 REFERENCES

A. AAA DM – American Association of Automatic Door Manufacturers.

B. AAMA 701/702 – Combined Voluntary Specifications for Pile Weatherstripping and

Replaceable Fenestration Weatherseals, American Architectural Manufacturers Association.

C. ANSI A117.1 – Accessible and Usable Buildings and Facilities.

D. ANSI A156.1 (BHMA 101) - Butts and Hinges.

E. ANSI A156.2 (BHMA 601) - Bored and Preassembled Locks and Latches.

F. ANSI A156.3 (BHMA 701) - Exit Devices.

G. ANSI A156.4 (BHMA 301) - Door Controls-Closers.

H. ANSI A156.5 (BHMA 501) - Auxiliary Locks and Associated Products.

I. ANSI A156.6 (BHMA 1001) - Architectural Door Trim.

J. ANSI A156.7 - Template Hinge Dimensions.

K. ANSI A156.8 (BHMA 311) - Door Controls-Overhead Holders.

L. ANSI A156.13 (BHMA 621) - Mortise Locks and Latches.

M. ANSI A156.15 (BHMA 321) - Closer Holder Release Devices.

N. ANSI A156.16 - Auxiliary Hardware.

O. ANSI A156.17 - Self Closing Hinges & Pivots.

P. ANSI A156.18 - Materials and Finishes.

Q. ANSI A156.21 – Thresholds.

R. ANSI A156.22 – Door Gasketing.

S. ANSI A156.26, ANSI A8134 - Continuous Hinges.

T. ASTM D2000 – Standard Classification System for Rubber Products in Automotive Applications.

U. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

V. BHMA – Builders Hardware Manufacturers Association.

W. BHMA A156.10 – Power Operated Pedestrian Doors.

X. NFPA 70 - National Electrical Code.

Y. NFPA 80 – Standard for Fire Doors and Fire Windows.

Z. NFPA 101 – Safety to Life from Fire in Buildings and Structures.

AA. NFPA 252 – Standard Methods of Fire Tests of Door Assemblies.

BB. UL 305 - Standard for Safety for Panic Hardware.

CC. UL 325 - Standard for Safety for Door, Drapery, Gate, Louver, and Window Operators and Systems.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data for each item of hardware in accordance with the Division One Section, "Submittals".. Include whatever information may be necessary to show compliance with requirements, and include instructions for installation and for maintenance of operating parts and finishes.

B. Hardware Schedule: Submit final hardware schedule in manner indicated below. Coordinate hardware with doors, frames and related work to ensure proper size, thickness, hand, function and finish of hardware.

C. Final Hardware Schedule Content: Based on door hardware indicated, organize hardware schedule into "hardware sets" indicating complete designations of every item required for each door or opening. Include the following information:

1. Type, style, function, size and finish of each hardware item.
2. Name and manufacturer of each item.
3. Fastenings and other pertinent information.
4. Location of hardware set cross-referenced to indications on Drawings both on floor plans and in door and frame schedule.
5. Explanation of all abbreviations, symbols, codes, etc. contained in schedule.
6. Mounting locations for hardware.
7. Door and frame sizes and materials.
8. Keying information.

D. Submittal Sequence: Submit schedule at earliest possible date particularly where acceptance of hardware schedule must precede fabrication of other work (e.g., hollow metal frames) which is critical in the project construction schedule. Include with schedule the product data, samples, shop drawings of other work affected by door hardware, and other information essential to the coordinated review of hardware schedule.

E. Keying Schedule: Submit separate detailed schedule indicating clearly how the Authority's final instructions on keying of locks has been fulfilled.

F. Samples: Prior to submittal of the final hardware schedule and prior to final ordering of door hardware, submit one sample of each type of exposed hardware unit, finished as required, and tagged with full description for coordination with schedule. Samples will be returned to the supplier. Units which are acceptable and remain undamaged through submittal, review and field comparison procedures may, after final check of operation, be used in the work, within limitations of keying coordination requirements.

G. Templates: Furnish hardware templates to each fabricator of doors, frames and other work to be factory-prepared for the installation of hardware. Upon request, check shop

drawings of such other work, to confirm that adequate provisions are made for proper location and installation of hardware.

H. Maintenance Data: For each type of door hardware to include in maintenance manuals specified in Division 01.

I. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

J. Coordinate layout and installation of recessed pivots and closers with floor construction. Cast anchoring inserts into concrete. Concrete, reinforcement, and formwork requirements are specified in 03 Section, Cast-in-Place Concrete.

K. Provide product data, shop drawings, layout, roughing-in diagrams, installation instructions, maintenance data, parts list for all components of power, automatic and alarmed door and gate systems including operators, actuators, bollards, electrical components, power supply, alarm devices, conduit and other hardware and equipment.

1. Provide copies of product warranties.
2. Provide certification that system meets applicable accessibility codes and requirements.
3. Provide a sample of the push-plate activation device with the actual symbol and words engraved (and painted) in the actual selected finish.
4. Wiring Diagrams: For power, signal, and control wiring and including the following:

    a) Details of interface of electrified door hardware and building safety and security systems.
    b) Schematic diagram of systems that interface with electrified door hardware
    c) Point-to-point wiring.
    d) Risers.
    e) Elevations of doors controlled by electrified door hardware.
    f) All equipment, power transfers and operators for power or automatic door systems.
    g) All equipment for alarmed door or gate systems.

5. Shop drawings shall indicate locations of equipment, power supplies and conduit; installation and support of the equipment; power and control wiring and means of access to the concealed equipment for maintenance, repair and replacement.
6. Provide shop drawings for the actuators and bollards indicating type, location, size and installation details for actuators and bollards.

L. Operation Narrative: Describe the operation of doors controlled by electrified door hardware.

M. Hardware schedule shall reference the door and frame shop drawings and both the hardware submittal and the door and frame submittal shall indicate the type of reinforcement and locations of reinforcement in the doors and frames required for the installation and support of hinges, closers, locksets and other door hardware.

N. Provide a copy of the Warranty for all hardware items from the manufacturer and installer of the hardware items for the Authority's review and approval.

1.05 QUALITY ASSURANCE

A. Manufacturer: Obtain each type of hardware (latch and lock sets, hinges, closers, etc.) from a single manufacturer, although several may be indicated as offering products complying with requirements.

B. Supplier: A recognized architectural finish hardware supplier, with warehousing facilities, who has been furnishing hardware in the project's vicinity for a period of not less than 2 years, and who is, or who employs an experienced architectural hardware consultant who is available, at reasonable times during the course of the work, for consultation about project's hardware requirements, to Authority and Contractor.

C. Installer Qualifications: Engage experienced installers who are authorized representatives of the product manufacturers for both installation and maintenance of hardware required for this Project.

D. Fire-Rated Openings: Provide hardware for fire-rated openings in compliance with NFPA Standard No. 80 and local building code requirements. Provide only hardware which has been tested and listed by UL or FM for types and sizes of doors required and complies with requirements of door and door frame labels. Where emergency exit devices are required on fire-rated doors, (with supplementary marking on doors' UL or FM labels indicating "Fire Door to be Equipped with Fire Exit Hardware") provide UL or FM label on exit devices indicating "Fire Exit Hardware".

1. Test Pressure: Test at atmospheric pressure.

E. Smoke and Draft-Control Door Assemblies: Where smoke and draft-control door assemblies are required, provide door hardware that meet requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.

1. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at the tested pressure differential of 0.3-inch wg (75 Pa) of water.

F. ADA and Illinois Accessibility Code Compliance: Unless noted and approved otherwise, all hardware to be in compliance with the requirements of the Americans with Disabilities Act of 1990 (ADA), and its 2010 Standards for Accessible Design. All public spaces to have an entrance/exit that is ADA and IAC accessible and compliant.

1. Handles, Pulls, Latches, Locks, and other Operating Devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.
2. Door Closures: Comply with the following maximum opening-force requirements indicated:

    a. Interior Hinged Doors: 5 lb applied perpendicular to door.
    b. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.

3. Thresholds: Not more than 1/2 inch high. Bevel raised thresholds with a slope of not more than 1:2.

4. NFPA 101: Comply with the following for means of egress doors:

    a. Latches, Locks, and Exit Devices: Not more than 15 lbf to release the latch. Locks shall not require the use of a key, tool, or special knowledge for operation.
    b. Delayed-Egress Locks: Lock released within 15 seconds after applying a force not more than 15 lbf for not more than 3 seconds.
    c. Door Closers: Not more than 30 lbf to set door in motion and not more than 15 lbf to open door to minimum required width.
    d. Thresholds: Not more than 1/2 inch high.

G. Power Door Operators:

1. ANSI Standard: Provide power door operator system that meets all requirements of ANSI A117.1, Accessible and Useable Buildings and Facilities.
2. BHMA Standard: Provide power door operators that comply with applicable requirements of BHMA A156.19, "Power Assist and Low Energy Power Operated Doors."
3. UL Standard: Provide power door operators that comply with UL 325.
4. Fire-Rated Doors and Emergency-Exit Openings: Provide door operators that comply with NFPA 80 requirements for doors as emergency exits and that do not interfere with fire ratings.
5. Size, type, location of actuators and bollards as required by ADA and codes.

H. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1. UL Standard: Comply with UL 325.
2. Electrical System Roughing-in: Coordinate layout and installation of automatic door operators with connections to power supplies.

I. Preinstallation Conference: Conduct conference at Project Site.

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Inspect and discuss preparatory work performed by other trades.
3. Inspect and discuss electrical roughing-in for electrified door hardware.
4. Review sequence of operation for each type of electrified door hardware.
5. Review required testing, inspecting, and certifying procedures.
6. Review keying items.

1.06 PRODUCT HANDLING

A. Tag each item or package separately, with identification related to final hardware schedule, and include basic installation instructions with each item or package.

B. Packaging of hardware is responsibility of supplier. As material is received by hardware supplier from various manufacturers, sort and repackage in containers clearly marked with appropriate hardware set number to match set numbers of approved hardware schedule. Two or more identical sets may be packaged in same container.

C. Inventory hardware jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.

D. Deliver individually packaged hardware items at the proper times to the proper locations (shop or project site) for installation.

E. Provide secure lock-up for hardware delivered to the project, but not yet installed. Control handling and installation of hardware items which are not immediately replaceable, so that completion of the work will not be delayed by hardware losses, both before and after installation.

1.07 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings to receive hardware and door components by field measurements before fabrication. Verify locations, dimensions and conditions for installation of components including bollards.

1.08 COORDINATION

A. Contractor shall coordinate the work of this section with the door and frame section(s) for the project to substantiate that the correct type and number of hardware is provided and reinforcement for the reinstallation and support of the hinges, closer, lockset and other door hardware is provided with the doors and frames as shown on the drawings, specified herein and otherwise required for doors in a heavy duty usage environment.

B. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.

C. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

D. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.

E. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

F. Coordinate the location of all remote hardware related items including power supply cabinet, alarm, ADA Actuators, bollards, ADA fare gates, etc.

1. Coordinate the requirements for electrical power supply to electrified hardware components, connections, conduits, devices, wiring.

2. Coordinate the work required to be performed by the electrical contractor for the hardware installation and operation.

3. Templates: Obtain templates for doors, frames, and other work specified to be factory prepared for installing automatic door operators. Shop drawings to indicate dimensions and locations for installing power door operator equipment.

4. Coordinate hardware with doors, frames and related work to ensure proper size, thickness, hand, function, and finish. Coordinate hardware for power door operators with hardware required for the rest of the project.

5. Electrical System Roughing-in: Coordinate layout and installation of power door operators with connections to power supplies.

G. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

H. Hardware and trim items to be of the same metal as the metal it is being attached to or welded to as required to avoid galvanic action. If the metal cannot be changed, provide separation material between the dissimilar metals as required to avoid galvanic action.

1.09 WARRANTY

A. The materials and installation of all the work of this section shall be warrantied for a period of at least One (1) Year from the date of Final Acceptance by the Authority. The warranty shall encompass defects in materials or workmanship; defects in the installation; and/or failure of the hardware item or installation in performing as specified within the warranty period.

1. Roton continuous hinges shall have a life-time warranty.

B. Special Warranty: Submit a written warranty, executed by the manufacturer, agreeing to repair or replace components of the power door operator system that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:

1. Faulty operation of operator or controls.
2. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
3. Warranty Period: Three (3) years from date of Final Completion of the total project.

C. Any hardware item or installation that fails within the warranty period shall be repaired or replaced to the Authority’s satisfaction and at no cost to the Authority.

1.10 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

B. Maintenance Service: Beginning at Substantial Completion, provide six (6) months' full maintenance by skilled employees of door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door and door hardware operation. Provide parts and supplies that are the same as those used in the manufacture and installation of original products.

PART 2 PRODUCTS

2.01 SCHEDULED DOOR HARDWARE

A. Provide door hardware for each door as scheduled to comply with requirements in this Section.

1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and products equivalent in function and comparable in quality to named products as well as products complying with BHMA designations referenced.

B. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.

C. Hardware and trim items to be of the same metal as the metal it is being attached to or welded to as required to avoid galvanic action. If the metal cannot be changed, provide separation material between the dissimilar metals as required to avoid galvanic action.

2.02 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following; or an approved equal:

1. Butts and Continuous Hinges:

a. Ives Hardware, Div. of Allegion.
b. McKinney Products Co. Div. of ASSA ABLOY.
c. Stanley Hardware, Div. of Stanley Works.

2. Electrical Power Transfer:

a. Von Duprin

3. Cylinders and Locks (All locks must accept interchangeable Best cylinders):

a. Schlage Lock, Div.of Allegion.
b. Sargent Lock, Div. of ASSA ABLOY.
c. Best Lock, Div. of Stanley Works.

4. Overhead Closers:

a. LCN 4040XP , Div. of Allegion.
b. Norton 9500 without PRV, Div. of ASSA ABLOY.
c. Sargent 281 without PRV, Div. of ASSA ABLOY.

5. Exit Door Hardware:

a. Von Duprin 98 Series. Div. of Allegion.
b. Sargent 80 Series. Div. of ASSA ABLOY.
c. Precision Apex Series. Div of Stanley Works.

6. Door Trim, Kick, Mop, and Armor Plates:

a. Ives Hardware. Div. of Allegion.
b. Hiawatha. Div. of Activar Industries.
c. Rockwood, Div of ASSA ABLOY

7. Door Stripping, Seals and Astragal:

a. National Guard Products, Inc.
b. Pemko Manufacturing Co., Inc.
c. Reese Enterprises, Inc.
d. Zero International, Inc.

8. Thresholds:

a. National Guard Products, Inc.
b. Pemko Manufacturing Co., Inc.
c. Reese Enterprises, Inc.
d. Zero International, Inc.

9. Lock Guard:

a. Ives Hardware. Div. of Allegion.
b. Hiawatha. Div. of Activar Industries.
c. Rockwood, Div of ASSA ABLOY

10. Actuators:

b. LCN

11. Bollards

a. LCN
b. Wikk Industries, Inc.

12. Peepholes:

a. Ives

2.03 SCHEDULED HARDWARE

A. Requirements for design, grade, function, finish, size and other distinctive qualities of each type of door hardware is indicated in the Hardware Schedule at the end of this section. Products are identified by using hardware designation numbers of the following:

1. Manufacturer's Product Designations: One or more manufacturers are listed for each hardware type required. Manufacturer's name indicated used in the Hardware Schedule is for purposes of establishing minimum requirements. Provide either the product designated, or, where more than one manufacturer is listed, the comparable product of one of the other manufacturers which comply with requirements including those specified elsewhere in this section.
2. ANSI/BHMA designations used elsewhere in this section or in schedules to describe hardware items or to define quality or function are derived from the

following standards. Provide products complying with these standards and requirements specified elsewhere in this section.

2.04 HINGES

A. Hinges: BHMA A156.1. Provide template-produced hinges for hinges installed on hollow metal doors and hollow-metal frames.

1. Manufacturers: Subject to compliance with requirements available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Allegion plc.
b. Baldwin Hardware Corporation.
c. Bommer Industries, Inc.
d. Cal-Royal Products, Inc.
e. Design Hardware.
f. Don-Jo Mfg., Inc.
g. Hager Companies.
h. Ives Architectural Hardware Products
i. Lawrence Hardware Inc.
j. McKinney Products Company; an ASSA ABLOY Group company.
k. PBB, Inc.
l. Stanley Commercial Hardware; a division of Stanley Security Solutions.
m. Approved equal

B. Quantity: Provide the following, unless otherwise indicated:

1. Two Hinges: For doors with heights up to 60 inches.
2. Three Hinges: For doors with heights 61 to 90 inches.
3. Four Hinges: For doors with heights 91 to 120 inches.
4. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.

C. Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

		Metal Thickness (inches)	
Maximum Door Size	Hinge Height	Standard Duty	Heavy Duty
32 by 84 by 1-3/4	4-1/2	0.134	
36 by 84 by 1-3/4	4-1/2	0.134	0.180
42 by 90 by 1-3/4	5	0.134	0.180
48 by 120 by 1-3/4	5	0.146	0.190

D. Template Requirements: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.

E. Hinge Applications: Unless otherwise indicated, provide the following:

1. Exterior and Entrance Doors: Heavy-weight hinges.
2. Doors with Closers: Antifriction-bearing hinges.
3. Interior Doors: Heavy-weight hinges for metal doors.

F. Hinge Base Metal: Unless otherwise indicated, provide the following:

1. Exterior Hinges: Stainless steel, with stainless-steel pin.
2. Interior Hinges: Stainless steel, with stainless-steel pin.
3. Hinges for Fire-Rated Assemblies: Stainless steel, with stainless-steel pin.

G. Hinge Options: Comply with the following where indicated in the Door Hardware Schedule or on Drawings:

1. Maximum Security Pin: Fix pin in hinge barrel after it is inserted.
2. Nonremovable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the following applications:

    a. Outswinging exterior doors.
    b. Outswinging corridor doors with locks.

1. Raised Barrel: Offset both leaves to raise barrel off door jamb.
2. Corners: 1/4 inch radius.

H. All Leaf Hinges: Full Mortise Hinges, Five Knuckle, Ball Bearing.

I. Fasteners: Comply with the following:

1. Machine TORX Screws: For metal doors and frames. Install into drilled and tapped holes.
2. Wood Screws: For wood doors and frames.
3. Threaded-to-the-Head Wood Screws: For fire-rated wood doors.
4. Screws: Phillips flat-head screws; machine screws (drilled and tapped holes) for metal doors and wood screws for wood doors and frames. Finish screw heads to match surface of hinges.

2.05 SELF-CLOSING HINGES AND PIVOTS

A. Self-Closing Hinges and Pivots: BHMA A156.17.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Allegion plc.
    b. Bommer Industries, Inc.
    c. Cal-Royal Products, Inc.
    d. Design Hardware.
    e. Don-Jo Mfg., Inc.
    f. Hager Companies.
    g. McKinney Products Company; an ASSA ABLOY Group company.

h. PBB, Inc.
i. Stanley Commercial Hardware; a division of Stanley Security Solutions.
j. Approved equal

2.06 CENTER-HUNG AND OFFSET PIVOTS

A. Center-Hung and Offset Pivots: BHMA A156.4.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Accurate Lock & Hardware Co.
b. Allegion plc.
c. Architectural Builders Hardware Mfg., Inc.
d. DORMA Architectural Hardware; a division of DORMA Group North America.
e. Hager Companies.
f. Rixson Specialty Door Controls; an ASSA ABLOY Group company.
g. Approved equal

2.07 CONTINUOUS HINGES

A. Continuous Hinges: BHMA A156.26; minimum 0.120-inch- thick, hinge leaves with minimum overall width of 4 inches; fabricated to full height of door and frame and to template screw locations; with components finished after milling and drilling are complete.

1. Use stainless steel pin and barrel continuous hinges unless shown or noted otherwise and approved by the Authority.

B. Pin-and-Barrel-Type Hinges:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Hager Companies.
b. Ives Architectural Hardware Products
c. Lawrence Hardware Inc.
d. Markar Architectural Products, Inc; an ASSA ABLOY Group company.
e. McKinney Products Company; an ASSA ABLOY Group company.
f. Select Products Limited.
g. Approved equal.

2. Provide a heavy duty stainless steel pin and barrel continuous hinge in a 630 (US32D) satin finish.
3. Fasten with stainless steel security type fasteners.

C. Continuous, Gear-Type Hinges: Extruded-aluminum, heavy duty, pinless, geared hinge leaves joined by a continuous extruded-aluminum channel cap; with concealed, self-lubricating thrust bearings.

1. Manufacturers: Subject to compliance with requirements available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Allegion plc.
    b. Architectural Builders Hardware Mfg., Inc.
    c. Bommer Industries, Inc.
    d. Cal-Royal Products, Inc.
    e. Hager Companies.
    f. Ives Architectural Hardware Products.
    g. McKinney Products Company; an ASSA ABLOY Group company.
    h. PBB, Inc.
    i. Pemko Manufacturing Co.
    j. Select Products Limited.
    k. Stanley Commercial Hardware; a division of Stanley Security Solutions.
    l. Zero International, Inc.
    m. Approved equal

2. Continuous gear hinges shall be clear or bronze anodized aluminum to match the door and frame and as selected by the Authority.
3. Fasten with stainless steel security type fasteners.

2.08 MECHANICAL LOCKS AND LATCHES

A. Lock Functions: As indicated in door hardware schedule.

B. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:

1. Mortise Locks: Minimum 3/4-inch latchbolt throw.
2. Deadbolts: Minimum 1.25-inch bolt throw.

C. Lock Backset: 2-3/4 inches, unless otherwise indicated.

D. Lock Trim:

1. Description: As selected by Authority.
2. Levers
3. Knobs
4. Escutcheons (Roses)
5. Dummy Trim: Match lever lock trim and escutcheons.
6. Operating Device: Lever with escutcheons (roses).

E. Provide knurled lever handles for doors leading to potentially hazardous areas as required by ADA.

F. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch.

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.

2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
3. Aluminum-Frame Strike Box: Manufacturer's special strike box fabricated for aluminum framing.
4. Rabbet Front and Strike: Provide on locksets for rabbeted meeting stiles.
5. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Allegion plc.
    b. Arrow USA; an ASSA ABLOY Group company.
    c. Best Access Systems; Stanley Security Solutions, Inc.
    d. Cal-Royal Products, Inc.
    e. Corbin Russwin, Inc.; an ASSA ABLOY Group company.
    f. Design Hardware.
    g. Hager Companies.
    h. Lawrence Hardware Inc.
    i. Marks USA.
    j. PDQ Manufacturing.
    k. SARGENT Manufacturing Company; ASSA ABLOY.
    l. Schlage
    m. Stanley Commercial Hardware; a division of Stanley Security Solutions.
    n. Weiser Lock Corp.
    o. Yale Security Inc; an ASSA ABLOY Group company.
    p. Approved equal

G. Mortise Locks: BHMA A156.13; Security Grade 1; stainless steel with steel or brass parts; Series 1000.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Accurate Lock & Hardware Co.
    b. Adams Rite Manufacturing Co; an ASSA ABLOY Group company.
    c. Allegion plc.
    d. Arrow USA; an ASSA ABLOY Group company.
    e. Best Access Systems; Stanley Security Solutions, Inc.
    f. Brink, R. R. Locking Systems, Inc.
    g. Cal-Royal Products, Inc.
    h. Corbin Russwin, Inc.; an ASSA ABLOY Group company.
    i. Design Hardware.
    j. Hager Companies.
    k. Lawrence Hardware Inc.
    l. Marks USA.
    m. PDQ Manufacturing.
    n. SARGENT Manufacturing Company; ASSA ABLOY.
    o. Schlage
    p. Approved equal

H. Push-Pull Latches: Mortise, BHMA A156.13; Grade 1; with paddle handles that retract latchbolt; capable of being mounted vertically or horizontally.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Adams Rite Manufacturing Co; an ASSA ABLOY Group company.
b. Architectural Builders Hardware Mfg., Inc.
c. Corbin Russwin, Inc.; an ASSA ABLOY Group company.
d. Rockwood Manufacturing Company; an ASSA ABLOY Group company.
e. SARGENT Manufacturing Company; ASSA ABLOY.
f. Schlage
g. Trimco.
h. Approved equal

2.09 AUXILIARY LOCKS

A. Bored Auxiliary Locks: BHMA A156.5: Grade 1; stainless steel with strike that suits frame.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Arrow USA; an ASSA ABLOY Group company.
b. Best Access Systems; Stanley Security Solutions, Inc.
c. Cal-Royal Products, Inc.
d. Hager Companies.
e. Marks USA.
f. Medeco Security Locks; an ASSA ABLOY Group company.
g. PDQ Manufacturing.
h. SARGENT Manufacturing Company; ASSA ABLOY.
i. Schlage
j. Weiser Lock Corp.
k. Yale Security Inc; an ASSA ABLOY Group company.
l. Approved equal

B. Mortise Auxiliary Locks: BHMA A156.5; Grade 1; with strike that suits frame.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Accurate Lock & Hardware Co.
b. Adams Rite Manufacturing Co; an ASSA ABLOY Group company.
c. Allegion plc.
d. Arrow USA; an ASSA ABLOY Group company.
e. Best Access Systems; Stanley Security Solutions, Inc.
f. Brink, R. R. Locking Systems, Inc.
g. Cal-Royal Products, Inc.
h. Hager Companies.
i. SARGENT Manufacturing Company; ASSA ABLOY.
j. Schlage
k. Stanley Commercial Hardware; a division of Stanley Security Solutions.
l. Yale Security Inc; an ASSA ABLOY Group company.
m. Approved equal

C. Narrow Stile Auxiliary Locks: BHMA A156.5; Grade 1; with strike that suits frame.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Accurate Lock & Hardware Co.
    b. Adams Rite Manufacturing Co; an ASSA ABLOY Group company.
    c. Approved equal

2.10 ELECTRIC STRIKES

A. Electric Strikes: BHMA A156.31; Grade 1; with faceplate to suit lock and frame.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Adams Rite Manufacturing Co; an ASSA ABLOY Group company.
    b. Dortronics Systems, Inc.
    c. DynaLock Corp.
    d. HES, Inc.; an ASSA ABLOY Group company.
    e. Rutherford Controls Int'l. Corp.
    f. Security Door Controls.
    g. Trine Access Technology.
    h. Approved equal

2.11 ELECTROMAGNETIC LOCKS

A. Electromagnetic Locks: BHMA A156.23; electrically powered; with electromagnet attached to frame and armature plate attached to door; full-exterior or full-interior type, as required by application indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Allegion plc.
    b. Door Controls International, Inc.
    c. Dortronics Systems, Inc.
    d. DynaLock Corp.
    e. Rutherford Controls Int'l. Corp.
    f. Securitron Magnalock Corporation; an ASSA ABLOY Group company.
    g. Security Door Controls.
    h. Approve equal

2.12 ELECTROMECHANICAL LOCKS

A. Electromechanical Locks: BHMA A156.25; Grade 1; motor or solenoid driven; mortise deadbolt; with strike that suits frame.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Allegion plc.
    b. Best Access Systems; Stanley Security Solutions, Inc.
    c. Brink, R. R. Locking Systems, Inc.
    d. DynaLock Corp.

e. Lawrence Hardware Inc.
f. Marks USA.
g. PDQ Manufacturing.
h. Rutherford Controls Int'l. Corp.
i. SARGENT Manufacturing Company; ASSA ABLOY.
j. Security Door Controls.
k. Stanley Commercial Hardware; a division of Stanley Security Solutions.
l. Weiser Lock Corp.
m. Yale Security Inc; an ASSA ABLOY Group company.
n. Approved equal

2.13 SELF-CONTAINED ELECTRONIC LOCKS

A. Self-Contained Electronic Locks: BHMA A156.25, mortise; with internal, battery-powered, self-contained electronic locks; consisting of complete lockset, motor-driven lock mechanism, and actuating device; enclosed in zinc-dichromate-plated, wrought-steel case, and strike that suits frame. Provide key override, low-battery detection and warning, LED status indicators, and ability to program at the lock.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allegion plc.
b. Best Access Systems; Stanley Security Solutions, Inc.
c. Kaba Ilco Corp.
d. Marks USA.
e. SARGENT Manufacturing Company; ASSA ABLOY.
f. Yale Security Inc; an ASSA ABLOY Group company.
g. Approved equal

2.14 EXIT LOCKS AND EXIT ALARMS

A. Exit Locks and Alarms: BHMA A156.29, Grade 1.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Arrow USA; an ASSA ABLOY Group company.
b. Detex Corporation.
c. Precision Hardware, Inc.; a Stanley company.
d. SARGENT Manufacturing Company; ASSA ABLOY.
e. Schlage
f. Approved equal

2.15 SURFACE BOLTS

A. Surface Bolts: BHMA A156.16.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allegion plc.
b. Burns Manufacturing Incorporated.

c. Don-Jo Mfg., Inc.
d. Door Controls International, Inc.
e. Hiawatha, Inc; a division of the Activar Construction Products Group.
f. Trimco.
g. Approved equal

B. Fire-Rated Surface Bolts: 8 inch steel bolt with 2 steel guides; minimum 1 inch throw; listed and labeled for fire-rated doors; with universal strike.

2.16 MANUAL FLUSH BOLTS

A. Manual Flush Bolts: BHMA A156.16; minimum 3/4-inch (19-mm) throw; designed for mortising into door edge.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Adams Rite Manufacturing Co; an ASSA ABLOY Group company.
b. Allegion plc.
c. Burns Manufacturing Incorporated.
d. Don-Jo Mfg., Inc.
e. Door Controls International, Inc.
f. Hiawatha, Inc; a division of the Activar Construction Products Group.
g. Trimco.
h. Approved equal

B. Manual-Extension Flush Bolts: Fabricated from extruded brass or aluminum, with 12 inch rod actuated by flat lever**;** listed and labeled for fire-rated doors. Provide matching strike.

C. Slide Flush Bolts: Cast brass, with rod actuated by slide. Provide matching strike.

D. Strikes: Provide dust proof strikes at all thresholds and floors than engage bolts.

2.17 FLUSH BOLTS

A. Flush bolts where indicated for top and/or bottom of doors to be Ives (or equal) Series FB458, 12" rod length, ½" square bolt head, 3/4" throw.

B. Standards: Comply with the following:

1. Surface Bolts:
2. Manual Flush Bolts: ANSI A156.16.

C. Surface Bolts: ANSI A156.16., L54161 – Stainless steel, Grade 1.

D. Flush Bolts: ANSI A156.16., L1408, 409, 410, 426 or 427 as appropriate – Stainless steel, Grade 1.

1. Flush Bolt Heads: Minimum of 1/2 inch diameter rods of brass, bronze, or stainless steel with minimum 12 inch long rod for doors up to 84 inches in height. Provide longer rods as necessary for doors exceeding 84 inches.

2.18 AUTOMATIC AND SELF-LATCHING FLUSH BOLTS

A. Automatic and Self-Latching Flush Bolts: BHMA A156.16; minimum 3/4-inch (19-mm) throw; designed for mortising into door edge.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a Allegion plc.
b Burns Manufacturing Incorporated.
c Cal-Royal Products, Inc.
d Don-Jo Mfg., Inc.
e Door Controls International, Inc.
f Rutherford Controls Int'l. Corp.
g Trimco.
h Approved equal

2.19 EXIT DEVICES AND AUXILIARY ITEMS

A. Exit Devices and Auxiliary Items: BHMA A156.3.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a Adams Rite Manufacturing Co; an ASSA ABLOY Group company.
b Allegion plc.
c Arrow USA; an ASSA ABLOY Group company.
d Cal-Royal Products, Inc.
e Corbin Russwin, Inc.; an ASSA ABLOY Group company.
f Design Hardware.
g Detex Corporation.
h Door Controls International, Inc.
i DORMA Architectural Hardware; a division of DORMA Group North America.
j Hager Companies.
k Lawrence Hardware Inc.
l Precision Hardware, Inc.; a Stanley company.
m Rutherford Controls Int'l. Corp.
n SARGENT Manufacturing Company; ASSA ABLOY.
o Stanley Commercial Hardware; a division of Stanley Security Solutions.
p Von Duprin
q Yale Security Inc; an ASSA ABLOY Group company.
r Approved equal

B. On all station exit doors, provide panic-type exit devices, with concealed vertical rod or cable device; except surface mounted vertical rod may be used on wood doors. Exit device to comply with ANSI A 156.3, Grade I. Panic bar to span across glass door lite. Finish shall be Type 304, Stainless Steel.

C. Exit devices to have cylinder dogging feature, keyed alike to building system, which will keep the exit devices from latching, allowing free access in both directions at all times when the station is open. When this feature is activated, the exit device becomes a push bar from the interior and there is a latch-less pull from the exterior.

D. When the station is closed and locked, both doors (active and inactive) of the pair can be locked into latch mode, allowing panic exit anytime from either door from the interior. The doors would then be inaccessible from the exterior, except by unlocking the active side of the pair of doors with a key.

E. For those exterior entrance doors designated to also have automatic door hardware, provide the electric latch retraction feature for the exit devices.

F. Certified Products: Provide one of specified exit devices listed in BHMA's "Directory of Certified Exit Devices." Devices must be independently certified to 2,500,000 cycles with static load testing up to 2,000 lbs.

G. Panic Exit Devices: Listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.

H. Fire Exit Devices: Complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252.

I. Outside Trim: Provide manufacturers standard pull plate.

J. TORX type Through Bolts: For exit devices and trim on metal doors.

K. Concealed Vertical Rod or Cable Exit Devices.

L. Electrified Exit Device Options: Types and functions indicated as follows:

1. Request-for-Exit Function: Signal initiated when push bar is actuated.
2. Electric Latch Retraction: Remote signal activates continuous-duty solenoid that retracts latch. Manufacturer to supply required power supply.

M. Alarmed Exit Devices: Alarm sounds when exit device activated. Signage in English and Brail: "EMERGENCY EXIT ONLY – ALARM WILL SOUND". Alarmed exit devices to be hard wired. . Alarm system to be alarmed/disarmed by key switch located in the CA kiosk. Alarm to be 100 decibels. Horn for alarm to be remotely located at ceiling as directed by the Authority. Activation of the alarm shall also activate an alarm with indicator in the console located in the Customer Assistant's kiosk for the station. Alarm to be automatically silenced when the door or gate returns to its closed position. Exit device to have an indicator light indicating proper operation. Alarmed exit device to comply with NFPA 101 Life Safety Code, UL listed for Panic Exit Hardware (UL 305) and tested in accordance with ANSI A 156.3 Grade 1 Panic Hardware.

1. Exit alarm to be an electric horn designed for use as an immediate local audible deterrent device that will sound an "air horn sound" different from a fire alarm type sound. Device to allow various combinations of volume, tone and code configurable by the user. Alarm shall not include a strobe.
2. Alarm devices shall be flush and surface mountable using standard electrical boxes.
3. Alarm devices shall be suitable for installation at exterior locations.
4. All hardware, equipment and power supply for alarmed doors shall be concealed in the door, frame and building construction to the greatest extent possible. Shop drawings shall indicate locations of equipment, power supply, conduit and access

to equipment for maintenance on the shop drawings for the Authority's review and approval.

2.20 AUTOMATIC DOOR HARDWARE

A. For entrance doors noted to be automatic or power assisted, for handicap accessibility, provide the following additional hardware:

1. Instead of the manual closer, provide and install a low energy electro-hydraulic operator. Closer to have all-weather fluid; a arm will allow the door to open slowly to 90 degrees; allowing manual operation or using the power to automatically open the door. Closer to be top jamb (push side) mounted, non-handed, nonsized.
2. Provide and install a self-contained control box or power supply. Location as indicated on drawings or as directed by engineer. Provide all required mounting accessories and electrical connections.
3. Provide and surface mount two actuators for each automatic door. One actuator to be located at the interior and one actuator at the exterior. Locations as shown on drawings or as directed by the Authority. Mounting height as required by code. Where indicated on the drawings or required by ADA or code, provide and install a stainless steel bollard for the actuator. Provide all wiring and connections.

B. Automatic door system, all hardware, and installation to conform to ADA, local codes, and ANSI A 156.19.

C. Acceptable Manufacturers:

1. Besam.
2. Norton Closers, Div. of ASSA ABLOY.
3. LCN Closers, Div. of Allegion.
4. Approved equal.

D. Capacity: Provide operators of size recommended by manufacturer for door size, weight, and movement; for condition of exposure; and for long-term, maintenance-free operation under heavy duty traffic load and use.

E. Adjustment Features: Operators shall be fully adjustable. Provide adjustment for opening, closing, and checking speeds, as well as length of time door remains open.

F. Door Operators: Provide door operators of size recommended by manufacturer for door size, weight and movement; for condition of exposure; and for long-term, maintenance free operation under normal traffic load for type of occupancy indicated.

G. Electromechanical Operators for Swinging Doors: Manufacturer's standard electromechanical unit with doors power opened and spring closed, with closing speed controlled mechanically by gear train and dynamically by braking action of electric motor, with solid-state microprocessor controller and with easy manual operation including spring closing with power off. Operator to be concealed, self-contained, overhead unit powered by fractional-horsepower, permanent-magnet dc motor. Provide operator action as indicated and mounting as follows:

1. Power-Assisted and Low-Energy Operators: Provide power-assisted and low energy operators meeting requirements of BHMA A156.19 and ADA's

"Accessibility Guidelines for Buildings and Facilities (ADAAG),"Appendix B, Article 4.13.12, "Automatic Doors and Power-Assisted Doors."

2. Power-Assisted Closing: Provide power-assisted spring closing for overcoming wind and static pressures.
3. When not activated, door operator must act as closer.

H. Adjustments: Power door operation to be adjustable for opening speed, hold-open time, closing speed, latching, obstruction recycling, and to counter wind.

I. Manual Opening for Power-Operated Swinging Doors: Provide hardware that in the event of a power failure allows door to open with a manual force not to exceed 30 lbf according to BHMA A156.10.

J. All hardware, equipment, power supply, power transfers and operators for automatic door systems shall be concealed in the door, frame and building construction to the greatest extent possible. Shop drawings shall indicate locations and installation details of equipment, power supplies, conduit and access to equipment for maintenance, repair and replacement on the shop drawings for the Authority's review and approval.

2.21 OPERATOR CONTROL SYSTEMS

A. Push-Plate Activation Device: Manufacturer's standard semi-flush, jamb, wall- or pedestal-mounted (as indicated on drawings), door-control switch plate for operation by touch of elbow by occupants familiar with door operating system. Provide an activation device on each side of the door. Activation device to have a 2 inch X 4 inch junction box. Shape of device to be square unless selected otherwise by the Authority.

1. Push-plate to be 4.5" square stainless steel with engraved and painted black message: International symbol of accessibility and "Push to Open" in words.

2.22 BOLLARDS FOR ACTUATORS

A. Bollard: When shown on the drawings, provide a stainless steel bollard for installation of the door actuator plate. Height and location required by code. Size as shown on the drawings and as required for installation of the actuator.

B. Bollards to be constructed of 304 type stainless steel all sides and top with satin finish US32D (630), All seems to be continuously welded then ground smooth with no sharp edges, protrusions or rough areas. Top to be welded stainless steel cap, sloped. Corner radius 15/64" typical.

C. Mounting: Surface mount to concrete or other finished floor using a U-shaped stainless steel bracket at base with access hole for wiring conduit. Secure bracket with minimum 4 – ½" x 2 ¾" length masonry anchors and secure bollard with minimum 4 -.1/4 -.20 stainless steel flat head tamper proof machine screws.

D. Sizes of bollards:

1. 6 x 6 x 1/8" wall for actuator(s) only. Height 42" above finished floor.
2. 6 x 18 x 1/8" wall for actuator(s) and CTA Braille sign where indicated on the drawings. Height 64" above finished floor. Provide an access panel with tamper proof screws.

2.23 LOCK CYLINDERS

A. Lock Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allegion plc.
b. Arrow USA; an ASSA ABLOY Group company.
c. ASSA, Inc.
d. Best Access Systems; Stanley Security Solutions, Inc.
e. Cal-Royal Products, Inc.
f. Corbin Russwin, Inc.; an ASSA ABLOY Group company.
g. Hager Companies.
h. Medeco Security Locks; an ASSA ABLOY Group company.
i. PDQ Manufacturing.
j. SARGENT Manufacturing Company; ASSA ABLOY.
k. Stanley Commercial Hardware; a division of Stanley Security Solutions.
l. Yale Security Inc; an ASSA ABLOY Group company.
m. Approved equal

B. Standard Lock Cylinders: BHMA A156.5; Grade 1; permanent cores that are interchangeable and removable; face finished to match lockset.

C. High-Security Lock Cylinders: BHMA A156.30; Grade 1; Type M, mechanical; permanent cores that are removable; face finished to match lockset.

D. Construction Master Keys: Provide cylinders with feature that permits voiding of construction keys without cylinder removal. Provide 10 construction master keys.

E. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.

2.24 KEYING

A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, Appendix A. Verify keying system with Authority and incorporate decisions made in keying conference.

1. No Master Key System: Only change keys operate cylinder.
2. Master Key System: Change keys and a master key operate cylinders.
3. Grand Master Key System: Change keys, a master key, and a grand master key operate cylinders.
4. Great-Grand Master Key System: Change keys, a master key, a grand master key, and a great-grand master key operate cylinders.
5. Existing System:

a. Master key or grand master key locks to Authority’s existing system.
b. Re-key Owner's existing master key system into new keying system.
c. Obtain instructions from the Authority in writing.

B. Cylinders:

1. Equip locks with cylinders and/or interchangeable-core pin tumbler inserts. Furnish only temporary cylinders or cores for construction, remove these when directed. Provide final cylinders or cores uncombinated, the Authority will combinate and install final units.
2. All final cylinders to be BEST cylinders conforming to existing CTA cylinders. Provide uncombinated cylinders or cores of the type so that the Authority can masterkey.
3. Metals: Construct lock cylinder parts from brass/bronze, stainless steel or nickel silver as indicated.
4. Temporary and final cylinders to be high-security, complying with performance requirements for Grade 1 cylinders as listed in ANSI/BHMA A156.5.

C. Keys and Keying:

1. Provide individual blank change keys for each lock which is noted below. Each key blank to be permanently inscribed with the notation "DO NOT DUPLICATE" and will be permanently inscribed with a number or lock that identifies cylinder manufacturer key symbol.
2. Key Material: Provide blank keys of nickel silver only.
3. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:

    a. Notation: Information to be furnished by the Authority.

4. Key Quantity: Furnish three (3) blank change keys for each lock; five (5) blank master keys for each master system; five (5) blank grandmaster keys for each grandmaster system; and five (5) blank great-grandmaster keys for each great-grandmaster system.

    a. Furnish one extra blank for each lock.
    b. Deliver blank keys to the Authority's representative.

D. Provide a key control system including envelopes, labels, tags with self-locking key clips, temporary markers, for the number of locks required for the project.

2.25 OPERATING TRIM

A. Operating Trim: BHMA A156.6; stainless steel, unless otherwise indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Allegion plc.
    b. Burns Manufacturing Incorporated.
    c. Don-Jo Mfg., Inc.
    d. Forms+Surfaces.
    e. Hager Companies.
    f. Hiawatha, Inc; a division of the Activar Construction Products Group.
    g. Rockwood Manufacturing Company; an ASSA ABLOY Group company.
    h. Trimco.
    i. Approved equal

2.26 ACCESSORIES FOR PAIRS OF DOORS

A. Coordinators: BHMA A156.3; consisting of active-leaf, hold-open lever and inactive-leaf release trigger; fabricated from steel with nylon-coated strike plates; with built-in, adjustable safety release.

B. Carry-Open Bars: BHMA A156.3; prevent the inactive leaf from opening before the active leaf; provide polished brass or bronze carry-open bars with strike plate for inactive leaves of pairs of doors unless automatic or self-latching bolts are used.

C. Astragals: BHMA A156.22.

2.27 SURFACE CLOSERS

A. Surface Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allegion plc.
b. Arrow USA; an ASSA ABLOY Group company.
c. Cal-Royal Products, Inc.
d. Corbin Russwin, Inc.; an ASSA ABLOY Group company.
e. Design Hardware.
f. DORMA Architectural Hardware; a division of DORMA Group North America.
g. Hager Companies.
h. LCN
i. Norton Door Controls; an ASSA ABLOY Group company.
j. Rixson Specialty Door Controls; an ASSA ABLOY Group company.
k. SARGENT Manufacturing Company; ASSA ABLOY.
l. Stanley Commercial Hardware; a division of Stanley Security Solutions.
m. Yale Security Inc; an ASSA ABLOY Group company.
n. Approved equal

B. Size of Units: Except as otherwise specifically indicated, comply with the manufacturer's specifications for size of door control unit, depending upon size of door, exposure to weather and anticipated frequency of use.

1. Where parallel arms are indicated for closers, provide closer unit one size larger than specified for use with standard arms.
2. Provide parallel arms for all overhead closers, except as otherwise indicated.

C. Access-Free Manual Closers: Where manual closers are indicated for doors required to be accessible to the physically handicapped, provide adjustable units complying with ANSI A 117.1 provisions for door opening force and delayed action closing.

D. Provide grey resilient parts for exposed bumpers.

E. All closers to be heavy duty, surface mounted, modern type (covered) conforming to ANSI/BHMA 156.4., Grade 1
   1. Rack-and-pinion hydraulic type; with adjustable sweep and latch speeds controlled by key-operated valves; with forged-steel main arm.
   2. Mounting: Parallel arm.
   3. Type: Regular arm.
   4. Backcheck: Adjustable.
   5. Cover Material: Aluminum.
   6. Closing Power Adjustment: At least 50 percent more than minimum tested value.
   7. Closers have been independently certified for 10 million cycles.

F. Provide all-weather fluid.

G. Coordinate closer type, size and location with door and frame manufacturer. Doors required to be internally reinforced for closer installation.

H. Closer to be installed using TORX type thru bolts unless specified and/or approved otherwise.

2.28 CONCEALED CLOSERS

A. Concealed Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves. Comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.

   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

      a. Allegion plc.
      b. DORMA Architectural Hardware; a division of DORMA Group North America.
      c. Norton Door Controls; an ASSA ABLOY Group company.
      d. Rixson Specialty Door Controls; an ASSA ABLOY Group company.
      e. SARGENT Manufacturing Company; ASSA ABLOY.
      f. Approved equal

2.29 CLOSER HOLDER RELEASE DEVICES

A. Closer Holder Release Devices: BHMA A156.15; Grade 1; closer connected with separate or integral releasing and fire- or smoke-detecting devices. Door shall become self-closing on interruption of signal to release device. Automatic release is activated by smoke detection system.

   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

      a. Allegion plc.

b. Corbin Russwin, Inc.; an ASSA ABLOY Group company.
c. DORMA Architectural Hardware; a division of DORMA Group North America.
d. Norton Door Controls; an ASSA ABLOY Group company.
e. Rixson Specialty Door Controls; an ASSA ABLOY Group company.
f. SARGENT Manufacturing Company; ASSA ABLOY.
g. Stanley Commercial Hardware; a division of Stanley Security Solutions.
h. Approved equal

2.30 MECHANICAL STOPS AND HOLDERS

A. Wall- and Floor-Mounted Stops: BHMA A156.16; stainless steel base metal, unless approved otherwise.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allegion plc.
b. Architectural Builders Hardware Mfg., Inc.
c. Baldwin Hardware Corporation.
d. Burns Manufacturing Incorporated.
e. Cal-Royal Products, Inc.
f. Don-Jo Mfg., Inc.
g. Door Controls International, Inc.
h. Hager Companies.
i. Hiawatha, Inc; a division of the Activar Construction Products Group.
j. Ives
k. Rockwood Manufacturing Company; an ASSA ABLOY Group company.
l. Trimco.
m. Approved equal

2.31 ELECTROMAGNETIC STOPS AND HOLDERS

A. Electromagnetic Door Holders: BHMA A156.15, Grade 1; wall-mounted electromagnetic single or floor-mounted electromagnet single or floor-mounted electromagnet double as shown or required unit with strike plate attached to swinging door; coordinated with fire detectors and interface with fire alarm system for labeled fire-rated door assemblies.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allegion plc.
b. Architectural Builders Hardware Mfg., Inc.
c. DORMA Architectural Hardware; a division of DORMA Group North America.
d. Hager Companies.
e. Lawrence Hardware Inc.
f. SARGENT Manufacturing Company; ASSA ABLOY.
g. Approved equal

2.32 OVERHEAD STOPS AND HOLDERS

A. Overhead Stops and Holders: BHMA A156.8.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Allegion plc.
    b. Architectural Builders Hardware Mfg., Inc.
    c. Rixson Specialty Door Controls; an ASSA ABLOY Group company.
    d. SARGENT Manufacturing Company; ASSA ABLOY.
    e. Approved equal

2.33 DOOR GASKETING AND WEATHERSTRIPPING

A. Door Gasketing: BHMA A156.22; air leakage not to exceed 0.50 cfm per foot (0.000774 cu. m/s per m) of crack length for gasketing other than for smoke control, as tested according to ASTM E 283; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Hager Companies.
    b. M-D Building Products, Inc.
    c. National Guard Products, Inc.
    d. Pemko Manufacturing Co.
    e. Reese Enterprises, Inc.
    f. Sealeze.
    g. Zero International, Inc.
    h. Approved equal

B. Provide continuous weather-strip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated or scheduled. Provide type, sizes and profiles shown or scheduled. Provide non-corrosive fasteners as specified by manufacturer for application indicated.

1. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame. Where head seals are used with parallel arm mounted closers, provide a head seal to match an NGP 700SA closer.
2. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
3. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

C. Air Leakage: Not to exceed 0.50 cfm per foot (0.000774 cu. m/s per m) of crack length for gasketing other than for smoke control, as tested according to ASTM E283.

D. Smoke-Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke-control ratings indicated, based on testing according to UL 1784.

1. Provide smoke-labeled gasketing on all smoke- and fire-rated doors requiring firelabel gasketing.

E. Fire-Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire

ratings indicated, based on testing according to UL 10B or NFPA 252. Where required by NFPA.

F. Gasketing Materials: Comply with ASTM D2000 and AAMA 701/702.

G. Replaceable Seal Strips: Provide only those unites where resilient or flexible seal strip is easily replaceable and readily available from manufacturers stock.

H. Weatherstripping at Jambs and Heads: Provide bumper-type resilient insert and metal retainer strips, surface-applied unless shown as mortised or semi-mortised, of metal, finish and resilient bumper material as indicated in hardware.

I. Weatherstripping at Door Bottoms: Provide threshold consisting of contact type resilient insert and metal housing of design and size shown; of metal, finish, and resilient seal strip indicated in hardware schedule.

J. Adjustable, Housed Perimeter Gasketing: Screw-adjustable gasket material held in place by metal housing; fastened to frame stop with screws.

1. Gasket Material: Polyurethane bulb or Vinyl bulb.
2. Housing Material: Stainless steel.

K. Meeting Gasket double doors with not astragal or center post: Gasket material held in place by metal housing; mounted with screws.

1. Gasket Material: Neoprene bulb or Vinyl bulb.
2. Housing Material: Stainless steel.
3. Mounting: Mortised or Semimortised into edge of each door.

2.34 THRESHOLDS

A. Thresholds: BHMA A156.21; fabricated to full width of opening indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Hager Companies.
b. M-D Building Products, Inc.
c. National Guard Products, Inc.
d. Pemko Manufacturing Co.
e. Reese Enterprises, Inc.
f. Rixson Specialty Door Controls; an ASSA ABLOY Group company.
g. Sealeze.
h. Zero International, Inc.
i. Approved equal

B. General: Except as otherwise indicated provide a threshold at every door, handicap accessible, stainless steel threshold unit of type, size and rabbeted profile as shown or scheduled.

C. Provide units not less than 4" wide, formed to accommodate change in floor elevation where indicated, fabricated to accommodate door hardware and to fit door frames, and as scheduled.

D. Saddle Thresholds for: Fluted top; type and base metal as follows:

1. Conforming to ANSI/BHMA 156.21, J52130 – Fluted top; Barrier free.
2. Base Metal: Stainless steel.

E. Neoprene Gasket: Unless indicated otherwise, all thresholds shall have a continuous neoprene gasket at the vertical ledge of the rabbeted threshold facing the opening side of the door.

2.35 METAL PROTECTIVE TRIM UNITS

A. Metal Protective Trim Units: BHMA A156.6; fabricated from 0.050-inch thick stainless steel; with manufacturer's standard machine or self-tapping screw fasteners.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allegion plc.
b. Burns Manufacturing Incorporated.
c. Don-Jo Mfg., Inc.
d. Hiawatha, Inc; a division of the Activar Construction Products Group.
e. InPro Corporation (IPC).
f. Ives
g. Pawling Corporation.
h. Rockwood Manufacturing Company; an ASSA ABLOY Group company.
i. Trimco.
j. Approved equal

B. Fasteners: Provide manufacturer's standard exposed fasteners for door trim units (kick plates, mop plates, edge trim, viewers, knockers, mail drops and similar units); either TORX type machine screws or self-tapping screw.

C. Fabricate edge trim of stainless steel, not more than 1/2" nor less than 1/16" smaller in length than door dimension.

D. Provide kickplates at both sides of door. Fabricate kick plates and mop plates not more than 2" less than door width on stop side and not more than 1" less than door width on pull side, x 8" high unless otherwise indicated. Metal plates shall be stainless steel, 0.050" (U.S. 16 ga.).

E. Standards: Comply with the following:

1. Door Trim: ANSI A156.6.
2. Stops and Bumpers: ANSI A156.16.
3. Door Silencers: ANSI A156.16

F. Stops: Provide each door with a convex, rubber wall stop or floor stop, with satin stainless steel base, similar as indicated in the schedule. Exterior and unusual door locations shall receive overhead stop integral with closer as indicated or required.

1. Stops and Bumpers: BHMA Grade 1.
2. Floor mounted dome stop: Ives FS438 or approved equal.
3. Wall mounted bumber: Ives WS406/407 CVX or approved equal.

2.36 LOCK GUARD

A. To deter insertion of tools, picking, or forcing of latch at opening between door and frame for doors in public areas that open outward. Lock guard to be non-handed, suitable for mortise locks, have an offset that permits use on hollow metal installations and allow clearance for lip of lock strike. Lock guard to be of 16 gauge stainless steel, satin finish. Lock guard to be 1 ½" wide X 9 ½" long.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Ives.
   b. Approved equal

2.37 AUXILIARY DOOR HARDWARE

A. Auxiliary Hardware: BHMA A156.16.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Allegion plc.
   b. Baldwin Hardware Corporation.
   c. Cal-Royal Products, Inc.
   d. Don-Jo Mfg., Inc.
   e. Hager Companies.
   f. Rockwood Manufacturing Company; an ASSA ABLOY Group company.
   g. Trimco.
   h. Approved equal

2.38 AUXILIARY ELECTRIFIED DOOR HARDWARE

A. Auxiliary Electrified Door Hardware:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Allegion plc.
   b. Door Controls International, Inc.
   c. DynaLock Corp.
   d. GE Security, Inc.
   e. PDQ Manufacturing.
   f. Precision Hardware, Inc.; a Stanley company.
   g. Rutherford Controls Int'l. Corp.
   h. SARGENT Manufacturing Company; ASSA ABLOY.
   i. Securitron Magnalock Corporation; an ASSA ABLOY Group company.
   j. Security Door Controls.
   k. Approved equal

2. All hardware, equipment, power supply, power transfers and operators for electrified door systems shall be concealed in the door, frame and building construction to the greatest extent possible. Shop drawings shall indicate locations and installation details of equipment, power supplies, conduit and access to equipment for maintenance on the shop drawings for the Authority's review and approval.

2.39 FASTENERS

A. Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to commercially recognized industry standards for application intended. Provide Phillips flathead screws with finished heads to match surface of door hardware, unless otherwise indicated.

1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
2. Steel TORX type Machine or Wood Screws: For the following fire-rated applications:

a. Mortise hinges to doors.
b. Strike plates to frames
c. Closers to doors and frames.

3. Steel TORX type Through Bolts: For the following fire-rated applications, unless door blocking is provided:

a. Surface hinges to doors.
b. Closers to doors and frames.
c. Surface-mounted exit devices.

4. Spacers or Sex Bolts: For through bolting of hollow metal doors.
5. Fasteners for Wood Doors: Comply with requirements of DHI WDHS.2, "Recommended Fasteners for Wood Doors."

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. The designations used in schedules and elsewhere to indicate hardware finishes are those listed in ANSI A 156.18 "Materials & Finishes Standard", including coordination with the traditional U.S. finishes shown by certain manufacturers for their products.

D. Fire-Rated Surface Bolts: 8 inch steel bolt with 2 steel guides; minimum 1 inch throw; listed and labeled for fire-rated doors; with universal strike.

2.40 FABRICATION

A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rated labels and as otherwise approved by Architect.

1. Manufacturer's identification is permitted on rim of lock cylinders only.

B. Base Metals: Produce door hardware units of base metal indicated, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18.

1. Dissimilar Metals: Hardware and trim items to be of the same metal as the metal it is being attached to or welded to as required to avoid galvanic action. If the metal cannot be changed, provide separation material between the dissimilar metals as required to avoid galvanic action.

C. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.

1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.

2. Fire-Rated Applications:

a. Wood or Machine Screws: For the following:

1) Hinges mortised to doors or frames; use threaded-to-the-head wood screws for wood doors and frames.
2) Strike plates to frames.
3) Closers to doors and frames.

b. Steel Through Bolts: For the following unless door blocking is provided:

1) Surface hinges to doors.
2) Closers to doors and frames.
3) Surface-mounted exit devices.

2. Spacers or Sex Bolts: For through bolting of hollow-metal doors.

3. Fasteners for Wood Doors: Comply with requirements in DHI WDHS.2, "Recommended Fasteners for Wood Doors."

4. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

2.41 FINISHES

A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

1. Butts and Hinges: ANSI A 156.1 (BHMA 101).
2. Locks and Lock Trim: ANSI A 156.2 (BHMA 601).
3. Exit Devices: ANSI A 156.3 (BHMA 701).
4. Door Controls - Closers: ANSI A 156.4 (BHMA 301).
5. Auxiliary Locks: ANSI A 156.5 (BHMA 501).
6. Architectural Door Trim: ANSI A 156.6 (BHMA 1001).
7. Template Hinge Dimensions: ANSI A 156.7.
8. Door Controls - Overhead Holders: ANSI A 156.8 (BHMA 311).
9. Mortise Locks & Latches: ANSI A 156.13 (BHMA 621).
10. Closer Holder Release Devices: ANSI A 156.15 (BHMA 321).
11. Auxiliary Hardware: ANSI A 156.16 (BHMA 1201).
12. Materials & Finishes: ANSI A 156.18 (BHMA 1301).
13. Continuous Geared Hinges: BHMA A156.26.

D. Finish shall be satin stainless steel ANSI/BHMA A156.18 Finish Number 630 or US32D, unless noted or approved otherwise. Provide matching finishes for hardware units at each door or opening, to the greatest extent possible, and except as otherwise indicated. Reduce differences in color and textures as much as commercially possible where the base metal or metal forming process is different for individual units of hardware exposed at the same door or opening. In general, match items to the manufacturer's standard finish for the latch and lock set (or push pull units if no latch lock sets) for color and texture.

2.42 MATERIALS AND FABRICATION

A. Hand of door: Drawings show direction of slide, swing or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.

B. Manufacturer's Name Plate: Do not use manufacturer's products which have manufacturer's name or trade name displayed in a visible location (omit removable nameplates), except in conjunction with required UL labels and as otherwise acceptable to Engineer. Manufacturer's identification will be permitted on rim of lock cylinders only.

C. Base Metals: Produce hardware units of basic metal and forming method indicated, using manufacturer's standard metal alloy, composition, temper and hardness, but in no case of lesser (commercially recognized) quality than specified for applicable hardware units by applicable ANSI A 156 series standard for each type hardware item and with ANSI A 156.18 for finish designations indicated. Do not furnish "optional" materials or forming methods for those indicated, except as otherwise specified.

D. Fasteners: Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation. Do not provide hardware which has been prepared for self-tapping sheet metal screws, except as specifically indicated.

E. Furnish screws for installation, with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match hardware finish or, if exposed in surfaces of other work, to match finish of such other work as closely as possible, including "prepared for paint" in surfaces to receive painted finish.

F. Provide concealed fasteners for hardware units which are exposed when door is closed, except to extent no standard units of type specified are available with concealed fasteners or specified otherwise. Unless specified otherwise, do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work, except where it is not feasible to adequately reinforce the work. In such cases, provide sleeves for each thru-bolt or use hex screw fasteners.

1. Use thru-bolts for installation of closers in all cases unless specified and/or approved otherwise or not permitted on fire rated doors. Finish of thru-bolts to match closer. Size of thru-bolts as required for hardware and door and recommended by manufacturer of door closer.

G. Tools and Maintenance Instructions for Maintenance: Furnish a complete set of specialized tools and maintenance instructions as needed for Authority's continued adjustment, maintenance, and removal and replacement of finish hardware.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Determine that doors and frames have been properly reinforced to receive the hardware and the reinforcing is properly located. Reinforcing to be concealed within the door and frame. Coordinate with door and frame supplier.

C. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.

B. Wood Doors: Comply with DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."

3.03 INSTALLATION

A. Mount Hardware units at heights indicated in recommendations by the Door and Hardware Institute, except as specifically indicated or required to comply with governing regulations, and except as may be otherwise directed by the Authority.

1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
2. Custom Steel Doors and Frames: HMMA 831.
3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

B. Install each hardware item in compliance with the manufacturer's instructions and specifications. Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted or finished in another way, coordinate removal, storage and reinstallation or application of surface protection with finishing work specified in the Division 09 sections. Do not install surface-mounted items until finishes have been completed on the substrate.

C. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

D. Drill and countersink units which are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

E. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.

F. Intermediate Offset Pivots: Where offset pivots are indicated, provide intermediate offset pivots in quantities indicated in door hardware schedule but not fewer than one intermediate offset pivot per door and one additional intermediate offset pivot for every 30 inches of door height greater than 90 inches.

G. Lock Cylinders: Install construction cores to secure building and areas during construction period.

1. Replace construction cores with permanent cores as directed by the Authority.
2. Furnish permanent cores to the Authority for installation.

H. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.

I. Boxed Power Supplies: Locate power supplies as indicated or, if not indicated, Verify location with Authority.

1. Configuration: Provide one power supply for each door opening or least number of power supplies required to adequately serve doors as approved by the Authority with electrified door hardware.
2. Provide conduit and power to hardware power supply, door frame, and devices.

J. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.

K. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

L. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

M. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

N. Set thresholds for doors in full bed of butyl-rubber or polyisobutylene mastic sealant.

O. Weatherstripping and Seals: Comply with manufacturer's instructions and specifications to the extent installation requirements are not otherwise indicated.

P. Examine roughing-in for electrical systems to verify actual locations of power connections before automatic door operator installation.

Q. Proceed with installation only after unsatisfactory conditions have been corrected.

3.04 INSTALLATION OF POWER DOOR OPERATORS

A. General: Install complete power door operator system according to manufacturer's written instructions, including controls, control wiring, and remote power units.

1. Refer to Division 26 Sections for power connection.

B. After repeated operation of completed installation equivalent to 3 days' use by normal traffic (100 to 300 cycles), readjust door operators and controls for optimum operating condition, safety, and weathertight closure. Lubricate hardware, operating equipment, and other moving parts.

C. Engage a certified inspector to train Authority’s representative to adjust, operate, and maintain the power door opener equipment.

D. All hardware, equipment, power supply, power transfers and operators for power door systems shall be concealed in the door, frame and building construction to the greatest extent possible and installed as shown, located and detailed on the approved shop drawings.

E. Install actuactors at locations indicated, as indicated on hardware schedule and to meet ADA and codes. Type of actuator as listed in hardware schedule. Height of actuator per ADA and codes. Verify all locations dimensions and conditions.

3.05 INSTALLATION OF BOLLARDS

A. Install complete power door operator system according to manufacturer’s written instructions including conduit and wiring.

B. Install bollards at locations including, as indicated on hardware schedule and meet ADA and codes. Type and size of bollard as shown on the drawings or listed in the hardware schedule. Height of bollard as required for required height of actuator. Verify all locations dimensions and conditions.

C. Secure bollard to concrete or other surface with manufacturer supplied and recommended bracket and bolts. Follow manufacturer’s installation instructions. Bollard to be straight and level. Installation to be tight and secure with no “wobble”. Provide continuous sealant where bollard meets pavement.

3.06 ADJUST AND CLEAN

A. Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly as intended for the application made.

1. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
2. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

B. Clean adjacent surfaces soiled by hardware installation.

C. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy of a space or area, return to the work during the week prior to acceptance or occupancy, and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

D. Instruct Authority's Personnel in proper adjustment and maintenance of hardware and hardware finishes, during the final adjustment of hardware.

E. Continued Maintenance Service: Approximately six months after the acceptance of hardware in each area, the Installer, accompanied by the representative of the latch and lock manufacturer, shall return to the project and re-adjust every item of hardware to restore proper function of doors and hardware. Consult with and instruct Authority's personnel in recommended additions to the maintenance procedures. Replace hardware items which have deteriorated or failed due to faulty design, materials or installation of hardware units. Prepare a written report of current and predictable problems (of substantial nature) in the performance of the hardware.

F. Engage a factory-authorized service representative to train Owner’s maintenance personnel to adjust, operate, and maintain automatic door operators. Refer to Division 01 Section, Closeout Procedures.

3.07 HARDWARE SCHEDULE

A. Provide hardware for each door to comply with requirements indicated in this section. The following hardware sets as listed in this Schedule are for locations indicated on the drawings.

B. Keying system per the Authority’s requirements. Refer to Drawings for door handing and sizes. Provide size of hinges as specified above.

C. Hardware groups 01 thru 10 are to be included, but not limited to, the following types of doors and frames, unless indicated otherwise:

1. Hollow Metal Doors and Frames
2. Stainless Steel Doors and Frames
3. Aluminum (Aluminum and Glass) Doors and Frames

4. Fiberglass Doors in Hollow Metal Frames

D. Wood doors and frames, gates, access panels, roll up grilles, window locks have their own specialized hardware groups.

Hardware Set No. 11

For use on mark/door #(s):
ELEVATOR OR ESCALATOR MACHINE ROOM DOOR

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	700SF Series	630	IVES
1	EA	STOREROOM LOCK	L9080L 807L 07L TORX	630	SCH
1	EA	SFIC MORTISE CYL	1E74 C265 RP3 WITH CONST CORE	626	BES
1	EA	LOCK GUARD	LG12	630	IVES
1	EA	OH STOP	90S SOC	630	GLY
1	EA	SURFACE CLOSER	4040XP EDA SRI ST-2730 TBTORX	689	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B4E TORX	630	IVES
1	EA	FLOOR STOP	FS438	626	IVES
		-OR-			
1	EA	WALL STOP	WS406/407CVX (See note 4.)	630	IVES
1	EA	RAIN DRIP	142A	AL	ZER
1	SET	SEALS	700SA	CL	NGP
1	SET	SEALS	328AA	AL	ZER
1	EA	DOOR SWEEP	39A	AL	ZER
1	EA	THRESHOLD	65A MSLA-10	AL	ZER
3	EA	SILENCER	SR64	GRY	IVES

Notes:

1) Provide appropriate closer and closer arm based on door swing. Either an LCN 4010 or LCN 4110.
2) Prior to bidding, consult with Authority via official RFI to verify.
3) Provide reinforcing in HM frame for both parallel arm mount or standard mount closer.
4) Provide an Ives FS438 Floor stop if a wall stop is not applicable and the location is acceptable for a floor stop. Prior to bidding, consult with Authority via official RFI to verify.
5) Provide a Glynn Johnson 90S OH stop if a wall or floor stop is not applicable. Prior to bidding, consult with Authority via official RFI to verify.
6) Provide TORX type screws at all weatherstripping.
7) Keying to be determined by owner. Prior to bidding, consult with Authority via official RFI to verify.
8) When this hardware group is used on a stainless steel door, provide an Ives 700 pin and barrel hinge with security screws in a 630 finish in lieu of the 224HD hinge.
9) Provide knurled handles for doors to hazardous areas per ADA.

Hardware Set No. 23
For use on mark/door #(s):
ELEVATOR WINDOW LOCKS

Provide each SGL window with the following:

Qty	Description	Catalog Number	Finish	Mfr

1	EA	SFIC CYL	1E7E4 WITH CONST CORE	626	BES

Notes:
1) Keying to be determined by Authority. Prior to bidding, consult with Authority via official RFI to verify.
2) Remainder or hardware by elevator window manufacturer.

Hardware Set No. 24
For use on mark/door #(s):
WALL, CEILING, and FLOOR ACCESS PANELS

Provide each SGL panel with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	SFIC CYL	1E7D4 WITH CONST CORE	626	BES

Notes:
1) Keying to be determined by Authority. Prior to bidding, consult with Authority via official RFI to verify.
2) Remainder or hardware by access panel manufacturer.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of DOOR HARDWARE shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of DOOR HARDWARE shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000.

END OF SECTION

SECTION 08 80 00
GLASS AND GLAZING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions and Division 01 Specification sections, apply to this section.

1.02 SUMMARY

A. Extent of glass and glazing work is indicated on drawings and schedules.

B. Types of work include glass and glazing for:

1. Ballustrades.
2. Windbreaks.
3. Vertical glazing.
4. Elevator cab enclosures.
5. Customer Assistant's Kiosk glazing.
6. Skylite or roof glazing.

C. Provide and install two layers of a sacrificial film on public facing sides of all glazing as identified in the Glazing Schedule and the Drawings, except skylight and roof glazing.

D. Related Sections: The following sections contain requirements that relate to this section:

1. Section 07 90 00, Joint Sealers.
2. Section 08 44 33, Canopy Sloped Glazing Assembly.
3. Section 13 06 00, Customer Assistant's Kiosk.

1.03 REFERENCES

A. ASTM C509 – Standard Specification for Elastomeric Cellular Preformed Gasket and Sealing Material.

B. ASTM C864 – Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.

C. ASTM C920 – Standard Specification for Elastomeric Joint Sealants.

D. ASTM C1021 – Standard Practice for Laboratories Engaged in the Testing of Building Sealants.

E. ASTM C1036 – Standard Specification for Flat Glass.

F. ASTM C1048 – Standard Specification for Heat-Treated Flat Glass--Kind HS, Kind FT Coated and Uncoated Glass.

G. ASTM C1172 – Standard Specification for Laminated Architectural Flat Glass.

H. ASTM C1330 – Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants.

I. ASTM D256 – Determining the Izod Pendulum Impact Resistance of Plastics.

J. ASTM D635 – Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.

K. ASTM D671 – Standard Test Method for Flexural Fatigue of Plastics by Constant- Amplitude of-Force.

L. ASTM D785 -Standard Test Method for Rockwell Hardness of Plastics and Electrical Insulating Materials.

M. ASTM D1003 –Standard Test Method for Haze and Luminous Transmittance of Transparent Plastics.

N. ASTM D1044 – Standard Test Method for Resistance of Transparent Plastics to Surface Abrasion.

O. ASTM D3330 – Standard Test Method for Peel adhesion of Pressure-Sensitive Tape.

P. ASTM D3652 – Standard Test Method for Thickness of Pressure-Sensitive Tapes.

Q. ASTM E162 – Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source.

R. ASTM E548 – Standard Guide for General Criteria Used for Evaluating Laboratory Competence.

S. ASTM E662 – Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials.

T. ASTM E773 – Standard Test Method for Accelerated Weathering of Sealed Insulating Glass Units.

U. ASTM E774 – Standard Specification for the Classification of the Durability of Sealed Insulating Glass Units.

V. ASTM E1300 -Standard Practice for Determining Load Resistance of Glass in Buildings.

W. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: GANA'S "Glazing Manual" and "Laminated Glass Design Guide."
2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIRA7, "Sloped Glazing Guidelines."
3. SIGMA Publications: SIGMA TM-3000, "Vertical Glazing Guidelines," and SIGMA TB-3001, "Sloped Glazing Guidelines."
4. Standard for Safety Glazing: Federal Standard 16 CFR 1201, Consumer

Product Safety Commission (CPSC) “Safety Standard for Architectural Glazing Materials”, as published in the Code of Federal Regulations (CFR).

1.04 DEFINITIONS

A. Interlayer: Space between lites of a laminated-glass unit that is made of Polyvinyl Butyral Interlayer or Ionomeric Polymer Interlayer.

B. Deterioration of Laminated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning laminated glass contrary to manufacturer’s written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1.05 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.06 PREINSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Section 01 31 50, Project Meetings.

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review temporary protection requirements for glazing during and after installation.
3. Pre-installation conference to be attended by the glazing contractor, curtain wall contractor, general contractor, designer of record and the Authority’s representative.

1.07 SUBMITTALS

A. Product Data: Submit manufacturer's technical data for each glazing material and fabricated glass product required, including installation and maintenance instructions.

B. Samples: Submit, for verification purposes, 12 inch square samples of each type of glazing and interlayer material indicated, and 12 inch long samples of each color required for each type of sealant or gasket exposed to view. Install sealant or gasket sample between two strips of material representative of adjoining framing system in color. Include a sample of each laminated glass product with patterned interlayer as indicated, with opaque interlayer as indicated, and a sample of the clear glass sheet in thickness indicated

1. Provide samples of clear, tints, opaque colors, and frit patterns for interlayer material for Authority’s selection and approval for each type of interlayer material to be used.

C. Certificate: Submit certificates from respective manufacturers attesting that glass

and glazing materials furnished for project comply with requirements. Separate certification will not be required for glazing materials bearing manufacturer's permanent labels designating type and thickness of glass, provided labels represent a quality control program involving a recognized certification agency or independent testing laboratory acceptable to authorities having jurisdiction.

D. Compatibility and Adhesion Test Report: Submit statement from sealant manufacturer indicating that glass and glazing materials have been tested for compatibility and adhesion with glazing sealants and interpreting test results relative to material performance, including specifications for primers and substrate preparation needed to obtain adhesion.

E. Schedule of types, sizes, thicknesses, and installation methods for each size opening and location; using same designations indicated on drawings for glazed openings; and based on actual field verified dimensions and conditions.

F. Qualification Data for Contractors: Demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses.

G. Product Test Reports: From a qualified testing agency indicating the following products comply with requirements, based on comprehensive testing of current products:

1. Laminated glass.

H. Preconstruction Adhesion and Compatibility Test Report: From glazing sealant manufacturer indicating glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.

I. SWRI Validation Certificate: For each elastomeric glazing sealant specified to be validated by SWRI's Sealant Validation Program.

J. Warranties: Special warranties specified in this Section.

1.08 MAINTENANCE MATERIAL SUBMITTALS

A. Attic Stock: Provide extra material equal to 5 percent of specific glass type and size, or a minimum of 1 whichever is greater of all furnished glazing products for all glazed canopies, glazed roofs, and vertical glazing.

1.09 QUALITY ASSURANCE

A. Glazing Standards: Comply with specifications of Flat Glass Marketing Association (FGMA) "Glazing Manual" and "Sealant Manual" except where more stringent requirements are indicated. Refer to those publications for definitions of glass and glazing terms not otherwise defined in this section or other referenced standards.

B. Safety Glazing Standard: Where safety glass is indicated, or required by authorities having jurisdiction, provide type of products indicated which comply with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for category II materials. Subject to compliance with requirements, provide safety glass permanently marked with certification label of Safety Glazing Certification Council (SGCC) or other certification agency acceptable to authorities having jurisdiction.

C. Fire-Rated Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252 for door assemblies and NFPA 257 for window assemblies.

D. Manufacturer Qualifications: A single manufacturer who has successfully produced and fabricated glass products of the type specified herein for this project for a period of at least five (5) years; for each kind and condition of glass indicated.

E. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance; and who employs glass installers for this project who are certified under the National Glass Association Glazier Certification Program as Level 2 (Senior Glaziers) or Level 3 (Master Glaziers).

F. Product Testing: Obtain test results for product test reports in "Submittals" Article from a qualified testing agency based on testing products.

1. Glass Testing Subcontractor Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E548.
2. Contractor shall provide a testing subcontractor, as defined in the Division 01 section, "Reference Standards and Definitions", to perform glazing testing and monitoring thereof. Such testing and monitoring shall be performed in accordance with the Division 1 section, "Testing and Inspection Service".

G. Elastomeric Glazing Sealant Product Testing: Obtain sealant test results for product test reports in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period.

1. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021 to conduct the testing indicated, as documented according to ASTM E548.
2. Test elastomeric glazing sealants according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C 920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.

H. Preconstruction Adhesion and Compatibility Testing: Submit to elastomeric glazing sealant manufacturers, for testing indicated below, samples of each glass type, tape sealant, gasket, glazing accessory, and glass-framing member that will contact or affect elastomeric glazing sealants.

1. Use manufacturer's standard test methods to determine whether priming and other specific preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.

    a. Perform tests under normal environmental conditions replicating those that will exist during installation.

2. Submit not fewer than nine pieces of each type and finish of framing members

and each type, class, kind, condition, and form of glazing as well as one sample of each glazing accessory (gaskets, tape sealants, setting blocks, and spacers).

3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
4. For materials failing tests, obtain sealant manufacturer's written instructions for corrective measures, including the use of specially formulated primers.
5. Testing will not be required if elastomeric glazing sealant manufacturers submit data based on previous testing of current sealant products for adhesion to, and compatibility with, glazing materials matching those submitted.

I. Safety Glass: Category II materials complying with testing requirements in 16 CFR 1201 and ANSI Z97.1.

1. Subject to compliance with requirements, permanently mark safety glass, as applicable, with certification label of Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction.

1.10 PRECONSTRUCTION TESTING

A. Preconstruction Adhesion and Compatibility Testing: Test each glass product, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.

1. Testing is not required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.
2. Use ASTM C 1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
3. Test no fewer than three (3) Samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.
4. Schedule enough time for testing and analyzing results to prevent delaying the Work.
5. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures including the use of specially formulated primers.

1.11 SEQUENCE

A. Scheduling: Glazing to not begin until the framing, doors or other substrate is permanently and properly in place.

B. Glazing contractor to re-measure all openings before fabricating or cutting the glass.

C. Do not deliver the glass until the openings are ready to receive the glass and the glass can be delivered to the site and installed without being broken or damaged.

1.12 DELIVERY, STORAGE, AND HANDLING

A. Protect glass and glazing materials during delivery, storage and handling to comply with manufacturer's directions and as required to prevent scratching and edge damage to

glass, and damage to glass and glazing materials from effects of moisture including condensation, of temperature changes, of direct exposure to sun, and from other causes.

1.13 PROJECT CONDITIONS

A. Environmental Conditions: Do not proceed with glazing when ambient and substrate temperature conditions are outside the limits permitted by glazing material manufacturer or when joint substrates are wet due to rain, frost, condensation or other causes.

1. Install liquid sealants at ambient and substrate temperatures above 40 degrees Fahrenheit.
2. Do not install polycarbonate units when ambient and substrate conditions are above 80 degrees Fahrenheit or below 40 degrees Fahrenheit.

1.14 WARRANTY

A. General: Warranties shall be in addition to, and not a limitation of, other rights the Authority may have under the Contract Documents.

B. Warranty Period: Manufacturer's standard but not less than five (5) years after date of Final Acceptance.

C. Manufacturer's Special Project Warranty on Laminated Glass: Provide written warranty signed by manufacturer of laminated glass agreeing to furnish f.o.b. point of manufacture, freight allowed project site, within five (5) years after date of Final Acceptance, replacements for those laminated glass units which develop manufacturing defects. Manufacturing defects are defined as edge separation, delamination, air pockets, or other imperfections which materially obstructs vision through the glass.

D. Manufacturer’s Special Warranty on Polycarbonate Sheet: Written warranty, made out to the Authority and signed by manufacturer agreeing to furnish replacements for polycarbonate sheet units that deteriorate as defined in “Definitions” Article, f.o.b. the nearest shipping point to Project site, or that yellow greater than index 7.5, within specified warranty period of five (5) years from the date of Final acceptance.

E. Manufacturer’s Special Warranty on Insulating Glass: Manufacturer’s standard form made out to Owner and signed by insulating-glass manufacturing agreeing to replace insulating-glass units that deteriorate as defined in “Definitions” Article, f.o.b. the nearest shipping point to Project site, within specified warranty period of five (5) years from date of Final Acceptance.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Provide glass and glazing that has been produced, fabricated and installed to withstand normal thermal movement, wind loading and impact loading (where applicable), without failure including loss or breakage of glass, failure of sealants or gaskets to remain watertight and airtight, deterioration of glass and glazing materials and other defects in construction.

B. Glass Design: Glass thicknesses indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing project loads and in-service conditions.

Provide glass lites for various size openings in nominal thicknesses indicated, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:

1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300 and to withstand all applicable loading requirements, according to the following requirements:

    a. Specified Design Wind Loads: Minimum 20psf, or as determined based on the Wind Pressure Diagrams on the Drawings.
    b. Specified Design Snow Loads: As indicated, but not less than snow loads applicable to project, required by ASCE 7, “Minimum Design Loads for Buildings and Other Structures”: Section 7, “Snow Loads”.
    c. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.

        i) Load Duration: 60 seconds or less.

    d. Probability of Breakage for Sloped Glazing: 1 lite per 1000 for lites set more than 15 degrees off vertical and under wind and snow action.

        i) Load Duration: 30 days.

    e. Maximum Lateral Deflection: For the following types of glass supported on all four edges, provide thicknesses required that limits center deflection at design wind pressure to 1/50 times the short side length or 1 inch (25 mm) whichever is less.

        i) For laminated-glass lites.

C. Heat-Treated Float Glass: ASTM C1048; Type I (transparent flat glass); Quality-Q3; of class, kind, and conditioned indicated.

    1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise noted.
    2. Provide Kind HS (heat-strengthened) float glass on other than attic stock.

D. Laminated Glass: ASTM C1172, and complying with other requirements specified and with the following:

    1. Interlayer: Polyvinyl butyral of minimum 6mm thickness with a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after laminating glass lites and installation.
    2. Lamination Process: Laminate lites in autoclave with heat plus pressure. Fabricate laminated glass to produce glass free of foreign substances and air or gas pockets.

E. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss. Size glazing panels to fit openings specified, allowing for expansion and contraction over the temperature range noted.

1. Temperature Change (Range): 120 degrees Fahrenheit (67 degrees Celsius), ambient; 180 degrees Fahrenheit (100 degrees Celsius), material surfaces.

F. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:

1. For laminated-glass lites, properties are based on products of construction indicated.
2. Center-of Glass U-Values: NFRC 100 methodology using LBL-35298 WINDOW 4.1 computer program, expressed as Btu/ sq.ft. x h x degrees Fahrenheit (W/sq.m x K).
3. Center-of-Glass Solar Heat Gain Coefficient: NFRC 200 methodology using LBL- 35298 WINDOW 4.1 computer program.
4. Solar Optical Properties: NFRC 300.

G. Glazing Design: Glazing thicknesses indicated, if any, are minimums. See drawings and/or schedules for thicknesses for specific applications and locations. Also, manufacturer shall provide the proper thickness for each type of glazing material based on the specific application, size of lite, wind and other loads, vibration, local codes and other design factors.

2.02 MANUFACTURERS

A. Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include; but are not limited to, the following:

1. Heat-Treated Glass:

a. AFG Industries, Inc.
b. Cardinal Glass Industries.
c. Environmental Glass Products.
d. Falconer Glass Industries.
f. Guardian Industries Corp.
h. LOF Glass, Inc.
i. OldCastle.
j. PPG Industries, Inc.
k. Viracon, Inc.

2. Manufacturers of Laminated Glass:

a. Advanced Coating Technology (Interlayer).
b. AFG Industries, Inc.
c. Cardinal Glass Industries.
d. Environmental Glass Products.
e. Falconer Glass Industries.
f. Guardian Industries Corp.
g. HGP & Affiliates, Inc.
h. OldCastle.
i. PPG Industries, Inc.
l. Viracon, Inc.

3. Manufacturers of glass clad polycarbonate laminate:

a. Globe Amerada Glass.

b. Guardian Industries.
c. Viracon, Inc.

4. Manufacturers of sacrificial film products:

a. MADICO, Inc.
b. 3M Company.
c. Eastman Performance Films.

5. Manufacturer and/or trade name of security glazing products:

a. "Secur-Tem + Poly" as manufactured by Globe/ Aemeroda Glass Co.
b. "Glass-Clad No. 31554 as manufactured by Guardian Industries.
c. "Guard-Vue 200" as manufactured by Viracon.
d. US Armor LLC.

2.03 GLASS PRODUCTS, GENERAL

A. Primary Glass Standard: Provide primary glass which complies with ASTM C1036 requirements, including those indicated by reference to type, class, quality, and, if applicable, form, finish, mesh and pattern.

B. Heat-Treated Glass Standard: Provide heat-treated glass which complies with ASTM C1048 requirements, including those indicated by reference to kind, condition, type, quality, class, and, if applicable, form, finish, and pattern.

C. Sizes: Fabricate glass to sizes required for glazing openings indicated, with edge clearances and tolerances complying with specifications of glass manufacturer. Provide thicknesses indicated and/or as specified by glass manufacturer for application indicated and/or as required by code for actual conditions, sizes, and wind loads.

2.04 PRIMARY GLASS PRODUCTS

A. Clear Float Glass: ASTM C1036, Type I (transparent glass, flat), Class 1 (clear, low-iron), Quality Q3 (glazing select).

B. Total thickness of clear float glass to be as indicated on drawings, to be as indicated on schedule at the end of this section, to meet design criteria, to meet standards indicated, and/ or to meet applicable codes; but not less than 3/8".

2.05 HEAT-TREATED (TEMPERED) GLASS PRODUCTS

A. Heat-Treated or Tempered Glass: ASTM C1048; manufacture heat-treated glass by vertical (tong-held) or horizontal (roller hearth) process, at manufacturer's option, except provide horizontal process where indicated as "tongless" or "free of tong marks".

1. Uncoated Clear Heat-Treated Float Glass: Condition A (uncoated surfaces), Type I (transparent glass, flat), Class 1 (clear, low-iron), Quality q3 (glazing select), kind FT (fully tempered) where indicated.

B. Total thickness of tempered glass to be as indicated on drawings, to be as indicated on schedule at the end of this section, to meet design criteria, to meet standards indicated, and/ or to meet applicable codes; but not less than 1/4".

2.06 LAMINATED GLASS PRODUCTS

A. Laminated Glass Products: Comply with ASTM C1172 for kinds of laminated glass indicated and other requirements specified. Refer to primary and heat-treated glass requirements relating to properties of glass products comprising laminated glass products.

B. Glass: Two glass panels of clear float glass (unless specified otherwise).

C. Interlayer: Interlayer material as indicated below, in clear or with frit pattern as noted, and of thickness indicated, with a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after laminating and installation.

1. Interlayer Material: Polyvinyl Butyral sheet.
2. Color and pattern of plastic interlayer: Clear or frit as specified.
3. Frit (where pattern is specified): Clear (or tinted if specified) interlayer of thickness as required for the assembly to comply as a Type II safety glass material) to have square frit printed pattern, 11/16" squares on 1-1/4" spacing, aligned in a grid vertically and horizontally. Squares are the frit rather than the grid.

D. The assembly is created by laminating the interlayer, two layers of adhesive and two glass panels; the entire assembly is then permanently bonded. The assembly shall comply as a safety laminated product meeting industry standard ANSI Z-97. 1-1984 and the Consumer Product Safety Commission Federal standard 16 CFR 1201, Category I and II. The assembly shall be both weather and ultraviolet radiation resistant.

E. Products: Subject to compliance with requirements, provide one of the following:

1. Polyvinyl Butyral Interlayer:

a. Saflex Crystal Clear, Eastman
b. Trosifol, Kuraray

2. Ionomeric Polymer Interlayer:

a. SentryGlas Plus, Kuraray

F. Laminating Process: Fabricate laminated glass to produce glass free of foreign substances and air or glass pockets as follows:

G. Total thickness of laminated glass to be as indicated on drawings; as indicated on the schedule at the end of this section; to meet design criteria; to meet standards indicated, and/ or to meet applicable codes; but not less than 9/16 inch (Inner and outer layer of 1/4 inch clear float glass bonded to interlayer of 0.06 inch Polyvinyl Butyral).

2.07 SECURITY GLAZING

A. Security shall be Ballistics, Attack and Forced Entry Resistant glass-clad polycarbonate laminate assembly to consist of the following:

1. 3/4 inch (.750 inch) overall thickness consisting of:

a. 3/16 inch thick clear, chemically strengthened glass.
b. 0.050 inch clear Urethane interlayer.
c. 5/16 inch clear polycarbonate interlayer.
d. 0.050 inch clear Urethane interlayer.
e. 3/16 inch thick clear, chemically strengthened glass.

B. Security Glazing assembly to be certified to meet the following tests:

1. Weatherability Tests: Meets ANSI Z.26.1-1977 and Z.26.1a-1983 and ASTM E773 and E774.
2. Clear Light Transmittance: 76 percent visible.
3. Attack Resistance: Tested and certified by H.P. White Laboratories to meet Level I Forced Entry.
4. Ballistic Protection: Tested by H.P. White Laboratories to meet Level B Ballistics Assult, 9 mm Luger; 3 shots in an 8 inch circle, 124 grain Full Metal Jacket, 25 feet. Results: Spall; no penetration.

C. Provide single responsibility for all phases of manufacturing, from the chemical strengthening of the raw glass through the final lamination.

D. Manufacturer and/or trade name of security glazing to be one of the following:

1. "Secur-Tem + Poly" as manufactured by Globe/ Aemeroda Glass Co.
2. "Glass-Clad No. 31554 as manufactured by Guardian Industries.
3. "Guard-Vue 200" as manufactured by Viracon.
4. US Armor LLC.
5. Approved equal.

2.08 SACRIFICIAL FILM FOR WINDOW GLAZING VANDAL PROTECTION

A. Provide and install a sacrificial film on both sides of all glazing for vandal protection unless shown or noted otherwise. Sacrificial film not required on skylights or roof glazing.

B. The sacrificial protective film on each side shall be one layer of Polyethylene Terathalate (PET), 6 mils thick. There shall be an acrylic pressure sensitive adhesive on the back of the film, protected by a peel-off release liner, for installation to the glass.

C. The protective film and adhesive must be formulated and approved for exterior applications.

D. The sacrificial protective film and adhesive shall be as manufactured by the following:

1. MADICO, Inc.
2. 3M Company
3. Eastman Performance Films

E. The films must be compatible with the existing application solutions presently used by the Authority and removable by peeling off.

1. The application solutions shall be non-toxic and contain no chemical within the formulation which is a suspected human caninogen. The application solutions currently approved and used by the Authority are as follows:

a. Product number 3901249 available through Graffiti Removal, Inc., Huntington Beach, CA.
b. Product Number 4608 available through Midwest Marketing, Peoria, IL.

F. Other manufacturers of films and applications solutions equal to the specified film and solutions must be submitted to the Authority for written approvals prior to bidding. Provide the Authority with certified test reports, specifications, installation/removal instructions, Material Safety Data Sheet, and samples of the proposed film and solution to demonstrate that it is equal to the specified film and solution and complies with all requirements set forth herein.

1. Samples that are judged by the Authority to be difficult to install or remove when compared to approved sacrificial protective film and application solution, or fail to function under normal operating conditions when tested in service shall be rejected.

G. Sacrificial film products shall meet or exceed the required results of the following ANSI/SAE Z26.1 tests:

1. Test 3, Humidity Test
2. Test 15, Optical Deviation and Visibility Test.
3. Test 17, Abrasion Resistance (Glass-Plastics)
4. Test 19, Chemical Resistance (Non-stressed)
5. Test 28, Resistance to temperature change.

H. The sacrificial film products shall also meet the following performance requirements:

1. Physical Properties:

Average Tensile Strength: Per ASTM D882	25,000 psi
Average Break Strength: Per ASTM D882	150 lbs./in. (width)
Adhesive Type:	Acrylic Pressure Sensitive
Average Peel Strength (mounted): Per ASTM D903	
For film to mounted glass	5 to 6 lbs./in. (of width)
For film mounted to plastic glazing	2.5 to 3.5 lbs./in (of width)

2. Solar optical properties – The sacrificial film shall meet or exceed the following solar optical properties:

Total Solar Energy;

Average Percent Transmitted	79
Average Percent Reflected	10
Average percent Absorbed	11
Visible Light (Daylight): Average Percent Transmitted	83
Average Percent Reflected	10
"U" Factor:	
Median	1.08
Design	1.12
Percent of Ultraviolet Light Rejected	99

Shading Coefficient:	0.93
Percent Total Solar Energy	19

I. Flame Spread and Smoke Developed: The sacrificial film shall meet or exceed a Class “A: Interior Wall and Ceiling Finish Classification as outlined in the National Fire Protection Association (NFPA) Life Safety Code 101, Section 6-5-3, when mounted to the appropriate substrate (i.e. glass) and tested and calculated per either NFPA 255 or ASTM E 84.

1. Class “A” Classification is as follows:

   a. Flame Spread 0-25
   b. Smoke Developed 0-450

J. The sacrificial film must be able to be readily removed or peeled off the glass, without damaging the glass, by the Authority’s personnel when the film has been damaged or defaced. A replacement film must be able to be installed by the Authority’s tradesmen to protect the glass. Film to be able to be removed and re-installed without the use of special tools.

K. As a part of this Contract, provide enough replacement material, in proper widths and for proper application (glass or plastic) to replace all the film used on this project at least once. Additional film must be available for purchase by the Authority for future replacements. As a part of this contract, provide all required equipment, supplies, and installation and removal instructions required for the Authority’s personnel to perform all removal and replacement operations.

2.09 ELASTOMERIC GLAZING SEALANTS

A. General: Provide products of type indicated and complying with the following requirements:

1. Compatibility: Select glazing sealants and tapes of proven compatibility with other materials with which they will come into contact, including glass products, interlayer of laminated glass units, and glazing channel substrates, under conditions of installation and service, as demonstrated by testing and field experience.
2. Suitability: Comply with specifications of sealant and glass manufacturers for selection of glazing sealants and tapes which have performance characteristics suitable for applications indicated and conditions at time of installation.
3. Colors: Provide color of exposed sealants indicated or, if not otherwise indicated, as selected by the Authority from manufacturer's standard colors.

B. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated which complies with ASTM C920 requirements, including those for Type, Grade, Class and Uses.

1. Additional Movement Capability: Where additional movement capability is specified in the Glazing Sealant Schedule, provide products with the capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C719, to withstand the specified percentage change in the joint width existing at time of installation and remain in compliance with other requirements in ASTM C920 for uses indicated.

C. One-Part Acid-Curing Silicone Glazing Sealant: Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to uses indicated, O.

D. Subject to compliance with requirements, glazing sealants which may be incorporated in the work include, but are not limited to, the following:

1. One-Part Acid-Curing Silicone Glazing Sealant:

a. "Chem-Calk 1200"; Bostik Construction Products Div.
b. "Dow Corning 795"; Dow Corning Corp.
c. “SCS 1200"; General Electric Corp.
d. "863"; Pecora Corp.
e. "Rhodorsil 3B"; Rhone-Poulenc Inc.
f. "Omniglaze"; Sonneborn Building Products Div.; ChemRex, Inc.
g. "Proglaze"; Tremco.

E. Glazing Sealant for Fire-Resistive Glazing Products: Identical to product used in test assembly to obtain fire-protection rating.

2.10 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tape: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C1281 and AAMA 800 for products indicated below:

1. AAMA 804.3 tape, where indicated.
2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

2.11 GLAZING GASKETS

A. Dense Elastomeric Compression Seal Gaskets: Molded or extruded gaskets of material indicated below, complying with ASTM C864, of profile and hardness required to maintain watertight seal:

1. Neoprene, ASTM C864.
2. EPDM, ASTM C864.
3. Thermoplastic polyolefin rubber.
4. Any material indicated above.

B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned gaskets of material indicated below; complying with ASTM C509, Type II, black; and of profile and hardness required to maintain watertight seal:

1. Neoprene.
2. EPDM.

C. Subject to compliance with requirements, manufacturers offering preformed gaskets which may be incorporated in the work include, but are not limited to, the

following:

1. D. S. Brown Co.
2. Maloney Precision Products Co.
3. Tremco.

2.12 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated.

B. Compatibility: Provide materials with proven record of compatibility with surfaces contacted in installation.

C. Cleaners, Primers and Sealers: Type specified by sealant or gasket manufacturer.

D. Setting Blocks: Neoprene, EPDM or silicone blocks as required for compatibility with glazing sealants, 80 to 90 Shore A durometer hardness.

E. Spacers: Neoprene, EPDM or silicone blocks, or continuous extrusions, as required for compatibility with glazing sealant, of size, shape and hardness specified by glass manufacturer to maintain glass lites in place for installation indicated.

F. Edge Blocks: Neoprene, EPDM or silicone blocks, or continuous extrusions, as required for compatibility with glazing sealant, of size, shape and hardness specified by glass manufacturer to maintain glass lites in place for installation indicated.

G. Compressible Filler Rods: Closed-cell or waterproof-jacketed rod stock of synthetic rubber or plastic foam, flexible and resilient, with 5-10 psi compression strength for 25 percent deflection.

H. Cylinder Glazing Sealant Backing: ASTM C1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.13 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing standard, to comply with system performance requirements.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with indoor and outdoor faces.

C. Grind smooth and polish exposed glass edges.

2.14 SOURCE QUALITY ASSURANCE

A. Single Source Responsibility for Glass: To ensure consistent quality of appearance and performance, provide materials produced by a single manufacturer or fabricator for each kind and condition of glass indicated and composed of primary glass obtained from a single source for each type and class required.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Glazing contractor to inspect work of glass framing erector for compliance with manufacturing and installation tolerances, including those for size, squareness, offsets at corners; for presence and functioning of weep system; for existence of minimum required face or edge clearances; and for effective sealing of joinery.

B. Glazing contractor to verify conditions for glazing blocks and spacers, glazing tapes, sealants and glazing stops.

C. Glazing contractor to examine the glass prior to installation and reject any glass that is cracked, chipped, scratched or otherwise damaged.

D. Obtain the glazing contractor's written report listing conditions detrimental to performance of glazing work. Do not allow glazing work to proceed until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Pre-Installation Meeting: At Contractor's direction, Glazier, sealant and gasket manufacturers' technical representatives, glass framing erector and other trades whose work affects glass and glazing shall meet at project site to review procedures and time schedule proposed for glazing and coordination with other work.

B. Clean glazing channels and other framing members to receive glass, immediately before glazing. Remove coatings which are not firmly bonded to substrates. Remove lacquer from metal surfaces where elastomeric sealants are indicated for use.

3.03 INSTALLATION OF SACRIFICIAL FILM FOR WINDOW GLAZING VANDAL PROTECTION

A. All glazing (glass and plastic) shall have installed on both sides a sacrificial film to protect the glazing. Film to be of such a type and installed in such a manner so that it may be readily removed and a new replacement film installed by the Authority’s personnel. Install the initial film under proper atmospheric condition on clean surfaces. Installation shall be without bubbles, cuts, tears, bulges, wrinkles or other imperfections. Film shall be one piece without seams or overlaps. Do not install on wet or dirty surfaces. Follow film manufacturer’s directions and recommendations for installation, including environmental and temperature range.

B. Film shall be warrantied for one year against delaminating, yellowing or other defects in materials or workmanship. Defective film or installations shall be replaced at no cost to the Authority.

C. Film shall be installed in the factory on both sides of the glazing so that it will end at the glazing gasket and the film can be removed without cutting or removing the glazing from the frame.

3.04 GLAZING, GENERAL

A. Comply with combined printed specifications of glass manufacturers, of manufacturers of sealants, gaskets and other glazing materials, except where more stringent requirements are indicated, including those of referenced glazing standards.

B. Glazing channel dimensions as indicated in details are intended to provide for necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by job conditions at time of installation.

C. Protect glass from edge damage during handling and installation; use a rolling block in rotating glass units to prevent damage to glass corners. Do not impact glass with metal framing. Use suction cups to shift glass units within openings; do not raise or drift glass with a pry bar. Rotate glass with flares or bevels along one horizontal edge which would occur in vicinity of setting blocks so that these are located at top of opening. Remove from project and dispose of glass units with edge damage or other imperfections of kind that, when installed, weakens glass and impairs performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by manufacturers for installing lites.

G. Provide spacers for glass lites where the length plus width is larger than 50 inches as follows:

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
2. Provide 1/8-inch (3 mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

3.05 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Do not remove release paper from tape until just before each glazing unit is installed.

D. Apply heel bead of elastomeric sealant.

E. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

F. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.06 GASKET GLAZING (DRY)

A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with stretch allowance during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Center lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Install gaskets so they protrude past face of glazing stops.

1. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage to ensure that gasket will not "walk" out when installation is subjected to movement.
2. Miter cut wedge-shaped gaskets at corners and install gaskets in manner specified by gasket manufacturer to prevent pull away at corners; seal corner joints and butt joints with sealant specified by gasket manufacturer.

3.07 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, in between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

C. Provide compressible filler rods or equivalent back-up material, as specified by sealant and glass manufacturers, to prevent sealant from extruding into glass channel weep systems and from adhering to joints back surface as well as to control depth of sealant for optimum performance, unless otherwise indicated.

D. Force sealants into glazing channels to eliminate voids and to ensure complete "wetting" or bond of sealant to glass and channel surfaces.

E. Tool exposed surfaces of sealants to provide a substantial "wash" away from

glass. Install pressurized tapes and gaskets to protrude slightly out of channel, so as to eliminate dirt and moisture pockets.

3.08 BUTT OR MITERED JOINT GLAZING

A. Where indicated, fill butt joint between glazing with sealant. Provide blocking at vertical mullions to maintain joint dimensions.

3.09 PROTECTION AND CLEANING

A. Protect exterior glazing from breakage immediately upon installation by use of crossed streamers attached to framing and held away from glazing. Do not apply markers to surfaces of glazing. Remove nonpermanent labels and clean surfaces.

B. Protect glazing from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove immediately by method specified by glazing manufacturer.

C. Examine glazing surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less often than once a month, for build-up of dirt, scum, alkali deposits or staining. When examination reveals presence of these forms of residue, remove by method specified by glass manufacturer.

D. Remove and replace glazing which is broken, chipped, cracked, scratched, abraded or damaged in other ways during construction period, including natural causes, accidents and vandalism.

E. Wash any glazing exposed during construction activities on both faces not more than 4 days prior to date scheduled for inspections intended to establish date of substantial completion in each area of project. Wash glazing by method specified by glazing manufacturer.

F. Remove any protective cover over sacrificial film and/or glazing just before Substantial Completion.

3.10 GLAZING SCHEDULE

A. Glass Type GL-1A (Sloped Glazing at Dome, Vault Canopy Locations Above High Gutter, Flyover Bridge Roof, and Glazed Stair Roofs): Low-Iron, Clear, Fully Tempered, Two-Ply Laminated Glass (Safety Glazing required) with Custom Ceramic Frit:

1. Exterior Lite: Low-Iron, Clear, Fully Tempered Glass. Minimum thickness as determined by Specialty Contractor’s engineer to meet specified performance requirements.
2. Custom Ceramic Frit, White, See Architectural drawings for patterns.
3. Ionomeric Polymer Interlayer, Min Thickness: 0.060 inch (1.52mm).
4. Interior Lite: Low-Iron, Clear, Fully Tempered Glass. Minimum thickness as determined by Specialty Contractor’s engineer to meet specified performance requirements.

B. Glass Type GL-1B (Sloped Glazing at Vault Canopy Below High Gutter): Low-Iron, Clear, Fully Tempered, Two-Ply Laminated Glass (Safety Glazing required):

1. Exterior Lite: Low-Iron, Clear, Fully Tempered Glass. Minimum thickness as determined by Specialty Contractor's engineer to meet specified performance requirements.
2. Ionomeric Polymer Interlayer, Min Thickness: 0.060 inch (1.52mm).
3. Interior Lite: Low-Iron, Clear, Fully Tempered Glass. Minimum thickness as determined by Specialty Contractor's engineer to meet specified performance requirements.
4. Two layers of Sacrificial Film for Vandal Protection at Interior, see drawings for locations.

C. Glass Type GL-2 (Vertical Glazing at East and West Abutments Enclosures): Low-Iron, Clear, Annealed, Two-Ply Laminated Glass (Safety Glazing required):

1. Two layers of Sacrificial Film for Vandal Protection at Exterior, see drawings for locations.
2. Exterior Lite: Low-Iron, Clear, Annealed Glass. Minimum thickness: 1/4 inch (6 mm).
3. Polyvinyl Butyral Interlayer, Thickness: 0.060 inch (1.52mm).
4. Interior Lite: Low-Iron, Clear, Annealed Glass. Minimum thickness: 1/4 inch (6 mm).

D. Glass Type GL-3 (Vertical Translucent Glazing East and West Abutments Enclosures): Low-Iron, Clear, Annealed, Two-Ply Laminated Glass (Safety Glazing required):

1. Two layers of Sacrificial Film for Vandal Protection at Exterior, see drawings for locations.
2. Exterior Lite: Low-Iron, Clear, Annealed Glass. Minimum thickness: 1/4 inch (6 mm).
3. Translucent Polyvinyl Butyral Interlayer, Thickness: 0.060 inch (1.52mm).
4. Interior Lite: Low-Iron, Clear, Annealed Glass. Minimum thickness: 1/4 inch (6 mm).

E. Glass Type GL-4 (Vertical Glazing at Escalator and Stair Enclosures, including Balustrades): Low-Iron, Clear, Annealed, Two-Ply Laminated Glass (Safety Glazing required):

1. Two layers of Sacrificial Film for Vandal Protection at Exterior.
2. Exterior Lite: Low-Iron, Clear, Fully Tempered Glass. Minimum thickness: 1/4 inch (6 mm).
3. Polyvinyl Butyral Interlayer, Thickness: 0.060 inch (1.52mm).
4. Interior Lite: Low-Iron, Clear, Fully Tempered Glass. Minimum thickness: 1/4 inch (6 mm).
5. Two layers of Sacrificial Film for Vandal Protection at Interior.

F. Glass Type GL-5 (Sloped Glazing at Historic Canopy and Wind Breaks): Low-Iron, Clear, Fully Tempered, Two-Ply Laminated Glass (Safety Glazing required):

1. Exterior Lite: Low-Iron, Clear, Fully Tempered Glass. Minimum thickness: 1/4 inch (6 mm).
2. Custom Ceramic Frit, Medium Gray, See Architectural drawings for patterns.
3. Polyvinyl Butyral Interlayer, Thickness: 0.060 inch (1.52mm).

4. Interior Lite: Low-Iron, Clear, Fully Tempered Glass. Minimum thickness: 1/4 inch (6 mm).

G. Glass Type GL-6: Not used.

H. Glass Type GL-7 (Vertical Glazing at Platform Wind Breaks): Low-Iron, Clear, Annealed, Two-Ply Laminated Glass (Safety Glazing required):

1. Two layers of Sacrificial Film for Vandal Protection at Exterior
2. Exterior Lite: Low-Iron, Clear, Annealed Glass. Minimum thickness: 1/4 inch (6 mm).
3. Polyvinyl Butyral Interlayer, Thickness: 0.060 inch (1.52mm).
4. Interior Lite: Low-Iron, Clear, Annealed Glass. Minimum thickness: 1/4 inch (6 mm).
5. Two layers of Sacrificial Film for Vandal Protection at Interior

I. Glass Type GL-8 (Glazing at Elevator Cab Enclosure and Doors) (Safety Glazing required):

1. Refer to Section 14 24 00, Hydraulic Elevators for glass requirements.
2. Two layers of Sacrificial Film for Vandal Protection at Interior.

J. Glass Type GL-9 (Security Glazing at Kiosk):

1. Refer to “Security Glazing” requirements within this Section; and Section, 13 06 00 Customer Assistant’s Kiosk, for glass/polycarbonate assembly requirements.

3.11 GLAZING SEALANT SCHEDULE

A. Medium-Modulus Neutral-Curing Silicone Glazing Sealant GS-1: Where glazing sealants of this designation are indicated, provide products complying with the following.

1. Products provide one of the following:

a. 756 H.P; Dow Corning.
b. Silglaze II; GE Silicones.
c. 895; Pecora Corporation.

2. Type and Grade: S (single component) and NS (nonsag).
3. Class 25.
4. Additional Movement Capability: 50 percent movement in extension and 50 percent movement in compression for a total of 100 percent movement.
5. Use Related to Exposure: NT (nontraffic).

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 08 80 00, Glass and Glazing shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 08 80 00, Glass and Glazing shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 08 80 00.S
GLASS AND GLAZING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions and Division 01 Specification sections, apply to this section.

1.02 SUMMARY

A. Extent of glass and glazing work is indicated on drawings and schedules.

B. Types of work include glass and glazing for:

1. Elevator enclosures.
2. Elevator information panels.
3. Elevator doors.
4. Kiosk glazing.

C. Provide and install a sacrificial film on both sides of all glazing except skylight and roof glazing.

D. Related Sections: The following sections contain requirements that relate to this section:

1. Section 07 90 00, Joint Sealers.
2. Section 08 41 10, Aluminum Entrances and Framing.
3. Section 08 51 19.S, Stainless Steel Windows

1.03 REFERENCES

A. ASTM C509 – Standard Specification for Elastomeric Cellular Preformed Gasket and Sealing Material.

B. ASTM C864 – Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.

C. ASTM C920 – Standard Specification for Elastomeric Joint Sealants.

D. ASTM C1021 – Standard Practice for Laboratories Engaged in the Testing of Building Sealants.

E. ASTM C1036 – Standard Specification for Flat Glass.

F. ASTM C1048 – Standard Specification for Heat-Treated Flat Glass--Kind HS, Kind FT Coated and Uncoated Glass.

G. ASTM C1172 – Standard Specification for Laminated Architectural Flat Glass.

H. ASTM C1330 – Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants.

I. ASTM D256 – Determining the Izod Pendulum Impact Resistance of Plastics.

J. ASTM D635 – Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.

K. ASTM D671 – Standard Test Method for Flexural Fatigue of Plastics by Constant Amplitude of-Force.

L. ASTM D785 -Standard Test Method for Rockwell Hardness of Plastics and Electrical Insulating Materials.

M. ASTM D1003 –Standard Test Method for Haze and Luminous Transmittance of Transparent Plastics.

N. ASTM D1044 – Standard Test Method for Resistance of Transparent Plastics to Surface Abrasion.

O. ASTM D3330 – Standard Test Method for Peel adhesion of Pressure-Sensitive Tape.

P. ASTM D3652 – Standard Test Method for Thickness of Pressure-Sensitive Tapes.

Q. ASTM E162 – Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source.

R. ASTM E548 – Standard Guide for General Criteria Used for Evaluating Laboratory Competence.

S. ASTM E662 – Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials.

T. ASTM E773 – Standard Test Method for Accelerated Weathering of Sealed Insulating Glass Units.

U. ASTM E774 – Standard Specification for the Classification of the Durability of Sealed Insulating Glass Units.

V. ASTM E1300 -Standard Practice for Determining Load Resistance of Glass in Buildings.

W. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: GANA'S "Glazing Manual" and "Laminated Glass Design Guide."
2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIRA7, "Sloped Glazing Guidelines."
3. SIGMA Publications: SIGMA TM-3000, "Vertical Glazing Guidelines," and SIGMA TB-3001, "Sloped Glazing Guidelines."

1.04 DEFINITIONS

A. Interlayer: Space between lites of a laminated-glass unit that is made of Polyvinyl Butyral Interlayer or other approved material.

B. Deterioration of Laminated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

C. Deterioration of Polycarbonate Sheet Glazing: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than breakage and practices for maintaining and cleaning the material contrary to manufacturer's written instructions. Defects include discoloration, perceptible visual distortion, materially obstructing vision through glazing, and blemishes exceeding those allowed by referenced polycarbonate sheet glazing standard.

D. Deterioration of Insulating Glass: Failure of hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture or film on interior surfaces of glass.

1.05 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.06 PREINSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Section 01 31 50, Project Meetings.

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review temporary protection requirements for glazing during and after installation.
3. Pre-installation conference to be attended by the glazing contractor, curtain wall contractor, general contractor, designer of record and the Authority's representative.

1.07 SUBMITTALS

A. Product Data: Submit manufacturer's technical data for each glazing material and fabricated glass product required, including installation and maintenance instructions.

B. Samples: Submit, for verification purposes, 12 inch square samples of each type of glazing and interlayer material indicated, and 12 inch long samples of each color required for each type of sealant or gasket exposed to view. Install sealant or gasket sample between two strips of material representative of adjoining framing system in color. Include a sample of each laminated glass product with patterned interlayer as indicated,

with opaque interlayer as indicated, and a sample of the clear glass sheet in thickness indicated.

1. Provide samples of clear, tints, opaque colors, and frit patterns for interlayer material for Authority's selection and approval for each type of interlayer material to be used.

C. Certificate: Submit certificates from respective manufacturers attesting that glass and glazing materials furnished for project comply with requirements. Separate certification will not be required for glazing materials bearing manufacturer's permanent labels designating type and thickness of glass, provided labels represent a quality control program involving a recognized certification agency or independent testing laboratory acceptable to authorities having jurisdiction.

D. Compatibility and Adhesion Test Report: Submit statement from sealant manufacturer indicating that glass and glazing materials have been tested for compatibility and adhesion with glazing sealants and interpreting test results relative to material performance, including specifications for primers and substrate preparation needed to obtain adhesion.

E. Schedule of types, sizes, thicknesses, and installation methods for each size opening and location; using same designations indicated on drawings for glazed openings; and based on actual field verified dimensions and conditions.

F. Qualification Data for Contractors: Demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses.

G. Product Test Reports: From a qualified testing agency indicating the following products comply with requirements, based on comprehensive testing of current products:

1. Laminated glass-each of 3 panel types indicated.

H. Preconstruction Adhesion and Compatibility Test Report: From glazing sealant manufacturer indicating glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.

I. SWRI Validation Certificate: For each elastomeric glazing sealant specified to be validated by SWRI's Sealant Validation Program.

J. Warranties: Special warranties specified in this Section.

1.08 QUALITY ASSURANCE

A. Glazing Standards: Comply with specifications of Flat Glass Marketing Association (FGMA) "Glazing Manual" and "Sealant Manual" except where more stringent requirements are indicated. Refer to those publications for definitions of glass and glazing terms not otherwise defined in this section or other referenced standards.

B. Safety Glazing Standard: Where safety glass is indicated or required by authorities having jurisdiction, provide type of products indicated which comply with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for category II materials. Subject to compliance with requirements, provide safety glass permanently marked with certification label of Safety Glazing Certification Council (SGCC) or other certification agency acceptable to authorities having jurisdiction.

C. Fire-Rated Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252 for door assemblies and NFPA 257 for window assemblies.

D. Manufacturer Qualifications: A single manufacturer who has successfully produced and fabricated glass products of the type specified herein for this project for a period of at least five (5) years; for each kind and condition of glass indicated.

E. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance; and who employs glass installers for this project who are certified under the National Glass Association Glazier Certification Program as Level 2 (Senior Glaziers) or Level 3 (Master Glaziers).

F. Product Testing: Obtain test results for product test reports in "Submittals" Article from a qualified testing agency based on testing products.

1. Glass Testing Subcontractor Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E548.
2. Contractor shall provide a testing subcontractor, as defined in the Division 01 section, "Reference Standards and Definitions", to perform glazing testing and monitoring thereof. Such testing and monitoring shall be performed in accordance with the Division 1 section, "Testing and Inspection Service".

G. Elastomeric Glazing Sealant Product Testing: Obtain sealant test results for product test reports in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period.

1. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021 to conduct the testing indicated, as documented according to ASTM E548.
2. Test elastomeric glazing sealants according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C 920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.

H. Preconstruction Adhesion and Compatibility Testing: Submit to elastomeric glazing sealant manufacturers, for testing indicated below, samples of each glass type, tape sealant, gasket, glazing accessory, and glass-framing member that will contact or affect elastomeric glazing sealants.

1. Use manufacturer's standard test methods to determine whether priming and other specific preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.

    a. Perform tests under normal environmental conditions replicating those that will exist during installation.

2. Submit not fewer than nine pieces of each type and finish of framing members and each type, class, kind, condition, and form of glazing as well as one sample of each glazing accessory (gaskets, tape sealants, setting blocks, and spacers).

3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
4. For materials failing tests, obtain sealant manufacturer's written instructions for corrective measures, including the use of specially formulated primers.
5. Testing will not be required if elastomeric glazing sealant manufacturers submit data based on previous testing of current sealant products for adhesion to, and compatibility with, glazing materials matching those submitted.

I. Safety Glass: Category II materials complying with testing requirements in 16 CFR 1201 and ANSI Z97.1.

1. Subject to compliance with requirements, permanently mark safety glass, as applicable, with certification label of Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction.

J. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the following testing and inspecting agency:

1. Insulating Glass Certification Council.

1.09 PRECONSTRUCTION TESTING

A. Preconstruction Adhesion and Compatibility Testing: Test each glass product, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.

1. Testing is not required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.
2. Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
3. Test no fewer than three (3) Samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.
4. Schedule enough time for testing and analyzing results to prevent delaying the Work.
5. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures including the use of specially formulated primers.

1.10 SEQUENCE

A. Scheduling: Glazing to not begin until the framing, doors or other substrate is permanently and properly in place.

B. Glazing contractor to re-measure all openings before fabricating or cutting the glass.

C. Do not deliver the glass until the openings are ready to receive the glass and the glass can be delivered to the site and installed without being broken or damaged.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Protect glass and glazing materials during delivery, storage and handling to comply with manufacturer's directions and as required to prevent scratching and edge damage to glass, and damage to glass and glazing materials from effects of moisture including condensation, of temperature changes, of direct exposure to sun, and from other causes.

1.12 PROJECT CONDITIONS

A. Environmental Conditions: Do not proceed with glazing when ambient and substrate temperature conditions are outside the limits permitted by glazing material manufacturer or when joint substrates are wet due to rain, frost, condensation or other causes.

1. Install liquid sealants at ambient and substrate temperatures above 40 degrees Fahrenheit.
2. Do not install polycarbonate units when ambient and substrate conditions are above 80 degrees Fahrenheit or below 40 degrees Fahrenheit.

1.13 WARRANTY

A. General: Warranties shall be in addition to, and not a limitation of, other rights the Authority may have under the Contract Documents.

B. Warranty Period: Manufacturer's standard but not less than five (5) years after date of Final Acceptance.

C. Manufacturer's Special Project Warranty on Laminated Glass: Provide written warranty signed by manufacturer of laminated glass agreeing to furnish f.o.b. point of manufacture, freight allowed project site, within five (5) years after date of Final Acceptance, replacements for those laminated glass units which develop manufacturing defects. Manufacturing defects are defined as edge separation, delamination, air pockets, or other imperfections which materially obstructs vision through the glass.

D. Manufacturer’s Special Warranty on Polycarbonate Sheet: Written warranty, made out to the Authority and signed by manufacturer agreeing to furnish replacements for polycarbonate sheet units that deteriorate as defined in “Definitions” Article, f.o.b. the nearest shipping point to Project site, or that yellow greater than index 7.5, within specified warranty period of five (5) years from the date of Final acceptance.

E. Manufacturer’s Special Warranty on Insulating Glass: Manufacturer’s standard form made out to Owner and signed by insulating-glass manufacturing agreeing to replace insulating-glass units that deteriorate as defined in “Definitions” Article, f.o.b. the nearest shipping point to Project site, within specified warranty period of five (5) years from date of Final Acceptance.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Provide glass and glazing that has been produced, fabricated and installed to withstand normal thermal movement, wind loading and impact loading (where applicable), without failure including loss or breakage of glass, failure of sealants or gaskets to remain watertight and airtight, deterioration of glass and glazing materials and other defects in construction.

B. Glass Design: Glass thicknesses indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing project loads and in-service conditions. Provide glass lites for various size openings in nominal thicknesses indicated, but not less than thicknesses and in strengths annealed or heat treated) required to meet or exceed the following criteria:

1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300 and to withstand all applicable loading requirements, according to the following requirements:

a. Specified Design Wind Loads: 20 psf.
b. Specified Design Snow Loads: As indicated, but not less than snow loads applicable to project, required by ASCE 7, “Minimum Design Loads for Buildings and Other Structures”: Section 7, “Snow Loads”.
c. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.

i) Load Duration: 60 seconds or less.

d. Probability of Breakage for Sloped Glazing: 1 lite per 1000 for lites set more than 15 degrees off vertical and under wind and snow action.

i) Load Duration: 30 days.

e. Maximum Lateral Deflection: For the following types of glass supported on all four edges, provide thicknesses required that limits center deflection at design wind pressure to 1/50 times the short side length or 1 inch (25 mm) whichever is less.

i) For monolithic-glass lites heat-treated to resist wind loads.
ii) For insulating glass. iii) For laminated-glass lites.

C. Heat-Treated Float Glass: ASTM C1048; Type I (transparent flat glass); Quality-Q3; of class, kind, and conditioned indicated.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise noted.

D. Laminated Glass: ASTM C1172, Type I (transparent flat glass); Quality-Q3; and complying with other requirements specified and with the following:

1. Interlayer: Polyvinyl Butyral of minimum 1.52 (0.06”) thickness with a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after laminating glass lites and installation.
2. Lamination Process: Laminate lites in autoclave with heat plus pressure. Fabricate laminated glass to produce glass free of foreign substances and air or gas pockets.

E. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat

loss. Size polycarbonate glazing panels to fit openings specified, allowing for expansion and contraction over the temperature range noted, per the manufacturer's printed instructions.

1. Temperature Change (Range): 120 degrees Fahrenheit (67 degrees Celsius), ambient; 180 degrees Fahrenheit (100 degrees Celsius), material surfaces.

F. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:

1. For laminated-glass lites, properties are based on products of construction indicated.
2. For insulating-glass units, properties are based on units with lites 6.0 mm thick and a nominal ½ inch wide interspace.
3. Center-of Glass U-Values: NFRC 100 methodology using LBL-35298 WINDOW 4.1 computer program, expressed as Btu/ sq.ft. x h x degrees Fahrenheit (W/sq.m x K).
4. Center-of-Glass Solar Heat Gain Coefficient: NFRC 200 methodology using LBL35298 WINDOW 4.1 computer program.
5. Solar Optical Properties: NFRC 300.

G. Glazing Design: Glazing thicknesses indicated, if any, are minimums. See drawings and/or schedules for thicknesses for specific applications and locations. Also, manufacturer shall provide the proper thickness for each type of glazing material based on the specific application, size of lite, wind and other loads, vibration, local codes and other design factors.

2.02 MANUFACTURERS

A. Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include; but are not limited to, the following:

1. Heat-Treated Glass:

a. AFG Industries, Inc.
b. Cardinal Glass Industries.
c. Environmental Glass Products.
d. Falconer Glass Industries.
e. Guardian Industries Corp.
f. LOF Glass, Inc.
g. OldCastle.
h. PPG Industries, Inc.
i. Viracon, Inc.

2. Manufacturers of Laminated Glass:

a. Advanced Coating Technology (Interlayer).
b. AFG Industries, Inc.
c. Cardinal Glass Industries.
d. Environmental Glass Products.
e. Falconer Glass Industries.
f. Guardian Industries Corp.
g. HGP & Affiliates, Inc.

h. OldCastle.
i. PPG Industries, Inc.
k. Viracon, Inc.

3. Manufacturers of glass clad polycarbonate laminate:

a. Globe Amerada Glass.
b. Guardian Industries.
c. Viracon, Inc.

4. Manufacturers of fire-rated glazing products:

a. FireLite Plus by Nippon Electric Glass Co., Ltd. distributed by Technical Glass Products.
b. PyroStop distributed by Technical Glass Products.
c. SuperLite II by SAFTI Div., O'Keeffe's Inc.
d. Pyrovue Commercial by Advanced Glass Systems Corp.

5. Manufacturers of sacrificial film products:

a. MADICO, Inc.

6. Manufacturer and/or trade name of security glazing products:

a. "Secur-Tem + Poly" as manufactured by Globe/ Aemeroda Glass Co.
b. "Glass-Clad No. 31554 as manufactured by Guardian Industries.
c. "Guard-Vue 200" as manufactured by Viracon.
d. US Armor LLC.

2.02 GLASS PRODUCTS, GENERAL

A. Primary Glass Standard: Provide primary glass which complies with ASTM C1036 requirements, including those indicated by reference to type, class, quality, and, if applicable, form, finish, mesh and pattern.

B. Heat-Treated Glass Standard: Provide heat-treated glass which complies with ASTM C1048 requirements, including those indicated by reference to kind, condition, type, quality, class, and, if applicable, form, finish, and pattern.

C. Sizes: Fabricate glass to sizes required for glazing openings indicated, with edge clearances and tolerances complying with specifications of glass manufacturer. Provide thicknesses indicated and/or as specified by glass manufacturer for application indicated and/or as required by code for actual conditions, sizes, and wind loads.

2.03 PRIMARY GLASS PRODUCTS

A. Clear Float Glass: ASTM C1036, Type I (transparent glass, flat), Class 1 (clear), Quality Q3 (glazing select).

B. Total thickness of clear float glass to be as indicated on drawings, to be as indicated on schedule at the end of this section, to meet design criteria, to meet standards indicated, and/ or to meet applicable codes; but not less than 3/8".

2.04 HEAT-TREATED (TEMPERED) GLASS PRODUCTS

A. Heat-Treated or Tempered Glass: ASTM C1048; manufacture heat-treated glass by vertical (tong-held) or horizontal (roller hearth) process, at manufacturer's option, except provide horizontal process where indicated as "tongless" or "free of tong marks".

1. Uncoated Clear Heat-Treated Float Glass: Condition A (uncoated surfaces), Type I (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select), kind FT (fully tempered) where indicated.

B. Total thickness of tempered glass to be as indicated on drawings, to be as indicated on schedule at the end of this section, to meet design criteria, to meet standards indicated, and/ or to meet applicable codes; but not less than 1/4".

2.05 LAMINATED GLASS PRODUCTS

A. Laminated Glass Products: Comply with ASTM C1172 for kinds of laminated glass indicated and other requirements specified. Refer to primary and heat-treated glass requirements relating to properties of glass products comprising laminated glass products.

B. Glass: Two outer glass panels of clear float glass (unless specified otherwise).

C. Interlayer: Interlayer material as indicated below, in clear or with frit pattern as noted, and of thickness indicated, with a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after laminating and installation.

1. Interlayer Material: Polyvinyl Butyral sheet.
2. Color and pattern of plastic interlayer: Clear or frit as specified.
3. Frit (where pattern is specified): Clear (or tinted if specified) interlayer of thickness as required for the assembly to comply as a Type II safety glass material) to have square frit printed pattern, 11/16" squares on 1-1/4" spacing, aligned in a grid vertically and horizontally. Squares are the frit rather than the grid.

D. The assembly is created by laminating the interlayer, two layers of adhesive and two glass panels; the entire assembly is then permanently bonded. The assembly shall comply as a safety laminated product meeting industry standard ANSI Z-97. 1-1984 and the Consumer Product Safety Commission Federal standard 16 CFR 1201, Category I and II. The assembly shall be both weather and ultraviolet radiation resistant.

E. Products: Subject to compliance with requirements, provide one of the following:

1. Polyvinyl Butyral Interlayer:

a. Saflex, Monsanto Co.
b. Butacite, E.I. du Pont de Nemours & Co., Inc.

F. Laminating Process: Fabricate laminated glass to produce glass free of foreign substances and air or glass pockets as follows:

1. Laminate clear float glass lites with polyvinyl butyral interlayer in autoclave with heat plus pressure.

G. Total thickness of laminated glass to be as indicated on drawings; as indicated on the schedule at the end of this section; to meet design criteria; to meet standards indicated,

and/ or to meet applicable codes; but not less than 9/16" (Inner and outer layer of ¼" clear float glass bonded to interlayer of 0.06" Polyvinyl Butyral).

2.06 FIRE RATED ASSEMBLIES

A. Laminated product in the form of two lites of clear safety glazing (heat treated, tempered) with a intumescent interlayer, including a clear, fully transparent, heat-absorbing gel. Thicknesses of glazing and interlayer as required for specific application, size of lite, as required by manufacturer, as required by code, and as required to obtain required firerating. Frame for fire-rated assembly to be as required to maintain required fire rating.

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2.09 INSULATING-GLASS UNITS

A. Insulating-Glass Units, General: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace and complying with ASTM E 774 for Class CBA units.

B. Glass Type: Provide Kind FT (fully tempered) safety glass for both lites unless indicated otherwise.

C. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated in schedule or on drawings and as required for size and application of glass lite and wind and other loads. Minimum 25 mm overall and 6.0 mm each lite.

D. Interspace Content: Air.

E. Sealing System: Manufacturer's standard sealants.

F. Spacer Material: Aluminum with mill finish.

2.10 SACRIFICIAL FILM FOR WINDOW GLAZING VANDAL PROTECTION

A. Provide and install a sacrificial film on both sides of all glazing for vandal protection unless shown or noted otherwise. Sacrificial film not required on skylights or roof glazing.

B. The sacrificial protective film on each side shall be one layer of Polyethylene Terathalate (PET), 6 mils thick. There shall be an acrylic pressure sensitive adhesive on the back of the film, protected by a peel-off release liner, for installation to the glass.

C. The protective film and adhesive must be formulated and approved for exterior applications.

D. The sacrificial protective film and adhesive shall be as manufactured by the following:

1. MADICO, Inc.

a. Product Number LCL-600-XSRG for film applied to glass (laminated, tempered, float, etc.)
b. Product Number LCL-600-BFXSR for film applied to polycarbonate.

E. The films must be compatible with the existing application solutions presently used by the Authority and removable by peeling off.

1. The application solutions shall be non-toxic and contain no chemical within the formulation which is a suspected human carcinogen. The application solutions currently approved and used by the Authority are as follows:

    a. Product number 3901249 available through Graffiti Removal, Inc., Huntington Beach, CA.
    b. Product Number 4608 available through Midwest Marketing, Peoria, IL.

F. Other manufacturers of films and applications solutions equal to the specified film and solutions must be submitted to the Authority for written approvals prior to bidding. Provide the Authority with certified test reports, specifications, installation/removal instructions, Material Safety Data Sheet, and samples of the proposed film and solution to demonstrate that it is equal to the specified film and solution and complies with all requirements set forth herein.

1. Samples that are judged by the Authority to be difficult to install or remove when compared to approved sacrificial protective film and application solution, or fail to function under normal operating conditions when tested in service shall be rejected.

G. Sacrificial film products shall meet or exceed the required results of the following ANSI/SAE Z26.1 tests:

1. Test 3, Humidity Test
2. Test 15, Optical Deviation and Visibility Test.
3. Test 17, Abrasion Resistance (Glass-Plastics)

4. Test 19, Chemical Resistance (Non-stressed)
5. Test 28, Resistance to temperature change.

H. The sacrificial film products shall also meet the following performance requirements:

1. Physical Properties:

Average Tensile Strength: Per ASTM D882	25,000 psi
Average Break Strength: Per ASTM D882	150 lbs./in. (width)
Adhesive Type:	Acrylic Pressure Sensitive
Average Peel Strength (mounted): Per ASTM D903	
For film to mounted glass	5 to 6 lbs./in. (of width)
For film mounted to plastic glazing	2.5 to 3.5 lbs./in (of width)

2. Solar optical properties – The sacrificial film shall meet or exceed the following solar optical properties:

Total Solar Energy;

Average Percent Transmitted	79

Average Percent Reflected	10
Average percent Absorbed	11
Visible Light (Daylight): Average Percent Transmitted	83
Average Percent Reflected	10
“U” Factor:	
Median	1.08
Design	1.12
Percent of Ultraviolet Light Rejected	99
Shading Coefficient:	0.93
Percent Total Solar Energy	19

I. Flame Spread and Smoke Developed: The sacrificial film shall meet or exceed a Class “A: Interior Wall and Ceiling Finish Classification as outlined in the National Fire Protection Association (NFPA) Life Safety Code 101, Section 6-5-3, when mounted to the appropriate substrate (i.e. glass) and tested and calculated per either NFPA 255 or ASTM E 84.

1. Class “A” Classification is as follows:

   a. Flame Spread 0-25
   b. Smoke Developed 0-450

J. The sacrificial film must be able to be readily removed or peeled off the glass, without damaging the glass, by the Authority’s personnel when the film has been damaged or defaced. A replacement film must be able to be installed by the Authority’s tradesmen to protect the glass. Film to be able to be removed and re-installed without the use of special tools.

K. As a part of this Contract, provide enough replacement material, in proper widths and for proper application (glass or plastic) to replace all the film used on this project at least once. Additional film must be available for purchase by the Authority for future replacements. As a part of this contract, provide all required equipment, supplies, and installation and removal instructions required for the Authority’s personnel to perform all removal and replacement operations.

2.11 ELASTOMERIC GLAZING SEALANTS

A. General: Provide products of type indicated and complying with the following requirements:

1. Compatibility: Select glazing sealants and tapes of proven compatibility with other materials with which they will come into contact, including glass products, interlayer of laminated glass units, and glazing channel substrates, under conditions of installation and service, as demonstrated by testing and field experience.

2. Suitability: Comply with specifications of sealant and glass manufacturers for selection of glazing sealants and tapes which have performance characteristics suitable for applications indicated and conditions at time of installation.

3. Colors: Provide color of exposed sealants indicated or, if not otherwise indicated, as selected by the Authority from manufacturer's standard colors.

B. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated which complies with ASTM C920 requirements, including those for Type, Grade, Class and Uses.

1. Additional Movement Capability: Where additional movement capability is specified in the Glazing Sealant Schedule, provide products with the capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C719, to withstand the specified percentage change in the joint width existing at time of installation and remain in compliance with other requirements in ASTM C920 for uses indicated.

C. One-Part Acid-Curing Silicone Glazing Sealant: Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to uses indicated, O.

D. Subject to compliance with requirements, glazing sealants which may be incorporated in the work include, but are not limited to, the following:

1. One-Part Acid-Curing Silicone Glazing Sealant:

a. "Chem-Calk 1200"; Bostik Construction Products Div.
b. "Dow Corning 795"; Dow Corning Corp.
c. "SCS 1200"; General Electric Corp.
d. "863"; Pecora Corp.
e. "Rhodorsil 3B"; Rhone-Poulenc Inc.
f. "Omniglaze"; Sonneborn Building Products Div.; ChemRex, Inc.
g. "Proglaze"; Tremco.

E. Glazing Sealant for Fire-Resistive Glazing Products: Identical to product used in test assembly to obtain fire-protection rating.

2.12 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tape: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C1281 and AAMA 800 for products indicated below:

1. AAMA 804.3 tape, where indicated.
2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

2.13 GLAZING GASKETS

A. Dense Elastomeric Compression Seal Gaskets: Molded or extruded gaskets of material indicated below, complying with ASTM C864, of profile and hardness required to maintain watertight seal:

1. Neoprene, ASTM C864.
2. EPDM, ASTM C864.
3. Thermoplastic polyolefin rubber.
4. Any material indicated above.

B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned gaskets of material indicated below; complying with ASTM C509, Type II, black; and of profile and hardness required to maintain watertight seal:

1. Neoprene.
2. EPDM.

C. Subject to compliance with requirements, manufacturers offering preformed gaskets which may be incorporated in the work include, but are not limited to, the following:

1. D. S. Brown Co.
2. Maloney Precision Products Co.
3. Tremco.

2.14 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated.

B. Compatibility: Provide materials with proven record of compatibility with surfaces contacted in installation.

C. Cleaners, Primers and Sealers: Type specified by sealant or gasket manufacturer.

D. Setting Blocks: Neoprene, EPDM or silicone blocks as required for compatibility with glazing sealants, 80 to 90 Shore A durometer hardness.

E. Spacers: Neoprene, EPDM or silicone blocks, or continuous extrusions, as required for compatibility with glazing sealant, of size, shape and hardness specified by glass manufacturer to maintain glass lites in place for installation indicated.

F. Edge Blocks: Neoprene, EPDM or silicone blocks, or continuous extrusions, as required for compatibility with glazing sealant, of size, shape and hardness specified by glass manufacturer to maintain glass lites in place for installation indicated.

G. Compressible Filler Rods: Closed-cell or waterproof-jacketed rod stock of synthetic rubber or plastic foam, flexible and resilient, with 5-10 psi compression strength for 25 percent deflection.

H. Cylinder Glazing Sealant Backing: ASTM C1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.15 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing standard, to comply with system performance requirements.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with indoor and outdoor faces. C. Grind smooth and polish exposed glass edges.

2.16 SOURCE QUALITY ASSURANCE

A. Single Source Responsibility for Glass: To ensure consistent quality of appearance and performance, provide materials produced by a single manufacturer or fabricator for each kind and condition of glass indicated and composed of primary glass obtained from a single source for each type and class required.

PART 3 EXECUTION

3.01 EXAMINATION

A. Glazing contractor to inspect work of glass framing erector for compliance with manufacturing and installation tolerances, including those for size, squareness, offsets at corners; for presence and functioning of weep system; for existence of minimum required face or edge clearances; and for effective sealing of joinery.

B. Glazing contractor to verify conditions for glazing blocks and spacers, glazing tapes, sealants and glazing stops.

C. Glazing contractor to examine the glass prior to installation and reject any glass that is cracked, chipped, scratched or otherwise damaged.

D. Obtain the glazing contractor's written report listing conditions detrimental to performance of glazing work. Do not allow glazing work to proceed until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Pre-Installation Meeting: At Contractor's direction, Glazier, sealant and gasket manufacturers' technical representatives, glass framing erector and other trades whose work affects glass and glazing shall meet at project site to review procedures and time schedule proposed for glazing and coordination with other work.

B. Clean glazing channels and other framing members to receive glass, immediately before glazing. Remove coatings which are not firmly bonded to substrates. Remove lacquer from metal surfaces where elastomeric sealants are indicated for use.

3.03 INSTALLATION OF SACRIFICIAL FILM FOR WINDOW GLAZING VANDAL PROTECTION.

A. All glazing (glass and plastic) shall have installed on both sides a sacrificial film to protect the glazing. Film to be of such a type and installed in such a manner so that it may be readily removed and a new replacement film installed by the Authority’s personnel. Install the initial film under proper atmospheric condition on clean surfaces. Installation shall be without bubbles, cuts, tears, bulges, wrinkles or other imperfections. Film shall be one

piece without seams or overlaps. Do not install on wet or dirty surfaces. Follow film manufacturer's directions and recommendations for installation, including environmental and temperature range.

B. Film shall be warrantied for one year against delaminating, yellowing or other defects in materials or workmanship. Defective film or installations shall be replaced at no cost to the Authority.

C. Film shall be installed in the factory on both sides of the glazing so that it will end at the glazing gasket and the film can be removed without cutting or removing the glazing from the frame.

3.04 GLAZING, GENERAL

A. Comply with combined printed specifications of glass manufacturers, of manufacturers of sealants, gaskets and other glazing materials, except where more stringent requirements are indicated, including those of referenced glazing standards.

B. Glazing channel dimensions as indicated in details are intended to provide for necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by job conditions at time of installation.

C. Protect glass from edge damage during handling and installation; use a rolling block in rotating glass units to prevent damage to glass corners. Do not impact glass with metal framing. Use suction cups to shift glass units within openings; do not raise or drift glass with a pry bar. Rotate glass with flares or bevels along one horizontal edge which would occur in vicinity of setting blocks so that these are located at top of opening. Remove from project and dispose of glass units with edge damage or other imperfections of kind that, when installed, weakens glass and impairs performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by manufacturers for installing lites.

G. Provide spacers for glass lites where the length plus width is larger than 50 inches as follows:

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
2. Provide 1/8-inch (3 mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

J. Remove temporary protective coating from polycarbonate, clean lite and assemble glazing. Glaze metal/polycarbonate/metal assembly into frames, with gaskets as indicated.

3.05 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening

C. Do not remove release paper from tape until just before each glazing unit is installed.

D. Apply heel bead of elastomeric sealant.

E. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

F. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.06 GASKET GLAZING (DRY)

A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with stretch allowance during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Center lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Install gaskets so they protrude past face of glazing stops.

1. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage to ensure that gasket will not "walk" out when installation is subjected to movement.
2. Miter cut wedge-shaped gaskets at corners and install gaskets in manner specified by gasket manufacturer to prevent pull away at corners; seal corner joints and butt joints with sealant specified by gasket manufacturer.

3.07 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, in between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure.

Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

C. Provide compressible filler rods or equivalent back-up material, as specified by sealant and glass manufacturers, to prevent sealant from extruding into glass channel weep systems and from adhering to joints back surface as well as to control depth of sealant for optimum performance, unless otherwise indicated.

D. Force sealants into glazing channels to eliminate voids and to ensure complete "wetting" or bond of sealant to glass and channel surfaces.

E. Tool exposed surfaces of sealants to provide a substantial "wash" away from glass. Install pressurized tapes and gaskets to protrude slightly out of channel, so as to eliminate dirt and moisture pockets.

3.08 BUTT OR MITERED JOINT GLAZING

A. Where indicated, fill butt joint between glazing with sealant. Provide blocking at vertical mullions to maintain joint dimensions.

3.09 PROTECTION AND CLEANING

A. Protect exterior glazing from breakage immediately upon installation by use of crossed streamers attached to framing and held away from glazing. Do not apply markers to surfaces of glazing. Remove nonpermanent labels and clean surfaces.

B. Protect glazing from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove immediately by method specified by glazing manufacturer.

C. Examine glazing surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less often than once a month, for build-up of dirt, scum, alkali deposits or staining. When examination reveals presence of these forms of residue, remove by method specified by glass manufacturer.

D. Remove and replace glazing which is broken, chipped, cracked, scratched, abraded or damaged in other ways during construction period, including natural causes, accidents and vandalism.

E. Wash any glazing exposed during construction activities on both faces not more than 4 days prior to date scheduled for inspections intended to establish date of substantial completion in each area of project. Wash glazing by method specified by glazing manufacturer.

F. Remove any protective cover over sacrificial film and/or glazing just before Substantial Completion.

3.10 GLAZING SCHEDULE

A. LAMINATED GLASS GL-1: Where glass of this designation is indicated, provided glass lites complying with the following:

1. Top Lite: Type I (transparent glass, flat, float) glass.

    a. Class 1 (clear).
    b. Thickness: 1/4" (nominal).

2. Bottom Lite: Type I (transparent glass, flat) float glass.

    a. Class 1 (clear).
    b. Thickness: 1/4" (nominal).

3. Plastic Interlayer: 0.060 inch thick.

    a. Interlayer Color: Clear; or
    b. Interlayer Color: Frit pattern as noted in this section and as selected.

4. Total thickness GL-1: 9/16”.

5. Laminated glass assembly to be protected both sides with sacrificial film.

3.11 GLAZING SEALANT SCHEDULE

A. Medium-Modulus Neutral-Curing Silicone Glazing Sealant GS-1: Where glazing sealants of this designation are indicated, provide products complying with the following.

1. Products provide one of the following:

    a. 756 H.P; Dow Corning.
    b. Silglaze II; GE Silicones.
    c. 895; Pecora Corporation.

2. Type and Grade: S (single component) and NS (nonsag).
3. Class 25.
4. Additional Movement Capability: 50 percent movement in extension and 50 percent movement in compression for a total of 100 percent movement.
5. Use Related to Exposure: NT (nontraffic).

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of GLASS AND GLAZING shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of GLASS AND GLAZING shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000.

END OF SECTION

SECTION 09 21 00

GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of contract, including General and Special Conditions andDivision 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes gypsum board assemblies for wall or ceiling applications and includes the following:

1. Metal framing.
2. Rigid Insulation.
3. Batt Insulation.
4. Vapor Retarder.
5. Gypsum board and accessories.

1.03 REFERENCES

A. Refer to the following standards for reference.

1. ASTM C 36: Standard Specification for Gypsum Wallboard; 1993.
2. ASTM C 475: Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 1993.
3. ASTM C 630/C 630M: Standard Specification for Water-Resistant Gypsum Backing Board; 1993.
4. ASTM C 645: Standard Specification for Non-Load (Axial) Bearing Steel Studs, Runners (Track), and Rigid Furring Channels for Screw Application of Gypsum Board; 1994.
5. ASTM C 754: Standard Specification for Installation of Steel Framing Members toReceive Screw-Attached Gypsum; 1988.
6. ASTM C 840: Standard Specification for Application and Finishing of Gypsum Board; 1994.
7. ASTM C 1002: Standard Specification for Steel Drill Screws for the Application ofGypsum Board or Metal Plaster Bases; 1993.
8. ASTM E 119: Standard Test Methods for Fire Tests of Building Construction and Materials; 1988.
9. Fire Resistance Directory; Underwriters Laboratories Inc. (UL); 1994.
10. GA-214-90 Recommended Specification: Level of Gypsum Board Finish; GypsumAssociation; 1990.
11. GA-216-93 - Recommended Specifications for the Application and Finishing of Gypsum Board; Gypsum Association; 1993.

1.04 RELATED SECTIONS

A. The following sections contain requirements that relate to this section:

1. Division 09: Painting.

1.05 SUBMITTALS

A. General: Submit the following according to Division 01 Specification Section, Submittals:

B. Product data for each type of product specified, including installation instructions and datasufficient to show compliance with requirements.

1. Each type of Gypsum Board specified or required.
2. Metal framing components.
3. Rigid insulation.
4. Batt insulation.
5. Tape and joint compounds.
6. Fastening devices.
7. Vapor barrier.
8. Trim pieces.

C. Shop drawings for cold-formed steel framing indicating layout, spacings, sizes thicknesses and types of cold-formed framing; fabrication; fastening and anchorage; reinforcing; and accessories.

D. Shop drawings for special assemblies designated on the drawings, including details sufficient to show compliance with design intent and performance requirements.

E. For cold-formed metal framing indicated to comply with design loads, include structural analysis and detailed shop drawings signed and sealed by a professional structural engineer licensed in the state of Illinois.

F. Reflected ceiling plan showing locations for light fixtures, access panels, vents and openings. Indicate reinforcing or additional framing for supporting fixtures, access panels and openings.

G. Certification and details for fire rated assemblies. Certification and details for STC-rated assemblies.

1.06 QUALITY ASSURANCE

A. Installer Qualifications, Metal Framing: Provide installation by a company specializing in work similar to that required on this project and with not less than 5 years of documented experience.

B. Installer Qualifications, Gypsum Board: Provide installation by a company specializing in work similar to that required on this project and with not less than 5 years of documented experience.

C. Single-Source Responsibility for Panel Products: Obtain each type of gypsum board, accessories and other panel products from a single manufacturer. Obtain finishing materials from either the same manufacturer that supplies gypsum board and other panel products orfrom a manufacturer acceptable to gypsum board manufacturer.

D. Fire-Resistive Rating: Where indicated for fire-resistance ratings, provide materials and installations identical with applicable assemblies, which have been tested per ASTM E 119 and listed by a testing laboratory recognized by authorities having jurisdiction.

E. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed SteelFraming - General Provisions."

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.

B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, construction traffic, corrosion, and other causes. Neatly stack and support gypsum panels flat and level to prevent sagging.

C. Handle gypsum board to prevent damage to edges, ends, and surfaces. Do not bend or otherwise damage metal corner beads and trim.

D. Store corner bead and other metal and plastic accessories to prevent bending, sagging, distortion, or other mechanical damage.

E. Do not install gypsum panels that have become wet.

1.08 PROJECT CONDITIONS

A. Environmental Conditions: Establish and maintain environmental conditions for applying and finishing gypsum board to comply with ASTM C 840 requirements or with gypsum board manufacturer's recommendations, whichever are more stringent. For non-adhesive attachment of gypsum board to framing, maintain not less than 40 deg Do not exceed 95 deg F when using temporary heat sources. Ventilate building spaces as required to dry joint treatment materials. Avoid drafts during hot, dry weather to prevent finishing materials fromdrying too rapidly.

B. Ventilation: Provide controlled ventilation during joint finishing operations, to eliminate excessive moisture. Avoid drafts during hot, dry weather to prevent finishing materials fromdrying too quickly.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited the following:

1. Steel Framing and Furring:

a. Clark Steel Framing Systems.
b. Consolidated Systems, Inc.
c. Dale Industries, Inc. - Dale/Incor.
d. Dietrich Industries, Inc.
e. MarinoWare; Division of Ware Ind.
f. National Gypsum Company.
g. Scafco Corporation.
h. Unimast, Inc.
i. Western Metal Lath & Steel Framing Systems.

2. Gypsum Board and Related Products:

a. American Gypsum Co.
b. G-P Gypsum Corp.
c. National Gypsum Company.
d. United States Gypsum Co.

2.02 STEEL FRAMING MATERIALS

A. General: Select size and gage of framing members and establish spacing to comply with requirements of ASTM C 754 unless otherwise specifically indicated.

1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal, unlessotherwise indicated.
2. Protective Coating: ASTM A 653, G60 hot-dip galvanized zinc coating.

B. Minimum Base-Metal Thickness: 0.0312 inch.

C. Size of runners and vertical members as shown on the drawings, unless noted otherwise orotherwise required structurally for actual conditions, loads or unsupported length.

D. Steel framing materials to be secured to substrates and to each other with stainless steel or galvanized screws and anchors of type, size and length required for the actual applicationand conditions.

E. Wire Ties: ASTM A 641 (ASTM A 641M), Class 1 zinc coating, soft temper, 0.162-inch (4.1-mm) diameter.

F. Wire Hangers: ASTM A 641 (ASTM A 641M), Class 1 zinc coating, soft temper, 0.162-inch(4.1-mm) diameter.

G. Channels: Cold-rolled steel, 0.0598-inch (1.5-mm) minimum thickness of base (uncoated)metal and 7/16-inch- (11.1-mm-) wide flanges, and as follows:

1. Carrying Channels: 1-1/2 inches (38.1 mm) deep, 475 lb/1000 feet (70 kg/100unless otherwise indicated.
2. Furring Channels: 3/4 inch (19.1 mm) deep, 300 lb/1000 feet (45 kg/100 unlessotherwise indicated.
3. Finish: Rust-inhibitive paint, except ASTM A 653, G 60 (ASTM A 653M, Z 180) hot-dip galvanized coating for framing for exterior soffits and where indicated.

H. Steel Studs and Runners: ASTM C 645, with flange edges of studs bent back 90 degrees and doubled over to form 3/16-inch- (5-mm-) wide minimum lip (return), and complying with the following requirements for minimum thickness of base (uncoated) metal, width and limiting heights. Limiting heights are based on using 16” o.c. stud spacing with 1/2” thick Gypsum board panels and 5 psf load perpendicular to partition or furring with an allowable detection of L/360.

1. Thickness, Width and Limiting Height:

Stud Width & Thickness	Limiting Height with One Layer of Gyp. Bd. Each Side
(0.0179”) 25 ga.	
2-1/2”	9’-10”
3-5/8”	12’-4”
4”	13’-4”
6”	17’-11”

2. Protective Coating: Manufacturer’s standard corrosion-resistant coating for exteriorsoffits and ceiling suspension members.
3. Runners: Match studs; type recommended by stud manufacturer for floor and ceilingsupport of studs, and for vertical abutment of drywall work at other work.
4. Stiffeners: 3/4” cold-rolled steel channels at 0.3 lb. Per ft., rust-inhibitive paint

finish.

5. Stud System Accessories: Provide stud manufacturer's standard clips, shoes, ties, reinforcements, fasteners and other accessories as needed for a complete stud system.

    a. Steel Channel Bridging: Cold-rolled steel, 0.0598-inch (1.5-mm) minimum thickness of base (uncoated) metal and 7/16-inch- (11.1-mm-) wide flanges, 1-1/2 inches (38.1 mm) deep, 475 lb/1000 feet (45 kg/100 unlessotherwise indicated.
    b. Steel Flat Strap and Backing Plate: Steel sheet for blocking and bracing complying with ASTM A 653 (ASTM A 653M) or ASTM A 568 (ASTM A 568M), length and width as indicated, and with a minimum base metal (uncoated) thickness as follows:

        1) Thickness: 0.027 inch (0.7 mm) where indicated.

I. Steel Joists and Framing: C – Channel sections, hot dip galvanized. Size, gauge or thickness, spacing as indicated on the drawings for the specific loading and spans withoutexceeding a deflection of 1/360 of the span.

1. Minimum Gauge: 18.
2. Stiffners, bridging and accessories as shown, required or recommended by the manufacturer.

J. Fasteners for Metal Framing: Provide fasteners of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel framing and furring members securely to substrates involved; complying with the recommendations of gypsum board manufacturers for applications indicated.

1. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws. Manufacturer's standard head unless indicated or required otherwise.

2.03 GYPSUM BOARD

A. Interior Gypsum Wallboard: ASTM C 36; maximum lengths available to minimize end-to-end butt joints in each area receiving finished gypsum board. Edges to be tapered unless indicated otherwise. Provide the following type(s) as specified or required for interior applications, walls or ceilings:

1. 1/2 inch regular gypsum board.
2. Fire-resistant Type X, 5/8 inch.
3. Moisture- and Mold-Resistant core and surfaces, 5/8 inch, Type X.
4. Abuse-Resistant Type. Manufactured to produce greater resistance to surface indentation and impact resistance than standard. Regular, Type X, and/or moistureand mold resistant.

B. Exterior Gypsum Wallboard: ASTM C 931; maximum lengths available to minimize end-to-end butt joints in each area receiving finished gypsum board. Provide the followingtype as specified or required for exterior applications, walls or soffits:

1. Fire-resistant Type X, 5/8 inch.
2. Glass-Mat Gypsum Sheathing Board: ASTM C 1177, 5/8 inch, Type X, "Dens-GlassGold by G-P Gypsum.

C. Tile Backing Panels:

1. Water-Resistant Gypsum Backing Board: ASTM C630; 1/2" or 5/8" thick as specifiedor required; Type X if specified or required.
2. Glass-Mat, Water-Resistant Backing Board: ASTM C 1178; DensShield Tile

Guardby G-P Gypsum or equal.

3. Complying with ASTM C 1177, “DensArmor Plus Interior Guard” by G-P Gypsum;1/2” or 5/8” thick as specified or required; Type X if specified or required.
4. Cementitious Backer Units: ANSI A108.1; 1/2” thick; by one of the following:

    a. Custom Building Products; Wonderboard.
    b. FinPan, Inc.; Util-A-Crete Concrete Backer Board.
    c. USG Corporation; DUROCK Cement Board.
    d. Approved equal.

D. Fiberglass Surfaced Gypsum:

1. Gypsum panel made of a treated, water-resistant core, surfaced all sides with fiberglass mats and a primer coating; conforming to ASTM C 1177 and ASTM C 1396.
2. Fiberglass surfaced gypsum to be resistant to delamination, deterioration, warping, rippling, buckling and sagging due to weather exposure. The board shall also be mold resistant.
3. Fiberglass surfaced gypsum to be mold resistant under ASTM D3273 test method.
4. Fiberglass surfaced gypsum shall be noncombustible as described and tested in accordance with ASTM E 136. Flame spread and smoke develop rating of 0/0 whentested in accordance with ASTM E 84.
5. Fiberglass surfaced gypsum boards shall be available in 1/2 “ thickness for non-UL applications and 5/8” thickness for UL rated applications. Boards to be 4 foot X 8 foot in size.
6. Provide fiberglass surfaced gypsum boards from the following:

    a. Georgia-Pacific.
    b. Approved equal.

2.04 TRIM AND ACCESSORIES

A. General: Except as otherwise specifically indicated, provide trim and accessories by manufacturer of gypsum board materials, made of galvanized steel or zinc alloy and configured for concealment in joint compound. Trim to conform to ASTM C 1047.

B. Include trim units necessary for project conditions. Provide accessories as required in order to achieve details indicated, whether or not specific accessories are shown on the drawings.

1. Cornerbead.
2. Bullnose bead.
3. LC-Bead.
4. L-Bead.
5. U-Bead.
6. Expansion joint trim.

2.05 JOINT TREATMENT

A. General: Provide products by manufacturer of gypsum boards. Comply with ASTM C 475and with manufacturer's recommendations for specific project conditions.

B. Joint Tape: Manufacturer's standard paper reinforcing tape.

1. Joint Tape for moisture-resistant Board: If recommended by manufacturer,

provide open-weave fiberglass tape for joint treatment of water-resistant gypsum backingboard.

C. Setting Type Joint Compound: Chemical hardening type, for the following applications:

1. Interior use: Taping and prefilling.

D. Drying Type Joint Compound: Vinyl-based ready-mixed type for interior use, and as follows;

1. Topping compound: Type specifically formulated for finishing drywall over taping compound.

E. Joint Compound: At joints and fasteners in moisture-resistant gypsum board, providecompound specifically recommended or permitted by manufacturer of gypsum board.

2.06 MISCELLANEOUS GYPSUM MATERIALS

A. General: Provide miscellaneous materials as produced or recommended by manufacturerof gypsum products.

B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated. Screws to be stainless steelor hot-dipped galvanized.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.

2.07 INSULATION

A. Rigid Insulation: Extruded Polystyrene Board Insulation: Rigid cellular polystyrene thermal insulation with closed cells and integral high-density skin, formed by the expansion of polystyrene base resin in an extrusion process to comply with ASTM C 578, Type IV; in manufacturer's standard lengths and widths; thicknesses as indicated.

1. Adhesive: Type recommended by insulation board manufacturer for application indicated.

B. Sound Attenuation Blankets: Unfaced mineral fiber blanket insulation produced by combining mineral fibers manufactured from slag wool or rock wool as required to achieve required acoustical and fire rating for the assembly, with thermosetting resins to comply with ASTM C 665 for Type I (blankets without membrane facing).

C. Thermal Insulation:

1. Unfaced Mineral Fiber Blanket Insulation: Unfaced mineral fiber blanket insulation to comply with ASTM C 665 for Type I (blankets without membrane facing); with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively;passing ASTM E 136 for combustion characteristics.
2. Thickness as required by manufacturer to achieve design R rating specified on thedrawings or required by code.

2.08 VAPOR RETARDERS

A. Polyethylene Vapor Retarders: ASTM D 4397, 6 mils (0.15 mm) thick, with maximum permeance rating of 0.13 perm.

B. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

C. Vapor-Retarder Fasteners: Pancake-head, self-tapping steel drill screws; with fender washers.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Inspection: Verify that project conditions and substrates are appropriate to begin installation of work of this section.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Furnish inserts and other devises indicated to other trades for installation in advance of timeneeded for coordination and construction.

3.03 INSTALLATION OF STEEL FRAMING, GENERAL

A. Installation Standards: ASTM C 754, and ASTM C 840 requirements that apply to framinginstallation.

B. Install bracing at terminations in gypsum board assemblies. Install supplementary framing, blocking, and bracing to support fixtures, equipment services, heavy trim, or similar construction. Comply with details indicated and with gypsum board manufacturer's written recommendations or, if none available, with United States Gypsum's "Gypsum Construction Handbook."

C. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

D. Installation Tolerances: Install steel framing components for walls so members for panel attachment are level to within 1/8 inch in 12 feet in 3.6 m measured lengthwise on each member and transversely between parallel members.

E. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.

F. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.

1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position betweenfabricated panels not exceeding 1/16 inch.

G. Install cold-formed metal framing and accessories plumb, square, and true to line, and withconnections securely fastened.

1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed metal framing members by welding, screw fastening, clinchfastening, or riveting. Wire tying of framing members is not permitted.
3. Comply with AWS D1.3 requirements and procedures for welding, appearance andquality of welds, and methods used in correcting welding work.
4. Locate mechanical fasteners and install according to Shop Drawings, and

complying with requirements for spacing, edge distances, and screw penetration.

H. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

I. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place,undisturbed, until entire integrated supporting structure.

J. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet.

K. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.04 INSTALLATION OF SUPPORT SUSPENSION SYSTEM

A. Furnish and install hanger devices in coordination with other work.

B. Secure hanger wires to structural support by wire-tying directly to structure where possible; otherwise, tie to inserts, clips or other anchorage devices or fasteners. Wire-tie hanger wires to main runners.

C. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing,countersplaying, or other equally effective means.

D. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards. Space main runners 4'-0” o.c. and space hangers 4'-0" along runners, except as otherwise shown.

E. Level main runners to a tolerance of 1/4" in 12'-0", measured both lengthwise on each runnerand transversely between parallel runners.

F. Wire-tie or clip furring members to main runners and to other structural supports.

G. Space furring member 16” o.c., except as otherwise indicated closer.

H. Install auxiliary framing and hangers, if applicable, at termination of drywall work, and at openings for light fixtures, access panels and similar work, as required for support of boththe drywall construction and other work indicated for support thereon.

I. For exterior soffits, provide cross bracing and additional framing required to resist wind uplift.

3.05 INSTALLATION OF WALL/PARTITION SUPPORT SYSTEM

A. Where studs are installed directly against exterior walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

1. Where indicated, secure furring members to wall with screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

B. Install studs so flanges within framing system point in same direction.

C. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install joints at tops of framing systems that prevent axial loading of finished assemblies.
2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.

a. Install two studs at each jamb, unless otherwise indicated.
b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2 inch clearance from jamb stud to allow for installation of control joint in finished assembly.
c. Extend jamb studs through suspended ceilings and attach to underside ofoverhead structure.

3. Other Framed Openings: Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills ofopenings to match framing required above door heads.

D. Install supplementary framing, solid blocking and bracing to support fixtures, equipment, services, heavy trim, furnishings, woodwork, accessories and similar work.

E. Isolate stud system from transfer of structural loading to system, both horizontally and vertically. Provide slip or cushioned type joints to attain lateral support and avoid axial loading. Cut studs 1/2” short of full height.

F. Space studs 16” o.c., except as otherwise indicated closer.

G. Fasten studs only at ends of floor and ceiling runner tracks by installing a screw into both flanges at each end.

H. Install horizontal stiffeners in stud system faced on one side only; space 4'-0" o.c. vertically;wire-tie at each intersection.

I. Install horizontal stiffeners 6" above and 6" below each opening more than 3'-0" wide, andextend 2 regular stud spaces beyond each jamb.

3.06 EXTERIOR WALL INSULATION SYSTEM

A. Fill spaces between studwork with blanket insulation cut to provide friction fit and to providecomplete coverage.

B. Cover surface with vapor barrier draped from top in as long lengths as practical. Lap and join over studs and seal with pressure sensitive vapor retardant tape.

C. Extend vapor retarder to extremities of exterior insulated walls and to cover miscellaneous voids in insulated substrates, including those which have been stuffed with loose thermal insulation.

D. Seal vertical joints in vapor retarders over framing by lapping not less than 2 wall studs. Fasten vapor retarders to framing at top, end, and bottom edges, at perimeter of wall openings, and at lap joints; space fasteners 16 inches on center.

E. Seal joints in vapor retarder caused by pipes, conduits, electrical boxes and similar items penetrating vapor retarders with cloth or aluminized tape which bonds permanently to vaporretarder.

F. Repair any tears or punctures in vapor retarder immediately before concealment by application of gypsum board or other construction.

3.07 INSTALLATION OF CEILING INSULATION

A. Install insulation according to manufacturer's directions. Install to required thickness. Batt or loose insulation to be of even height. Insulation to cover entire area except at vents. Verifythat insulation to be installed over light fixtures.

3.08 APPLYING PANELS, GENERAL

A. Gypsum Board Application and Finishing Standards: ASTM C 840 and GA-216.

B. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.

C. Examine panels before installation. Reject panels that are wet, moisture damaged, and molddamaged.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.09 APPLYING PANELS

A. Install board panels horizontally, unless noted or approved otherwise, at right angles across framing to minimize the number of abutting end joints. Stagger abutting end joints of adjacentpanels not less than one framing member.

B. Install gypsum panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

C. Locate edge and end joints over supports. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other thancontrol joints at corners of framed openings.

D. Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open(unsupported) edges of stud flanges first.

E. Attach gypsum panels to framing provided at openings and cutouts.

F. Form control and expansion joints with space between edges of adjoining gypsum panels.

G. Fit gypsum panels around ducts, pipes, conduits, structural members and other protrusions.

H. Isolate perimeter of gypsum board applied to non-load bearing partitions at structural abutments, except floors. Provide ¼ to ½ inch wide spaces at these at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edgesand abutting structural surfaces with acoustical sealant.

3.10 PANEL APPLICATION METHODS

A. Single-Layer Fastening Methods: Apply gypsum panels to supports with steel drill screws.Follow any requirements for fire rated walls.

B. Multilayer Application: Apply base layer of gypsum panels to supports with steel drill screws. Apply face layer of gypsum panels offset over joints of base layer; fasten face layer separately with screws long enough to secure to supports. Face layer may also be secured with adhesive to the base layer if the method and adhesive is approved by the Authority. Follow any installation requirements for fire rated walls.

3.11 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners.
2. Bullnose Bead: Use at outside corners.
3. LC-Bead: Use at exposed panel edges.
4. L-Bead: Use where indicated.
5. U-Bead: Use at exposed panel edges.

3.12 FINISHING GYPSUM BOARD ASSEMBLIES

A. General: Treat gypsum board joints, interior angles, edge trim, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints and damaged surface areas.

C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below, according to ASTMC 840, for locations indicated:

1. Level 4: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges at panel surfaces that will be exposed to view,unless otherwise indicated.

3.13 CLEANING

A. Promptly remove any residual gypsum drywall materials from adjacent or adjoining surfaces,leaving spaces ready for subsequent finishing operations and decorating.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 09 21 00, Gypsum Board Assemblies shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 09 21 00, Gypsum Board Assemblies shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 09 22 00.S
PORTLAND CEMENT PLASTER

PART 1 GENERAL

1.01 SUMMARY

A. Portland cement plaster for installation over metal lath, masonry, concrete, and solid surfaces.

B. Metal lath and furring.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions and Division 1 Specification Sections, apply to this Section.

1.03 RELATED WORK

A. Section 09 25 50, Gypsum Board Systems.

1.04 REFERENCES

A. ASTM A641 – Specification for Zinc-Coated (Galvanized) Carbon Steel Wire

B. ASTMA653/A653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

C. ASTM C91 – Standard Specification for Masonry Cement

D. ASTM C150 – Standard Specification for Portland Cement

E. ASTM C207 – Standard Specification for Hydrated Lime for Masonry Purposes

F. ASTM C847 – Specification for Metal Lath

G. ASTM C926 – Standard Specification for Surface-Applied Bonding Compounds for Exterior Plastering

H. ASTM C1063 – Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster

1.05 SUBMITTALS

A. Plaster Materials: Provide product data and specifications for plaster materials, characteristics and limitations of products specified. Include mixing instructions, installation instructions and recommendations, and finishing instructions.

B. Metal Lath, Furring and Framing: Provide product data and specifications for metal lath, furring, framing, wires, hangers and other related products. Include structural limitations and installation details.

C. Plaster Trim and Accessories: Provide product data on plaster trim and accessories. Provide color choices and actual sample of color selected for trim and accessories.

D. Certificate: Provide specification and certification for galvanizing of all ferrous metal lath, furring, framing and accessories.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with PCA Portland Cement Plaster (Stucco) Manual.

B. Fire-Test-Response Characteristics: For portland cement plaster assemblies with fire-resistance ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Interior Plasterwork: Maintain room temperatures at greater than 40 degrees Fahrenheit for at least 48 hours before plaster application, and continuously during and after application.

1. Avoid conditions that result in plaster drying out during curing period. Distribute heat evenly; prevent concentrated or uneven heat on plaster.
2. Ventilate building spaces as required to remove water in excess of that required for hydrating plaster in a manner that prevents drafts of air from contacting surfaces during plaster application and until plaster is dry.

B. Exterior Plasterwork:

1. Apply and cure plaster to prevent plaster drying out during curing period. Use procedures required by climatic conditions, including moist curing, providing coverings, and providing barriers to deflect sunlight and wind.
2. Apply plaster when ambient temperature is greater than 40 degrees Fahrenheit.
3. Protect plaster coats from freezing for not less than 48 hours after set of plaster coat has occurred.

PART 2 PRODUCTS

2.01 METAL SUPPORTS FOR SUSPENDED AND FURRED CEILINGS

A. General: Size metal ceiling supports to comply with the Portland Cement Plaster Installation, ASTM C1063, unless otherwise indicated.

B. Wire for Hangers and Ties: ASTM A641, Class 1 zinc coating, soft temper, not less than 0.16 inch diameter.

C. Rod Hangers: Mild steel, zinc coated.

D. Flat Hangers: Mild steel, zinc protected with rust-inhibitive paint.

E. Channels: Cold-rolled steel, 0.05980-inch minimum thickness of base metal (uncoated), allowable bending stress of 18,000 psi, protected with galvanizing complying with ASTM A653/A653M for G60 coating designation, and as follows:

1. Carrying Channels: 1-1/2-inch-deep by 7/16-inch-wide flanges, 508 lbs. per 1000 feet galvanized.
2. Furring Channels: 3/4-inch-deep by 7/16-inch-wide flanges, 316 lbs. per 1000 feet galvanized.

F. Hanger Anchorage Devices: Screws, cast-in-place concrete inserts, or other devices appropriate for anchorage to the form of structural framing indicated and whose suitability for use intended has been proven through standard construction practices or certified test data. Size devices to develop full strength of hanger but not less than 3 times calculated hanger loading, except size direct pullout concrete inserts for 5 times calculated hanger loading

2.02 PLASTER MATERIALS

A. Contractor may use Premix, Masonry Cement or Portland Cement and Lime as the basis for his Plaster Mix.

B. Portland Cement: ASTM C150, Type I.

1. Color for Finish Coats: White:

C. Masonry Cement: ASTM C91 Type N.

1. Color for Finish Coats: White:

D. Lime: ASTM C207, Type S.

E. Aggregate: In accordance with ASTM C926.

F. Water: Clean, fresh, potable and free of mineral or organic matter, which can affect plaster.

G. Ready-Mixed Finish-Coat Plaster: Mill-mixed portland cement, aggregates, coloring agents, and proprietary ingredients.

1. Products:

a. California Stucco Products Corp.; Conventional Portland Cement Stucco.
b. ChemRex; Thoro Stucco.
c. United States Gypsum Co.; Oriental Exterior Finish Stucco.
d. Or approved equal.

2. Color: As selected by the Authority from manufacturer's full range.

2.03 METAL LATH

A. Diamond Mesh Metal Lath: ASTM C847.

1. G60 hot-dipped galvanized zinc coating.
2. Weight: 3.4 lbs per square yard.

B. Beads, Screeds, and Joint Accessories: Steel, with rust inhibitive primer.

1. Corner Mesh: Formed sheet steel, minimum 0.018 inch thick, perforated flanges shaped to permit complete embedding in plaster, minimum 2 inch size; same finish as lath.
2. Strip Mesh: Expanded metal lath, same weight as lath, 2 inch wide by 24 inch long; same finish as lath.
3. Casing Beads: Formed sheet steel, depth governed by plaster thickness, maximum possible lengths, expanded metal flanges, with square edges; zinc-coated (galvanized) steel, and with 2” expanded metal extension on plaster side.
4. Corner Beads: Formed sheet steel, depth governed by plaster thickness, maximum possible lengths, expanded metal flanges with radiused edge; zinc-coated (galvanized) steel, and with 2” expanded metal extension on plaster side.
5. Base Screeds: Formed sheet steel, depth governed by plaster thickness, maximum possible lengths, expanded metal flanges, with beveled edge; zinc-coated (galvanized) steel, and with 2” expanded metal extension on plaster side.
6. Control and Expansion Joints: Formed sheet steel, accordion profile, 2 inch expanded metal flanges each side; zinc-coated (galvanized) steel, and with 2” expanded metal extension on plaster side.

2.04 PLASTER MIXES

A. Over Solid Bases: Two-coat application, mixed and proportioned in accordance with ASTM C926 and PCA Plaster Manual.

B. Over Metal Lath: Three-coat application, mixed and proportioned in accordance with ASTM C926 and PCA Plaster Manual.

C. Mix only as much plaster as can be used prior to initial set.

D. Mix materials dry, to uniform color and consistency, before adding water.

E. Protect mixtures from freezing, frost, contamination, and excessive evaporation.

F. Do not retemper mixes after initial set has occurred.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify the suitability of existing conditions before starting work.

B. Masonry: Verify joints are cut flush and surface is ready to receive work of this section. Verify no bituminous or water repellent coatings exist on masonry surface.

C. Concrete: Verify surfaces are flat, honeycomb are filled flush, and surfaces are ready to receive work of this section. Verify no bituminous, water repellent, or form release agents exist on concrete surface that are detrimental to plaster bond.

D. Metal Lath and Accessories: Verify lath is flat, secured to substrate, and joint and surface perimeter accessories are in place.

3.02 PREPARATION

A. Dampen masonry surfaces to reduce excessive suction.

B. Clean concrete surfaces of foreign matter. Clean surfaces using acid solutions, solvents, or detergents. Wash surfaces with clean water.

C. Roughen smooth concrete surfaces and apply bonding agent in accordance with manufacturer's instructions.

D. Preparation and Coordination: Coordinate installation of ceiling suspension system with installation of overhead structural systems to ensure that inserts and other structural anchorage provisions have been installed to receive ceiling hangers in a manner that will develop their full strength and at spacings required to support ceiling. Furnish concrete inserts, and other devices indicated, to other trades for installations well in advance of time needed for coordination with other work.

3.03 INSTALLATION OF LATHING AND FURRING, GENERAL

A. Portland Cement Plaster Lathing and Furring Installation Standard: Install lathing and furring materials indicated for Portland cement plaster to comply with ASTM C1063.

B. Install supplementary framing, blocking, and bracing at terminations in the work and for support of fixtures, equipment services, and similar work to comply with details indicated or, if not otherwise indicated, to comply with applicable published recommendations of Portland cement plaster manufacturer or, if not available, comply with "Gypsum Construction Handbook" published by United States Gypsum Co.

C. Isolation: Where lathing and metal support system abuts building structure horizontally and where partition/wall work abuts overhead structure, isolate the work from structural movement sufficiently to prevent transfer of loading into the work from the building structure. Install slip- or cushion-type joints to absorb deflections but maintain lateral support. Frame both sides of control and expansion joints independently, and do not bridge joints with furring and lathing or accessories.

3.04 INSTALLATION OF CEILING SUSPENSION SYSTEMS

A. Hanger Installation: Attach hangers to structure above ceiling to comply with ML/SFA "Specifications for Metal Lathing and Furring" and with referenced standards. Do not attach hangers to metal deck tabs.

B. Install ceiling suspension system components of sizes and spacings indicated but not in smaller sizes or greater spacings than those required by referenced lathing and furring installation standards.

1. Wire Hangers: Space 8-gauge (0.16-inch-diameter) wire hangers not over 4 foot-0 inch on center parallel with and not over 3 foot-0 inch perpendicular to direction of carrying channels, unless otherwise indicated, and within 6 inches of carrying channel ends.
2. Carrying Channels: Space carrying channels not over 3 foot-0 inch on center with 4 foot 0 inch on center hanger spacing.
3. Furring Channels to Receive Metal Lath: Space furring channels not over 16 inches on center for 3.4-lb. diamond mesh lath.

3.05 METAL LATH

A. Install expanded metal lath for the following applications where plaster base coats are required. Provide appropriate type, configuration, and weight of metal lath selected from materials indicated that comply with referenced lathing installation standards. Suspended and furred ceilings using 3.4 lbs. per sq. yd. minimum weight diamond mesh lath.

3.06 PLASTERING

A. Apply premixed plaster in accordance with manufacturer's instructions.

B. Apply plaster in accordance with PCA Plaster (Stucco) Manual. If manufacturer's instructions do not agree with the PCA Manual, request a clarification from the Authority.

C. Moist cure base coats.

D. Apply second coat immediately following initial set of first coat.

E. After curing, dampen previous coat prior to applying finish coat.

F. Avoid excessive working of surface. Delay troweling as long as possible to avoid drawing excess fines to surface.

G. Moist cure finish coat for minimum period of 48 hours.

H. Plaster Finish Coats: Apply to provide finish to match the Authority's selection.

3.07 ERECTION TOLERANCES

A. Maximum Variation from True Flatness: 1/8 inch in 10 feet.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of PORTLAND CEMENT PLASTER shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of PORTLAND CEMENT PLASTER shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000.

END OF SECTION

SECTION 09 30 00
TILING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes providing all the labor, materials, and equipment necessary to perform the following work as shown on the drawings, specified herein, or as otherwise required fora complete installation:

1. Provide and install new ceramic wall tile at interior locations.
2. Make repairs as shown and required at existing wall tile locations, including patching with salvaged tile.
3. Provide and install new quarry tile treads at existing stairs.

B. Related Sections include the following:

1. Division 02 Section "Selective Demolition" for removing existing finishes.
2. Division 04 Section “Masonry” for new concrete masonry unit walls.
3. Division 07 Section "Joint Sealants" for sealing of expansion, contraction, control,and isolation joints in tile surfaces.

1.03 DEFINITIONS

A. Module Size: Actual tile size (minor facial dimension as measured per ASTM C 499) plus jointwidth indicated.

B. Facial Dimension: Actual tile size (minor facial dimension as measured per ASTM C 499).

1.04 REFERENCES

A. American National Standards Institute (ANSI)

1. ANSI A108.1A, 1999 - Specifications for Installation of Ceramic Tile in the Wet-SetMethod with Portland Cement Mortar.
2. ANSI A108.1B, 1999 - Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex Portland Cement Mortar.
3. ANSI A108.1C, 1999 - Specifications for Contractors Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar -or- Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex PortlandCement Mortar.
4. ANSI A108.4, 1999 - Specifications for Ceramic Tile Installed with Organic Adhesives or Water-Cleanable Tile Setting Epoxy Adhesive.
5. ANSI A108.5, 1999 - Specifications for Ceramic Tile Installed with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar.
6. ANSI A108.6, 1999 - Specifications for Ceramic Tile Installed with Chemical-Resistant, Water-Cleanable Tile-Setting and -Grouting Epoxy.
7. ANSI A108.8, 1999 - Specifications for Ceramic Tile Installed with Chemical-

Resistant Furan Mortar and Grout.

8. ANSI A108.9, 1999 - Specifications for Ceramic Tile Installed with Modified EpoxyEmulsion Mortar/Grout.
9. ANSI A108.10, 1999 - Specifications for Installation of Grout in Tilework.
10. ANSI A118.1, 1999 - Standard Specification for Dry-Set Portland Cement Mortar.
11. ANSI A118.3, 1999 - Chemical-Resistant, Water-Cleanable, Tile-Setting and -Grouting Epoxy and Water-Cleanable Tile-Setting Epoxy Adhesive.
12. ANSI A118.4, 1999 - Latex-Portland Cement Mortar.
13. ANSI A118.5, 1999 - Chemical-Resistant Furan Mortar and Grout.
14. ANSI A118.6, 1999 - Standard Ceramic Tile Grouts.
15. ANSI A118.7, 1999 - Polymer Modified Cement Grouts
16. ANSI A118.8, 1999 - Modified Epoxy Emulsion Mortar/Grout.
17. ANSI A118.9, 1999 - Test Methods and Specifications for Cementitious BackerUnits
18. ANSI A118.10, 1999 - Load bearing, Bonded, Waterproof Membranes for Thinset Ceramic Tile and Dimensional Stone.
19. ANSI A136.1, 1999 - Organic Adhesives for Installation of Ceramic Tile.
20. ANSI A137.1, 1988 - Specifications for Ceramic Tile.
21. ANSI B 101.1 – Test Method for Measuring Wet Static Coefficient of Friction ofCommon Hard-Surface Floor Materials.
22. ANSI B 101.3 – Test Method for Measuring Wet Dynamic Coefficient of Friction ofCommon Hard-Surface Flooring Materials.
23. ANSI A 326.3 – American National Standard Test Method for Measuring DynamicCoefficient of Friction of Hard Surface Flooring Materials.

B. American Society for Testing and Materials (ASTM)

1. ASTM C50 - Standard Specification for Portland Cement.
2. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.
3. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes.
4. ASTM E303 – Standard Test Method for Measuring Surface Functional Properties using the British Pendulum Tester.

C. Tile Council of America

1. TCA (HB) - Handbook for Ceramic Tile Installation; Tile Council of America, Inc.

1.05 PERFORMANCE REQUIREMENTS

A. Tile walking surface test on samples of tile flooring specified for the project.

1. Slip resistance: Slip resistance tests must be performed by a qualified independent testing agency approved by the Authority and the tests to be done according to ANSI B 101.3, Test Method for Measuring Wet DCOF (Dynamic Coefficient of Friction) of Common Hard Surface Floor Materials using the BOT-3000E digital tribometer measuring device and/or according to ASTM E303 using the British pendulum tester. The test device and method to be as selected by and approved by the Authority.

1.06 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces. Show installation details for each tile included in this work.

C. Samples for Initial Selection: For each type of tile and grout indicated. Include Samples ofaccessories involving color selection.

D. Samples for Verification:

1. Full-size units of each type and composition of tile and for each color and finish required.2. Assembled samples with grouted joints for each type and composition of tile and for each color and finish required, at least 24 inches square and mounted on rigid panel. Use grout of type and in color or colors approved for completed work.3. Full-size units of each type of trim and accessory.

E. Product Data for Materials and Instructions for Installation:

1. Provide product data, specifications, installation directions, installation recommendations and other information for each of the setting and grout productsused in the installation of the tile.

F. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tilemanufacturer and Installer.

G. Product Certificates: For each type of product, signed by product manufacturer.

H. Qualification Data: For Installer.

I. Material Test Reports: For each tile-setting and -grouting product and special-purpose tile.

J. Provide a copy of the warranty for the completed tile system.

K. Mock ups:

1. Provide two (2) four foot square (2 foot X 2 foot) panel samples to be reviewed and approved by the Authority. The tile to be the same as that used from the project.

L. Test reports:

1. Test report for coefficient of friction for the tile walking surface.

1.07 QUALITY ASSURANCE

A. Source Limitations for Tile: Obtain all tile of same type and color or finish from one sourceor producer.

1. Obtain tile from same production run and of consistent quality in appearance andphysical properties for each contiguous area.

B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from a single manufacturer and each aggregate from one source or producer.

C. Mockups: Build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution.

1. Approved mockup may become part of the completed Work if undisturbed at timeof Substantial Completion.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and

labels intact until time of use. Comply with requirement in ANSI A137.1 for labeling sealed tile packages.

B. Store tile and cementious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained andcontamination avoided.

D. Store liquid latexes and emulsion adhesives, if any, in unopened containers and protectedfrom freezing.

E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.09 PROJECT CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

1.10 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amountinstalled, for each type, composition, color, pattern, and size of tile indicated.

1.11 WARRANTY

A. Manufacturer of tile, setting and grout materials as well as installer of each tile system must sign a single warranty covering all defects in the new tile system including delamination; spalling; cracking or chipping of tiles; cracking of grout; tiles falling off; discoloration, pitting, fading, or other degrading of the tile surface; discoloration of the grout; or other defect for aperiod of ten years after the date of Final Acceptance.

B. Repairs or replacements shall be made during the warranty period at no cost to the Authority and to the satisfaction of the Authority. Replacement tiles must match the existing tiles.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with the requirements specified herein, manufacturers offering products that may be incorporated into the Work must produce a tile that matches the existing tile in size, thickness, type, finish, glaze and color. Samples of the tile must be submitted to the Authority for review, selection, and approval.

2.02 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard Provide tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.

1. Provide tile complying with Standard grade requirements, unless otherwise indicated.
2. For facial dimensions of tile, comply with requirements relating to tile sizes specifiedin Part 1 "Definitions" Article.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI standards referenced including "Setting and Grouting Materials" Article.

C. Slip Resistance: Tile walking surface to have a minimum value of 0.42 DCOF measured with the BOT-3000E and using a 0.05% SLS water solution per the specified test method.

D. Colors, Textures, and Patterns: Provide products for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with the following requirements:

1. New tile to match existing tile match existing tile in size, thickness, type, color, finish, glaze, and gloss; and as selected and approved by the Authority.
2. Grout for tile to match color, finish, and type of existing grout.
3. Provide matching tiles as required, as shown on drawings, and to match existing installation including trim units, bull nose, cove base, wainscot cap, external and internal corners.

E. Factory Blending: For tile exhibiting color variations within ranges selected during Sample submittals, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

F. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer and as recommended by the manufacturer for the specific location and application, unless otherwise indicated.

2.03 TILE PRODUCTS

A. Manufacturers:

1. American Marazzi Tile, Inc.
2. American Olean; Div. of Dal-Tile International Corp.
3. Buchtal Corporation USA.
4. Cerim-Floor Gres Ceramiche.
5. Crossville Ceramics Company, L.P.
6. Daltile; Div. of Dal-Tile International Inc.
7. Florida Tile Industries, Inc.
8. GranitiFiandre.
9. Interceramic.
10. KPT, Inc.
11. Laufen USA.
12. Lone Star Ceramics Company.
13. Metropolitan Ceramics.
14. Monarch Tile, Inc.
15. Porcelanite, Inc.
16. Quarry Tile Company.

17. Seneca Tiles, Inc.
18. Summitville Tiles, Inc.
19. United States Ceramic Tile Company.
20. Winburn Tile Manufacturing Company.
21. Or Approved Equal.

B. Unglazed Quarry Tile: Square-edged flat tile, plain surface, 8 by 8 inches in size, ¾" thicknessor as required for flush installation at existing stair tread recess.

2.04 SETTING AND GROUTING MATERIALS

A. Manufacturers:

1. Atlas Minerals & Chemicals, Inc.
2. Boiardi Products Corporation.
3. Bonsal, W. R., Company.
4. Bostik.
5. C-Cure.
6. Custom Building Products.
7. DAP, Inc.
8. Jamo Inc.
9. LATICRETE International Inc.
10. MAPEI Corporation.
11. Southern Grouts & Mortars, Inc.
12. Summitville Tiles, Inc.
13. TEC Specialty Products Inc.
14. Or Approved Equal**.**

B. Mortar for leveling existing vertical concrete surface, as required: Laticrete 3701 Fortified Mortar Bed or approved equal.

C. Waterproofing and anti-fracture membrane: Laticrete Hydro Ban or approved equal.

D. Thin Set setting bed for tile: Laticrete 254 Platimum thin set; Mapei Karabond-Karalastic System Two Component Liquid Latex Cement or approved equal, ANSI A118.4 and ANSIA118.11.

E. Grout for tile joints: Laticrete Permacolor Grout; Mapei Ultra Color Plus Cement Grout or approved equal, ANSI A118.6 and ANSI A118.7; color as selected by the Authority from Manufacturer's standards.

F. Joints at expansion or control joints shall be approved sealant.

2.05 ELASTOMERIC SEALANTS

A. General: Provide manufacturer's standard chemically curing, elastomeric sealants.

B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealedjoints, unless otherwise indicated.

C. One-Part, Mildew-Resistant Silicone Sealant: ASTM C 920; Type S; Grade NS;

D. Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and extremetemperatures.

1. Products:

a. Dow Corning Corporation; Dow Corning 786.
b. GE Silicones; Sanitary 1700.
c. Pecora Corporation; Pecora 898 Sanitary Silicone Sealant.
d. Tremco, Inc.; Tremsil 600 White.
e. Or Approved Equal.

2.06 MISCELLANEOUS MATERIALS

A. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and groutmanufacturers.

B. Grout Sealer: Manufacturer's standard silicone product for sealing grout joints that does not change color or appearance of grout.

1. Products:

a. Bonsal, W. R., Company; Grout Sealer.
b. Bostik; CeramaSeal Grout Sealer.
c. C-Cure; Penetrating Sealer 978.
d. Custom Building Products; Surfaceguard Grout Sealer.
e. Jamo Inc.; Penetrating Sealer.
f. MAPEI Corporation; KER Silicone Spray Sealer for Cementitious TileGrout.
g. Southern Grouts & Mortars, Inc.; Silicone Grout Sealer.
h. Summitville Tiles, Inc.; SL-15, Invisible Seal Penetrating Grout and TileSealer.
i. TEC Specialty Products Inc.; TA-256 Penetrating Silicone or TA-257 Silicone Grout Sealer.

2.07 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affectingperformance of installed tile.

1. Verify that substrates for setting tile are firm; dry; clean; free of oil, waxy films, and curing compounds; and within flatness tolerances required by referenced ANSI A108 Series of tile installation standards for installations indicated.
2. Verify that all existing tile, grout, setting mortar, and other materials that are to be removed are completely removed; leaving a clean, smooth, level and sound

substrate.

3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.
4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with the Authority.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Remove coatings, including curing compounds and other substances that contain soap, wax, oil, or silicone, that are incompatible with tile-setting materials.

1. Fill cracks, holes, and depressions with trowelable leveling and patching compound according to tile-setting material manufacturer's written instructions. Use product specifically recommended by tile-setting material manufacturer.
2. Remove protrusions, bumps, and ridges by sanding or grinding.

B. Blending: For tile exhibiting color variations within ranges selected during Sample submittals, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

C. Field-Applied Temporary Protective Coating: Where indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, pre-coat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

D. Masonry back up to be in place for installation of tile and in good condition. Provide vapor barrier if required or recommended by manufacturer. Surfaces to be clean and secure.

3.03 INSTALLATION, GENERAL

A. ANSI Tile Installation Standards: Comply with parts of ANSI A108 Series "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to methods indicated in ceramic tile installation schedules.

B. TCA Installation Guidelines: TCA's "Handbook for Ceramic Tile Installation." Comply with TCA installation methods indicated in ceramic tile installation schedules.

C. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

E. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile

cutting.Provide uniform joint widths, unless otherwise indicated.

1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.

F. Lay out tile wainscots to next full tile beyond dimensions indicated.

G. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Locate joints in tile surfaces directly above joints in concrete substrates.
2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."

H. Grout tile to comply with requirements of the following tile installation standards:

1. For ceramic tile grouts (sand-portland cement; dry-set, commercial portland cement; and latex-portland cement grouts), comply with ANSI A108.10.
2. For chemical-resistant epoxy grouts, comply with ANSI A108.6.
3. For chemical-resistant furan grouts, comply with ANSI A108.8.

3.04 WATERPROOFING AND CRACK-SUPPRESSION MEMBRANE INSTALLATION

A. Install waterproofing to comply with ANSI A108.13 and waterproofing manufacturer's written instructions to produce waterproof membrane of uniform thickness bonded securely to substrate.

B. Install crack-suppression membrane to comply with manufacturer's written instructions to produce membrane of uniform thickness bonded securely to substrate.

C. Do not install tile over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

3.05 WALL TILE INSTALLATION

A. Install types of tile designated for wall installations to comply with requirements in the Wall Tile Installation Schedule, including those referencing TCA installation methods and ANSIsetting-bed standards.

B. Joint Widths: Install tile on walls with a 1/16 inch joint width or to match existing, as approvedby the Authority.

3.06 FLOOR TILE INSTALLATION

A. General: Install tile to comply with requirements in the TCA installation methods referencemanual and ANSI A108 Series of tile installation standards.

1. Provide 95 percent mortar coverage.
2. Install quarry tile on floors with constant widths; ¼ inch to 3/8 inch wide.

B. Grout Sealer: Apply grout sealer to grout joints according to grout-sealer manufacturer’s written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer that has gotten on tile faces by wiping with soft cloth.

3.07 CLEANING AND PROTECTING

A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so theyare free of foreign matter.

1. Remove grout residue from tile as soon as possible.
2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions, but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
3. Remove temporary protective coating by method recommended by coating manufacturer that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent it from clogging drains.

B. When recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.

C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting iscompleted.

D. Before final inspection, remove protective coverings and rinse neutral cleaner from tilesurfaces.

3.08 WALL TILE INSTALLATION SCHEDULE

A. Tile Installation: Wall installation over sound, dimensionally stable masonry; thin-set mortar;TCA W202 and ANSI A108.5.

1. Repair any cracks in masonry. Remove any loose or spalling masonry or mortar. Fill any voids in surface. Provide and install mortar bed to even out substrate surface or bring to proper level. Substrate surface for thin set to be sound, smooth, level, dry, cured and free of oil, grease or other detrimental materials that will affect the bond. Prepare surface as recommended by tile setting materials manufacturer.
2. Provide and install waterproofing and anti-fracture membrane coating according to manufactuer’s recommendations. Material and installation to be approved by the tile setting materials manufacturer.
3. Provide and install approved thin set material according to manufacturer’s recommendations and directions.
4. Provide and install tile according to tile manufacturer’s directions and recommendations and referenced standards.
5. Provide and install approved grout according to manufacturers recommendationsand directions. Clean tile of excess grout.
6. Apply sealer to grout only if recommended by grout manufacturer for this installation.

3.09 FLOOR TILE INSTALLATION SCHEDULE

A. Tile Installation: Quarry tile tread installation over sound, dimensionally stable concrete;thin-set mortar; TCA F113 and ANSI A108.5.

1. Repair any cracks in concrete. Remove any loose or spalling concrete. Fill and patch any voids in surface. Provide and install mortar bed to even out substrate surface or bring to proper level. Substrate surface for thin set to be sound, smooth,

level, dry, cured and free of oil, grease or other detrimental materials that will affect the bond. Prepare surface as recommended by tile setting materials manufacturer.

2. Provide and install approved thin set material according to manufacturer's recommendations and directions.
3. Provide and install tile according to tile manufacturer's directions and recommendations and referenced standards.
4. Provide and install approved grout according to manufacturers recommendationsand directions. Clean tile of excess grout.
5. Apply sealer to grout only if recommended by grout manufacturer for this installation.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 09 30 00, Tiling shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 09 30 00, Tiling shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 09 30 10

TACTILE TILE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 DESCRIPTION

A. This section specifies furnishing and installing surface applied detectable tactile warning surface tiles where indicated, using an exterior grade tile with UV protection.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's literature describing products, installation procedures, fasteners, adhesive and routine maintenance.

B. Samples for Verification Purposes: Submit three (3) samples of fasteners and full size samples of tactile tiles of the kind proposed for use showing full range of color and patternvariations.

C. Shop Drawings are required for products specified showing fabrication details, composite structure, fastener locations, plans of tile placement including joints, and material to be usedas well as outlining installation materials and procedure.

D. Material Test Reports: Submit test reports from qualified independent testing laboratory indicating that materials proposed for use are in compliance with requirements and meet theproperties indicated.

E. Maintenance Instructions: Submit copies of manufacturer's specified maintenance practicesfor each type of tactile tile and accessory required.

F. Warranty: Provide a copy of the warranty for review and approval.

1.04 QUALITY ASSURANCE

A. Provide tactile tiles and accessories as produced by a single manufacturer, including mechanical fasteners.

B. Installers Qualifications: Engage an experienced Installer certified in writing by tactile manufacturer as qualified for installation, who has successfully completed tile installations similar in material, design, and extent to that indicated for Project. Manufacturer's supervisor shall be present during all construction.

C. Americans with Disabilities Act (ADA) Equivalent Facilitation: Provide tactile warning surfaces which comply with the detectable warnings on walking surfaces section of the Americans with Disabilities Act (Title 49 CFR TRANSPORTATION, Part 37.9 STANDARDS FOR ACCESSIBLE TRANSPORTATION FACILITIES, Appendix A, Section 4.29.2 DETECTABLE WARNINGS ON WALKING SURFACES).

D. Vitrified Polymer Composite Tile (VPC): Exterior grade tile with ultra-violet resistant

additive shall be an epoxy polymer composition employing a minimum of 25% by weight aluminum oxide particles or equivalent in truncated domes and shall meet or exceed the following testcriteria:

1. Tile Dimensions: Nominal 2'-0" x 4'-0" x 0.125" thick; 0.325" thick at the domes, with a 1-1/8" deep front edge flange and 1/2" deep back flange. The first two rows of domes at the rear edges of the tiles away from the track shall be graduated in height 0.190" and 0.257" respectively. Tiles shall be formed with holes for anchors in the dome; minimum of 13 holes per tile. Three of the holes shall be in the first row of domes which overlaps and fastens through a 1-1/2" lap-flange in the next tile.

    a. Domes for tactile tile shall be an “in Line” pattern vertically and horizontally except where tiles are needed to match adjacent existing tiles that are in a“diagonal” pattern.

2. Water Absorption: When tested by ASTM C 373 shall not exceed 0.35%.
3. Slip Resistance: When tested by ASTM C 1028, the combined wet/dry static co- efficient of friction shall be not less than 0.80.
4. Compressive Strength: When tested by ASTM D 695 shall be not less than 18,000psi.
5. Tensile Strength: When tested by ASTM D 638 shall be not less than 10,000 psi.
6. Flexural Strength of Tile: When tested by ASTM C 293 shall not be less than 24,000 psi.
7. Gardner Impact to geometry "GE" of the standard: When tested by ASTM D 5420 shall have a mean failure energy expressed as a function of specimen thickness of not less than 450 in. lbf/in. A failure is noted if a hairline fracture is visible in the specimen.
8. Chemical Stain Resistance: When tested by ASTM D 543 shall withstand without discoloration or staining -1% hydrochloric acid, urine, calcium chloride, stamp padink, gum and red aerosol paint.
9. Abrasive Wear of Tile: When tested by BYK - Gardner Tester ASTM D 2386 with reciprocating linear motion of $\pm$37 cycles per minute over a 10" travel. The abrasive medium, a 40 grit Norton Metallite sand paper, was fixed and leveled to a holder. The combined mass of the sled, weight and wood block is Average wear depth shall not exceed 0.030 after 1,000 abrasion cycles measured on the top surface of the dome representing the average of three measurement locations per sample.
10. Fire Resistance: When tested by ASTM E 84 flame spread shall be less than 25.
11. Accelerated Weathering of Tile: When tested by ASTM G 26 for 2,000 hours shall exhibit the following result, no deterioration, fading or chalking of surface of tile.
12. Accelerated Aging and Freeze Thaw Test of Tile and Adhesive System: When tested by ASTM D 1037 shall show no evidence of cracking, delaminating, warping, checking, blistering, color change, loosening of the tiles or other defects.
13. Salt and Spray Performance of Tile and Adhesive System: When tested by ASTM B 117 shall not show any deterioration or other defects after 100 hours of exposure.

1.05 DELIVERY, STORAGE AND HANDLING

A. Tiles shall be suitably packaged or crated to prevent damage in shipment or handling. Finished surfaces shall be protected by sturdy wrappings, and tile type shall be identified by part number.

B. Tiles shall be delivered to location at building site for storage prior to installation.

1.06 SITE CONDITIONS

A. Environmental Conditions and Protection: Maintain minimum temperature of 40 degrees F in spaces to receive tactile tiles for at least 48 hours prior to installation, during installation, and for not less than 48 hours after installation. Store tactile tile material in spaces where they will be installed for at least 48 hours before beginning installation. Subsequently, maintain minimum temperature of 40 degrees F in areas where work is completed.

B. Dust from cutting, grinding or drilling shall be contained or removed by vacuum attached to equipment or by other means and shall not be allowed to spread into the atmosphere, among the workers, passengers or public, or to contaminate the area below or around the site.

C. The use of water for work, cleaning or dust control etc. shall also be contained and controlled and shall not be allowed to come in contact with the passengers or public. Provide barricadesor screens to protect passengers or public.

D. Disposal of any liquids or other materials of possible contamination shall be made in accordance with federal state and local laws and ordinances.

E. Cleaning materials shall have code acceptable low VOC solvent content and low flammability if used on the site.

F. Contractor shall coordinate phasing and flagging personnel operations as specified in thecontract documents.

1.07 EXTRA STOCK

A. Deliver extra stock to CTA West Shops, 3901 W. Maypole Street, Chicago, IL 60624., Furnish new materials from same manufactured lot as materials installed and enclose in protective packaging with appropriate identification. Furnish not less than ten percent (10%) of the supplied materials, for each type, color, pattern installed including fasteners. Furnishnot less than twenty percent (20%) of concealed caps.

1.08 GUARANTEE

A. Tactile tiles shall be guaranteed in writing, signed by the Manufacturer and the Contractor, for a period of ten years from date of Final Acceptance. The guarantee includes defective materials and installation, loosening of fasteners or tiles, defective bonding of adhesives or sealants, breakage, cracked, chipped or broken tiles, marred or defaced surface, deformation, fading and chalking of finishes, cracked or open joints, and improper slope fordrainage, or improper elevation of leading edge causing tripping.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

1. The Vitrified Polymer Composite (VPC) Surface Applied Tactile Tiles on concrete specified is based on Armour-Tile manufactured by Engineered Plastics Inc (1- 800-682-2525). Existing engineered and field tested products

which are subject to compliance with requirements, may be incorporated in the work and shall meet orexceed the specified test criteria and characteristics:

a. Color: Blue (AT-B-2070); Process Blue, Pantone Matching System (PMS).
b. Color: Yellow, only for single tile length, aligned with 8-Car Berth Marker or at the berth marker for the longest train operated at the station. Verify quantities and locations with CTA Rail Operations.

2.02 MATERIALS

A. Fasteners:

1. Concrete Platform: 3/16” x 2” (5 x 50) stainless steel fasteners with plastic concrete anchors for the leading edge of each tile and ¼” x 1 9/16” (6 x 40) stainless steel fasteners with plastic concrete anchors for the remaining areas of each tile unlessrecommended otherwise by the manufacturer.
2. Wood Platform: Fasteners for plank platforms shall be 1/4" x 1-1/4" stainless steelwood screws to be positioned in the molded recessed holes of the truncated domesunless recommended otherwise by the manufacturer.
3. The fasteners are to be used in conjunction with the recommended adhesive.

B. VPC Dome Caps: Truncated dome caps shall be press fit and bonded into correspondingtruncated domes in tiles.

C. Adhesive: Heavy duty elastomeric polyurethane adhesive system as recommended by themanufacturer.

D. Closed Cell Foam: Closed cell foam rope size as indicated, by Sonoco or approved equal.

E. Joint Sealant: Heavy duty elastromeric polyurethane sealant system.

PART 3 - EXECUTION

3.01 GENERAL

A. Comply with applicable requirements of the tile manufacturer's installation instructions. Ensure that adequate safety precautions and job site protection are being maintained.

B. At precast concrete and wood plank station platforms, saw cut a clean straight groove 1/4" wide and 3/8" deep (or as otherwise required by manufacturer) at proper distance in from track center line (Approx. 24" from edge of platform) in platform to receive tile leading edge lip. Tile track edge at platform edge shall be in line to follow the platform edge at proper distance from center of track (4'-7"). Cut or grind platform track edge to maintain tile at proper distance from center of track. Provide plastic edge shim pieces securely anchored to platform track edge for support under tile where void space is over 1/4".

C. Grind or plane platform surface down sufficient depth for new tile and adhesive, smooth and level surface to remove any projections or high points from interfering with installation of tiles. Provide slope to platform edge for water drainage.

D. The surface shall be vacuumed and cleaned free from dirt, debri, and dust. Inspect surface and grind away or plane any obstructions or bumps. Clean sawcut of any

obstructions or foreign matter without chipping or damaging the sawcut.

E. Install adhesive according to manufacturer's recommendations. Set tiles in place; adjust and align, Drill holes and fasten stainless steel fasteners in pre-located holes in tiles. Adhesive is not required on wood plank platforms. Do not install tiles over expansion joints or installtile with shiplap edge exposed. Tile edges at platform edge shall be in a

F. straight line to follow platform edge at proper distance from center of track. Fasteners in first row of domes at inside leading edge of tiles shall hold tile down to prevent the leading edge from buckling or causing a tripping hazard. Remove any tiles with such deformed edge andreplace.

G. The leading edge of the tile shall be checked to ensure the tolerance provided is in accordance with the contract drawings. Adjust as required.

H. Allow a gap of 1/8" or as otherwise directed by the manufacturer for expansion and contraction.

I. At construction joints between precast concrete panels provide adhesive under tile and between shiplap joints spanning construction joints.

J. Layout tiles and joints to fit at expansion joints in precast concrete slabs. Provide tiles with largest size units as possible at ends, but not less than a half unit. Tiles shall not cover expansion joints.

K. Maintain expansion joints in platforms and any other reference marker or openings that maybe required to be left exposed.

L. Provide and install fasteners as recommended by manufacturer for the substrate.

M. Prepare pre-located holes in domes by abrading surface and cleaning and add caps in accordance with manufacturer's specifications. Set VPC concealed caps into recesses on truncated domes with the polyurethane adhesive to fasten, conceal and protect the fastener locations. Surfaces to receive adhesive shall be clean of any dust, grease, or other contaminants. Apply the recommended amount of adhesive in the corresponding recesses of the truncated domes, in accordance with the manufacturer's specifications. Tap concealed caps in place with a plastic mallet. Care shall be taken to avoid any excess adhesive flowing out from around the concealed cap when inserted.

N. Provide sealant at joints as recommended by manufacturer.

3.02 CLEANING AND PROTECTION

A. Protect tiles against damage during construction period to comply with tactile tile manufacturer's specifications.

B. Protect tiles against damage from rolling loads following installation by covering with plywood or hardwood.

C. Clean tactile tiles not more than four days prior to date scheduled for inspection intended to establish date of Substantial Completion in each area of project. Clean tactile tile by methodspecified by tactile tile manufacturer.

3.03 WARRANTY INSPECTIONS

A. In addition to any warranty provisions covered by these specifications, the Contractor shall perform complete inspections of the tactile tile installations. The inspections shall be conducted Monday to Friday, normal daytime hours. The warranty inspections shall take place eleven (11) months from the date of final acceptance by the Authority of each station installation. The Authority's representative will accompany the Contractor on the inspections.

B. The Contractor shall prepare and submit to the Authority a written report with two (2) copies, stating the condition of the installations outlining any modifications to the maintenance specifications or procedures and respond in writing to questions raised by the Engineer ormaintenance personnel during the inspection periods.

C. As part of the inspections, Contractor shall at no cost to the Authority completely replace any tactile tile or installation showing undue wear or damage from ordinary use, cracked or broken tile, loose or malfunctioning fasteners, separation from substrate, cracked loose or damaged sealant or adhesive, hollow areas underneath tiles, discoloration of tiles or adhesive from natural causes, or the wrong height or slope of the tiles for proper drainage or to avoid tripping. This shall be furnished as part of the guarantee obligation by the Contractor.

D. The inspections shall be performed by the Contractor's service representative. All costs involved with each of these inspections such as travel, accommodations, international charges, fees, tools, equipment and parts costs, shall be paid in full by the Contractor.

E. Contractor shall notify the Authority in writing at least two (2) weeks prior of the intent to conduct the tactile tile warranty inspections.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 09 30 10, Tactile Tile shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 09 30 10, Tactile Tile shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 09 60 00
STONE FLOORING AND COMPASS ROSE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of contract, including General and Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes providing and installing natural stone (granite) paver flooring and Compass Rose set in mortar bed over concrete as shown on the drawings and specified herein.

B. Compass Rose assembly and design as shown on drawings; type, color and finish of stones to be used for the Compass Rose to be as indicated onthe drawings, or as otherwise submitted to and approved by the Authority.

C. This Section includes providing and installing stone stair treads, risers, stone base and trims in accordance with Drawings.

1.03 RELATED WORK

A. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 02 Section, “Concrete Paving”.
2. Division 07 Section, "Joint Sealants".

1.04 REFERENCES

A. American National Standards Institute. (ANSI)

1. ANSI B 101.1 - Test Method for Measuring Wet Static Coefficient of Friction ofCommon Hard-Surface Floor Materials.
2. ANSI B 101.3 - Test Method for Measuring Wet Dynamic Coefficient of Friction ofCommon Hard-Surface Floor Materials.
3. ANSI A 326.3 - American National Standard Test Method for Measuring DynamicCoefficient of Friction of Hard Surface Flooring Materials.

B. National Building Granite Quarries Association Inc. (NBGQA): “NBGQA Specifications forBuilding Granite.”

C. CTI A118.4 - Specifications for Latex Portland Cement Mortar (included in ANSI A108.1)

D. CTI A118.6 - Specifications for Ceramic Tile Grouts (included in ANSI A108.1)

E. CTI A108.10 - Specifications for Installation of Grout in Tile work (included in ANSI A108.1)

F. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar

G. ASTM C241 - Standard Test Method for Abrasion Resistance of Stone Subjected to

FootTraffic

H. ASTM C615 - Standard Specification for Granite Dimension Stone.

I. ASTM E 303 - Standard Test Method for Measuring Surface Functional Properties Using the British Pendulum Tester.

J. NFSI - National Floor Safety Institute

1.05 DEFINITIONS

A. Stone flooring is fabricated from natural stone to produce non-gauged units 1-1/4 inch to 2 inches thick. Stone flooring units require thick mortar bed setting.

B. Compass Rose is fabricated from natural multi-colored and shaded stone (granite) pieces cut to sizes and shapes set into design and graphics indicated, including name of street and north arrow in granite letters and symbols, that is adhered to a granite backer piece. Compass Rose assembly is set flush into pavement at indicated location.

1.06 PERFORMANCE REQUIREMENTS

A. Stone Testing: Perform the following tests on random samples of stone quarried for the project.

1. Absorption, and Bulk Specific Gravity (Density): ASTM C97. Two tests each.
2. Compressive strength: ASTM C170. Four tests. Apply loading parallel or perpendicular to the rift plane, whichever will be the loaded condition of stone usedin the work.
3. Modulus of Rupture: ASTM C99. One group of 30 tests dry. One group of 30 tests wet. Apply loading parallel or perpendicular to the rift plane, whichever will be theloaded condition of stone used in the Work.
4. Flexural Bending: ASTM C880. One group of 30 tests dry. One group of 30 tests wet. Apply loading parallel or perpendicular to the rift plane, whichever will be the loadedcondition of stone used in the Work.
5. Abrasion Resistance: ASTM C241. One test of each type stone to be used for walking surfaces.
6. Slip resistance: Test each combination of stone and surface finish to be used for walking surfaces. Slip resistance tests must be performed by a qualified independent testing agency approved by the Authority and the tests to be done according to ANSI B101.3, Test Method for Measuring Wet DCOF of Common Hard Surface Floor Materials using the BOT-3000E digital tribometer measuring device and/or according to ASTM E303 using the British pendulum tester. The test device and method to be as selected by and approved by the Authority.
7. Petrographic Analysis: ASTM C295. One test.

1.07 SUBMITTALS

A. General: Submit the following according to the Division 01 Specification Section, “Submittals”.

B. Product Data: As follows:

1. Each stone type.
2. Setting, grouting and epoxy materials.
3. Surface sealers.
4. Cleaning Products.

5. Granite Backer for Compass Rose.

C. Maintenance data to be included in the Maintenance Manual specified in Division 01 Section "Project Closeout." Furnish information describing the materials, equipment, and procedures to be followed for the cleaning and maintenance of the stone used in the work.

D. Actual samples for each color, grade, finish, type, and variety of stone consisting of 12 inch-square units. Include a minimum of three units in each set showing the full range of each type of visual and textural characteristics to be expected in the completed Work.

1. Obtain samples from the same source as the stone to be used in the Work of this Section.

E. Shop drawings indicating cut sizes, dimensions, sections, and profiles of stone paving units, and details showing relationship of units to adjacent work. Show installation details at special and substrate conditions.

F. Unless approved otherwise by the Authority, Compass Rose fabricator to construct a mock-up of the Compass Rose assembly. The mock up may be used for installation if acceptable to the Authority. Provide written approval of mock up by the Authority prior to installation of the sample or proceeding with fabrication of additional Compass Rose Assemblies.

G. Shop drawings for each Compass Rose assembly indicating design, sizes, dimensions, joint patterns, graphics, lettering, location of each color, shade, and texture of stone and other design features. Shop drawings to indicate profiles and sections for assembly and details.

H. Shop drawings indicating location of each Compass Rose installation with dimensions and relationship to street and to adjacent elements. Shop drawings to indicate actual north arrow indication and actual street name. Shop drawings to show installation details, profiles of installation and any special installation or substrate conditions.

I. Qualification data for firms and persons specified in "Quality Assurance" article to demonstrate their capabilities and experience. Include list of completed projects with project name, addresses, names of Architects and Owners, and other information specified.

J. Reports for granite tests prepared by the independent testing agency for the following specified tests of the granite and grout properties:

1. Absorption.
2. Compressive Strength.
3. Modulus of Rupture.
4. Minimum abrasive hardness.
5. Flexural Strength.
6. Abrasion Resistance.
7. Slip Resistance.

1.08 QUALITY ASSURANCE

A. Fabricator Qualifications: Firm experienced in supplying products similar to those indicatedfor this Project with a record of successful in-service performance.

B. Installer Qualifications: Engage an experienced Installer who has completed interior stone flooring installations that are similar in material, design, and extent as that indicated for this Project and that have performed successfully. Installer must be

approved by the fabricatorof the stone.

C. Single-Source Responsibility for Stone: Obtain each color, grade, finish, type, and variety of stone from a single source with resources to provide materials of consistent quality in appearance and physical properties, including capacity to cut and finish material without delaying the progress of the stone installation.

D. Single-Source Responsibility for Setting Materials: Obtain mortar and grout mix ingredients of uniform quality, from one manufacturer for each cementitious and admixture component,and from one source or producer for each aggregate.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Comply with fabricator's instructions and specifications for delivery, storage, and handlingrequirements.

B. Deliver all materials, including fabricated Compass Rose, to site in an undamaged condition.

C. Store and handle paving stones, Compass Rose and related materials to prevent deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breakage, chipping, or cracking.

1. Do not use pinch or wrecking bars to move stone units.
2. Lift stones with wide belt-type slings where possible. Do not use wire rope or ropes containing tar or stain-causing substances. Use cushion-protected wood rollers andlifting devices when required to move stone.
3. Store stones on protected wood skids or pallets, covered with non-staining, water-protective membrane. Place skids and stack stones to distribute weight evenly and to prevent stones from breaking or cracking. Allow air to circulate aroundstones.
4. Store cementitious materials off ground, under cover, and in a dry location.
5. Store aggregate materials covered and in a dry location.

1.10 PROJECT CONDITIONS

A. Do not set stone or Compass Rose when air temperature or material temperature is below 50 deg F.

B. Maintain minimum ambient temperatures of 50 deg F during installation and for 7 days after completion, unless higher temperatures are required by manufacturer's instructions.

C. Determine that recess in concrete floor slab is sufficient enough for flush installation of thestone pavers and Compass Rose assembly.

1.11 SEQUENCING AND SCHEDULING

A. Schedule and sequence stone flooring and Compass rose installation with adjoining and related work to minimize damage and soiling during and after installation.

B. Adjacent concrete pavement to be complete and cured. Verify that size, depth and location for Compass Rose insert is proper and ready for installation. Verify condition of substrate for Compass Rose is as recommended by manufacturer and installer.

PART 2 - PRODUCTS

2.01 STONE FLOORING, GENERAL

A. Comply with referenced standards and product requirements indicated and applicable to each stone type required.

B. Provide matched blocks from a single quarry for each type, variety, color, and quality of stone required. Texture, graining, tone, size and frequency of voids to match approved samples.

1. Extract blocks from a single bed of quarry stratum reserved for this Project.
2. Select stones from selected blocks visually acceptable to Authority.

C. Source Approval by Authority: Make quarried and cut blocks available for Authority's approval during quarry operation and prior to shipment to fabricator or prior to fabrication.

D. Require fabricator to coordinate and inspect quarrying for this Project to ensure quarried block orientations produce finished stone with specified characteristics.

E. Provide stone that is sound and free of cracks, seams, and other defects starts impairing structural integrity, durability, appearance or function of stone.

2.02 COMPASS ROSE EMBLEM FABRICATION

A. Comply with referenced standards and product requirements indicated and applicable to thetype of stone specified.

B. Each color of granite to be from a single quarry and match the color, texture, variety and quality of stone selected and approved by the Authority.

1. Extract blocks of each type and color from a single bed of quarry stratum reservedfor this Project.
2. Select stones from selected blocks visually acceptable to Authority.

C. Source Approval by Authority: Make quarried and cut blocks available for Authority's approval during quarry operation and prior to shipment to fabricator or prior to fabrication.

D. Fabricator to coordinate and inspect quarrying for this Project to ensure quarried block orientations produce finished stone with specified characteristics.

E. Provide stone that is free of cracks, seams, and defects that would impair structural integrity, durability, appearance, or function, and from a single quarry for each stone type with the characteristics listed below.

2.03 GRANITE

A. Granite Dimension Stone Standard: ASTM C 615.

1. Granite: As specified by National Building Granite Quarries Association, Inc. (NBGQA) in "Specifications for Architectural Granite."

B. Granite Properties: Conform to the following physical requirements:

1. Absorption: Maximum 0.4% by weight per ASTM C97. Density: Minimum 160 pcf.
2. Compressive Strength: Minimum 19,000 psi per ASTM C170.
3. Modulus of Rupture: Minimum 1500 psi per ASTM C99.
4. Minimum abrasive hardness of 25 for stone subjected to foot traffic.
5. Flexural Strength: Minimum 1200 psi per ASTM C 880.
6. Abrasion Resistance: ASTM C241.
7. Slip Resistance: Granite walking surface to have a minimum value of 0.42 DCOF measured with the BOT-3000E and using a 0.05% SLS water solution per the specified test method.

C. Finish of Granite Flooring: Finish of exposed surfaces of granite flooring to be as indicatedon the drawings or as selected by the Authority:

1. GR-1A: Rockville White, Diamond 5.
2. GR-1B: Rockville White, Diamond 8.

D. Finish of Compass Rose: Finish of exposed surface of the granite compass rose shall be asfollows:

1. GR-2A: Jet Mist, Sandblasted and Painted with Lithichrome in Black.
2. GR-2B: Jet Mist, Flamed.

E. Match Authority's sample for each type, variety, group, color, finish and related visual andtextural characteristics for the floor and the compass rose.

F. Granite Color and Grain:

1. For Floor Pavers and Enclosure Sills (base): Rockville White Granite quarried by Cold Spring Granite; light gray with medium grain; or as selected by the Authority.
2. For Compass Rose: Rockville White Granite and Jet Mist Granite as shown and scheduled on Drawings and as selected and approved by the Authority for the indicated design and graphics.

G. Granite Thickness:

1. For Floor Pavers: Minimum thickness 1-1/4 inch or as indicated on Drawings.
2. Pieces for Compass Rose: As indicated on Drawings.

H. Granite Types and Sources: Subject to compliance with requirements, provide from the following:

1. Quarra Stone Company, Wisconsin.
2. Coldspring Granite, Minnesota.
3. Granites of America, Virginia.

2.04 MORTAR AND GROUT

A. Thick-Bed Leveling Mortar for Stone: Proprietary mortar for leveling beds, factory proportioned in dry blend to be mixed with specified manufacturer’s liquid additive, suitablefor mortar bed up to 2” thickness.

1. Laticrete International “Laticrete 226 Thick Bed Mortar”, “Laticrete 3701 Admix”MAPEI “Mapecem”, “Planicrete 50” additive.
2. TEC Incorporated “TA-325 Quick Patch”, TA-861 Primer and Patch Additive”.

B. Latex-Portland Cement Thin-Set Mortar for Stone: ANSI A118.4, latex-modified

cement mortar for thin set application. Factory proportioned cement and fillers in dry blend to be mixed with specified manufacturer's liquid additive. Suitable for mortar bed up to 1/4" thickness.

1. Laticrete International "Laticrete 226 Thick Bed Mortar", "Laticrete 3701 Admix"MAPEI "Ultra/Flor Mortar", "Keraply" additive.
2. TEC Incorporated "TA-373 Medium Bed Mortar", "Full Bond" additive

C. Latex-Portland Cement Sanded Grout: ANSI A118.6, polymer-modified cement grout suitable for use with stone flooring. Factory proportioned cement, sand, polymer, additives and alkali resistant non-fading mineral pigments in dry blend to be mixed with water. Groutcolor as selected by the Authority.

1. Laticrete International "Laticrete 1500 Series Sanded Grout" MAPEI "KER 200Sanded Grout"
2. TEC Incorporated "TA-650 AccuColor Sanded Grout"

D. Aggregate: ASTM C144 as indicated below:

1. For joints narrower than 1/4 inch, use aggregate graded with 100 percent passing a No. 8 sieve, and 95 percent a No. 16 sieve.
2. For pointing mortar, use aggregate graded with 100 percent passing a No. 16 sieve.
3. White Aggregates: Natural washed white sand or ground white stone.
4. Colored Aggregates: Ground marble, granite, or sound colored stone acceptable toAuthority.

E. Colored Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for mortar mixes. Use only pigments with records of satisfactory performancein stone mortars.

1. Products:

    a. SGS Mortar Colors, Solomon Grind-Chem Services, Inc.
    b. True Tone Mortar Colors, Davis Colors, A Subsidiary of Rockwood Industries.
    c. Sonobrite, Sonneborn.

F. Water: Potable.

G. Latex-Portland Cement Mortar: CTI A118.4, composition as follows:

1. Water Emulsion Latex Additive: Add at Project site to the factory-packaged drymortar mix specified or as specified by latex additive manufacturer.

H. Mixing: Combine and thoroughly mix cementitious materials, water, and aggregates in a mechanical batch mixer. Comply with referenced ASTM or ANSI standards, as applicable for setting mortar and joint grout, for mixing time and water content, unless indicated otherwise.

1. Do not use admixtures, including coloring pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or calciumchloride, unless indicated otherwise.

2.05 ACCESSORIES

A. Cleaner: Provide stone cleaners specifically formulated for stone types, finishes, and applications indicated as specified by stone producer, and if a sealer specified, by sealer manufacturer. Do not use cleaning agents containing acid or cleaning compounds and solutions containing caustic or harsh fillers, except where expressed by written approval fromthe stone producer for stone type condition.

B. Floor Sealer: Colorless, slip- and stain-resistant sealer, not affecting color or physical properties of stone surfaces as specified by stone manufacturer for application indicated.

C. Backer Stone: 13/16 inch thick smooth granite slab. One piece cut to size of entire granite assembly.

D. Epoxy: Use AKA-BOND or approved equal epoxy as recommended and approved by the granite fabricator to set and secure granite pieces to backer stone and to each other for Compass Rose.

2.06 FLOOR PAVER FABRICATION

A. General: Fabricate stone flooring in sizes and shapes required to comply with requirementsindicated, including details on Drawings and final shop drawings.

B. Cut stones to fit stone pattern as indicated on Drawings and final shop drawings. Produce units to minimize field cutting for thickness, face sizes, and within fabrication tolerances specified by applicable stone association or stone source.

1. Fabricate to required profiles, shapes, and sizes within a maximum 3/64” deviation in 48”. Maximum variation from required thickness must not exceed 1/4” on piecesup to 2” thick.

C. Workmanship: Accurately cut, dress, drill, fit and finish stone work to shapes and dimensions shown and/or as indicated on final shop and setting drawings. Make exposed plane surfaces true in line. Cut external corners with quirk-miter joints where shown. Cut all other joints and edges square and at right angles to face, and with backs parallel to face. Make arrises straight, sharp, true, and continuous at joints. Cut and drill stones in shop as required for supports, anchors, ties, bolts, and other inserts.

D. Produce joints of uniform width as indicated.

1. Allow for expansion and contraction within the limits of the joint material when cutting for anchorage devices.

E. Clean sawn backs of stones to remove rust stains and free iron particles.

F. Flatness Tolerances: Maximum variations for honed, and fine-rubbed surfaces at bed andjoint arris lines; 3/64 inch or 1/16 of specified joint width, whichever is greater.

1. Beds and Joints: Bed and joint surfaces cut or sawn full square for specified minimum thickness of unit.
2. Backs sawn or roughly dressed to approximate true planes. Maximum variation plus or minus 1/8 inch.

G. Finish exposed faces and edges of stones to comply with requirements indicated for finish under each type and application of stone and to match approved samples and field-constructed mockup.

H. Carefully inspect finished stones at fabrication plant for compliance with requirements relative to qualities of appearance, material, and fabrication. Replace defective stones withunits that comply.

1. Grade and mark stones for overall uniform appearance when assembled in place. Natural variations in appearance are acceptable if installed stones match range of colors and other appearance characteristics are represented in approved samplesand field-constructed mockups.

2.07 COMPASS ROSE FABRICATION

A. General: Fabricate stone Compass Rose assembly in sizes, design and shapes required to comply with requirements indicated, including details on Drawings, final shop drawings, and approved sample, if applicable.

B. Cut different colored stones to fit Compass Rose pattern, graphics, and lettering as indicated on Drawings, final shop drawings and approved sample; including granite border. Produce units within fabrication tolerances specified by applicable stone association or stone source.

C. Face Sizes, design, colors and graphics: As indicated on drawings, final shop drawings, and approved samples. Lettering, size and fonts as shown on drawings or as otherwise submittedand approved by the Authority.

D. Stone Edges: Square.

E. Produce joints of uniform width as indicated. Joints to be as tight as possible.

F. Clean sawn backs of stones to remove rust stains and free iron particles.

G. Flatness Tolerances: Maximum variations for honed, and fine-rubbed surfaces at bed and joint arris lines; 3/64 inch or 1/16 of specified joint width, whichever is greater.

1. Beds and Joints: Bed and joint surfaces cut or sawn full square for specified minimum thickness of unit.
2. Backs sawn or roughly dressed to approximate true planes. Maximum variation plus or minus 1/8 inch.

H. Finish exposed faces and edges of stones to comply with requirements indicated for finish under each type and application of stone and to match approved samples and field-constructed mockup.

I. Carefully inspect finished stones at fabrication plant for compliance with requirements relative to qualities of appearance, material, and fabrication. Replace defective stones withunits that comply.

1. Grade and mark stones for overall uniform appearance when assembled in place. Natural variations in appearance are acceptable if installed stones match range of colors and other appearance characteristics are represented in approved samplesand mockups.

J. Set granite graphics and design pieces on granite backer. Pieces to be clean, with smooth edges, and free of dust, dirt and grease. Colors, finishes, design, and graphics as approved. Epoxy granite pieces to granite backer and to each other; following epoxy manufacturer's directions and recommendations.

2.08 COMPASS ROSE ASSEMBLY

A. Set and adhere granite border and granite pieces in design indicated and approved with required graphics to granite backer with epoxy. All joints between granite pieces to be even and tight with epoxy at the joints between all granite pieces. All edges to be smooth and free of defects. Follow epoxy manufacturer’s directions and recommendations for preparation of surfaces, application, curing, and environmental conditions for epoxy installation. Design, graphics and spacing to be true to their geometric shapes, true to lines, parallel, centered, with even spacings. Letters and north arrow to be at proper orientations.

B. Set stones to comply with Drawings, final shop drawings, and approved sample.

C. Do not use stone units with chips, cracks, voids, stains, or defects visible in the finished work.

D. Match stones for color and pattern as for uniformity and to match where required.

E. Wash stone unit faces to remove loose material and soil.

F. Scribe and cut stone as necessary to fit design. Produce neat and tight joints.

G. Set individual stones for border and design onto granite backer slab. Surfaces to be clean, flat, even and without projections to assure continuous contact. Take care to maintain accurate surface, joint alignment and spacing. Apply epoxy to all required surfaces according to directions and recommendations. Tap stone into place to ensure 100 percent contact between back of stone and backer stone and contact at stone joints. Take care to maintain accurate surface, joint alignment, and spacing. Do not realign stone after epoxy has takeninitial set.

H. Entire Compass Rose Assembly to have an even and flat surface. Thickness of assemblyto be approximately 1-1/2 inches.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine surfaces to receive stone flooring and Compass Rose assembly and conditions where stone will be installed. Review with the Installer present for compliance with requirements for tolerances and conditions affecting installation performance. Report in writing conditions not complying with requirements. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. At new concrete slabs or paving, lower floor or provide recess of required depth for stone and setting bed. Extent of lowered floor or recess to accommodate stone and grout joints. At installation of new stone or Compass Rose assembly in existing concrete; sawcut existing concrete with straight, even lines and 90 degree corners and remove concrete as required.

C. Do not use Compass Rose assembly with the following defects:

1. Broken, chipped, stained, or otherwise damaged stones.
2. Defective joints.
3. Stones and joints not matching approved samples and field-constructed mockups.
4. Stone flooring not complying with requirements indicated.

3.02 PREPARATION

A. Before installing stone flooring and Compass Rose; clean substrates, including concrete recesses, to remove dust, debris, and contaminants such as curing compounds and surface sealer or other deleterious substances not compatible with setting material.

B. Substrates shall be free of previously applied surface material. Saturate bare concrete substrate with clean water and remove any surface water just prior to application of the setting bed.

C. Provide filling, patching, or leveling of substrate as required for stone installation.

3.03 STONE FLOOR INSTALLATION

A. Install stone flooring only on sound substrates.

B. Layout and set stones to comply with Drawings and final shop drawings. Layout in requiredpattern, center in both directions and adjust to minimize cutting.

C. Do not use stone units with chips, cracks, voids, stains, or defects visible in the finished Work.

D. Match stones for color and pattern by using units numbered in sequence as indicated on finalshop drawings.

1. Wash stone unit faces to remove loose material and soil.
2. Scribe and field-cut stone if necessary to fit at obstructions. Produce tight and neatjoints.
3. Where grinding is required to completely align and level flooring joints, permit a minimum of six days of setting time to elapse before commencing. Perform grinding by wet abrasion, in a manner as to retain the finish, to match the balance of stone flooring and so as to be free of depressions and grind marks. Exercise care to avoiddamage or soiling of adjacent work.

3.04 INSTALLATION OF SETTING BED FOR STONE FLOOR

A. Mortar and Grout Mix Requirements: Provide specified latex-Portland cement mixes, machine mixed to specified proportions. Shovel measurement not permitted. Prepare the mixes in quantities that are usable before initial set occurs, but not more than 45 minutes before delivery to points of use. Do not re-temper nor use partially set mixes. Apply mortar only on such area as can be immediately covered by stone within the working life of the setting material and remove mortar that dries or begins to set before stone is installed.

B. Cement Mortar Leveling Bed: Apply thick-bed leveling mortar as slurry bond coat and screed bed filling, patching and leveling of substrate as required to make ready for stone installation. Place leveling bed, screed to the level or slope as required to conform to the subsequent finish stone elevation, and allow the screed leveling bed to properly cure.

3.05 INSTALLATION OF STONE FLOOR

A. Set individual stones into screeded and fully compacted setting bed material. Tamp and beat stone into setting bed with a rubber headed mallet or wooden block to ensure 100 percent contact between back of stone and setting material. Take care to maintain accurate surface, joint alignment, and spacing. Do not realign stone after bed material has taken initial set.

B. Terminate the stone flooring neatly at obstructions, edges, and corners, without disruption of pattern or joint alignment. Apply setting material only on such area as can be immediately covered by stone flooring within the working life of the setting material. Remove setting material that dries or begins to set before stone is installed. Thoroughly beat stone into setting material to obtain 100% contact and permanent bond.

3.06 STONE FLOOR JOINTS

A. Joint widths to be a maximum of 1/4" wide and consistent throughout the project.

B. Control and Expansion Joints: Form control joints where indicated and where flooring intersects with vertical surfaces. Make expansion Joints the same width as joints the samewidth as joint in substrate, but not less than the typical paver joint width.

C. Grouting of Joints: After setting, rake joints and completely fill joints solid with specified grout, free from voids or pits. Tool grout flush with top surface of stone. Promptly remove excess and spillage from stone faces to prevent staining or defacement. Cover areas to provide proper moist curing.

3.07 COMPASS ROSE INSTALLATION

A. Either saw cut a recess in existing concrete to accept the Compass Rose assembly or form a recess in new concrete to accept the Compass Rose assembly. Size of recess in pavement to be size of Compass Rose assembly plus ¼ inch joint at perimeter. Depth of recess to be2-1/2 inches or as required to allow flush installation of granite assembly.

B. If remaining depth of concrete after creating recess is insufficient structurally; for an installation at existing concrete, remove all the concrete and pour a base of sufficient depth or, for an installation in new concrete, pour a thicker slab under the recess for the Compass Rose.

C. Cement Mortar Leveling Bed to be applied as slurry bond coat and screed bed for filling, patching and leveling of substrate as required to make ready for Compass Rose installation. Place leveling bed, screed to the level or slope as required to conform to the subsequent finish elevation, and allow the screed leveling bed to properly cure.

D. Set Compass Rose assembly, including granite border, in pavement recess with a thinset bed of epoxy mortar. Apply a bed of mortar over leveling or setting bed substrate and apply to back of Compass Rose backer stone just prior to installation. Use a notched trowel and work the mortar into 100 percent contact with the surfaces. Set Compass Rose assembly into place on the setting bed. Place and thoroughly tamp the Compass Rose assembly into setting material to obtain 100 percent contact and permanent bond. Set and level assembly immediately maintaining uniform perimeter joint widths. Perimeter joints to be even and straight. Top surface of Compass Rose assembly to be level and align with adjacent concretesurfaces, especially at perimeter.

E. Grout outside joint along entire perimeter between granite and pavement. After setting, rake joints and completely fill joints solid with specified grout, free from voids or pits. Tool grout flush with top surface of stone. Promptly remove excess and spillage from stone faces to prevent staining or defacement. Cover areas to provide proper moist curing.

3.08 INSTALLATION TOLERANCES

A. Variation in Surface Plane of Flooring: Do not exceed 1/8 inch in 10 feet from level or slope indicated when tested with a 10-foot straight edge. Do not exceed ± 1/32” joint width variationat any location and 1/16” in 3-foot run variation in alignment of joints.

3.09 ADJUSTING

A. Remove stone flooring with the following defects:

1. Broken, chipped, stained, or otherwise damaged stones.
2. Defective joints.
3. Stones and joints not matching approved samples and field-constructed mockups.
4. Stone flooring not complying with requirements indicated.

B. Replace damaged stone flooring with new units to match approved samples and field-constructed mockups without evidence of replacement.

C. Replace damaged stone Compass Rose assembly with new units to match approved samples and mockup without evidence of replacement.

3.10 CLEANING

A. Upon completion of the Work, remove unused materials, debris, containers and equipmentfrom the project site.

B. Clean stone floor and Compass Rose assembly after setting and grouting is complete. Remove excess mortar and sealant from surfaces as the work progresses and before it hardens on the surface. Clean the stone by washing with water and bristle brushes or approved cleaner according to manufacturer's recommendations. Remove stains, dirt and other discolorations. Use procedures specified by stone fabricator for type of application. Donot use acids or wire brushes.

3.11 SEALER

A. Apply sealer to cleaned stone flooring and Compass Rose Assembly according to sealer manufacturer's printed instructions.

3.12 PROTECTION

A. Prohibit traffic from installed stone for a minimum of 72 hours.

B. Protect set and grouted stone floor and Compass Rose assembly during construction with non-staining kraft paper. Where adjoining areas require construction work access, cover stone flooring with a minimum of 3/4-inch untreated plywood over Kraft paper.

C. Before inspection for Substantial Completion, remove protective covering and clean surfaces using procedures, products, and materials specified by the stone producer.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 09 60 00, Stone Flooring and Compass Rose shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 09 60 00, Stone Flooring and Compass Rose shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 09 60 10.S
STONE FLOORING AND TRIM

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and Division 01 Specification sections, apply to this section.

1.02 SUMMARY

A. This section includes the removal, salvage, protection, cleaning, and reinstallation of existing stone flooring.

B. This Section includes providing and installing natural stone (granite) paver flooring, in various colors, set in mortar bed over concrete as shown on the drawings and specified herein.

C. This section includes stone stair treads and risers and trims, in thicknesses and colors as shown and scheduled on drawings.

D. Provide stone (granite) and settings for flooring, wall base, and solid stone base trims as shown on drawings.

E. Provide granite colors and thicknesses as scheduled and to match existing stone flooring.

1.03 RELATED WORK

A. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 02 Section, “Concrete Paving”.
2 Division 07 Section, "Joint Sealants".

1.04 REFERENCES

A. American National Standards Institute. (ANSI)

1. ANSI B 101.1 – Test Method for Measuring Wet Static Coefficient of Friction of Common Hard-Surface Floor Materials.
3. ANSI B 101.3 – Test Method for Measuring Wet Dynamic Coefficient of Friction of Common Hard-Surface Floor Materials.
4. ANSI A 326.3 – American National Standard Test Method for Measuring Dynamic Coefficient of Friction of Hard Surface Flooring Materials.

B. National Building Granite Quarries Association Inc. (NBGQA): “NBGQA Specifications for Building Granite.”

C. CTI A118.4 – Specifications for Latex Portland Cement Mortar (included in ANSI A108.1)

D. CTI A118.6 – Specifications for Ceramic Tile Grouts (included in ANSI A108.1)

E. CTI A108.10 – Specifications for Installation of Grout in Tile work (included in ANSI A108.1)

F. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.

G. ASTM C241 – Standard Test Method for Abrasion Resistance of Stone Subjected to Foot Traffic.

H. ASTM C615 - Standard Specification for Granite Dimension Stone

I. ASTM E 303 – Standard Test Method for Measuring Surface Functional Properties Using the British Pendulum Tester.

J. NFSI – National Floor Safety Institute

1.05 DEFINITIONS

A. Stone flooring: fabricated from natural stone (granite) to produce non-gauged units 1-1/4 inch to 2 inches thick. Stone flooring units require thick mortar bed setting.

B. Solid stone base: fabricated stone (granite) of thicknesses greater than 2”, in profiles, lengths, and anchorages as shown in drawings.

C. Stone Trim: Non-flooring cut and finished stone such as wall base and stair stringers. Colors per schedule or as indicated.

D. Epoxy Abrasive Strip: Non-slip bars let in to rabbets at nose of stair treads.

1.06 PERFORMANCE REQUIREMENTS

A. Stone Testing: Perform the following tests on random samples of stone quarried for the project.

1. Absorption, and Bulk Specific Gravity (Density): ASTM C97. Two tests each.
2. Compressive strength: ASTM C170. Four tests. Apply loading parallel or perpendicular to the rift plane, whichever will be the loaded condition of stone used in the work.
3. Modulus of Rupture: ASTM C99. One group of 30 tests dry. One group of 30 tests wet. Apply loading parallel or perpendicular to the rift plane, whichever will be the loaded condition of stone used in the Work.
4. Flexural Bending: ASTM C880. One group of 30 tests dry. One group of 30 tests wet. Apply loading parallel or perpendicular to the rift plane, whichever will be the loaded condition of stone used in the Work.
5. Abrasion Resistance: ASTM C241. One test of each type stone to be used for walking surfaces.
6. Slip resistance: Test each combination of stone and surface finish to be used for walking surfaces. Slip resistance tests must be performed by a qualified independent testing agency approved by the Authority and the tests to be done according to ANSI B 101.3, Test Method for Measuring Wet DCOF of Common Hard Surface Floor Materials using the BOT-3000E digital tribometer measuring device and/or according to ASTM E303 using the British pendulum tester. The test device and method to be as selected by and approved by the Authority.
7. Petrographic Analysis: ASTM C295. One test.

1.07 SUBMITTALS

A. General: Submit the following according to the Division 01 Specification Section, “Submittals”.

B. Product Data: As follows:

1. Each stone type.
2. Setting, grouting and epoxy materials.
3. Surface sealers.
4. Cleaning Products.

C. Maintenance data to be included in the Maintenance Manual specified in Division 01 Section "Project Closeout." Furnish information describing the materials, equipment, and procedures to be followed for the cleaning and maintenance of the stone used in the work.

D. Actual samples for each color, grade, finish, type, and variety of stone consisting of 12-inch-square units. Include a minimum of three units in each set showing the full range of each type of visual and textural characteristics to be expected in the completed Work.

1. Obtain samples from the same source as the stone to be used in the Work of this Section.

E. Shop drawings indicating cut sizes, dimensions, sections, and profiles of stone paving units, and details showing relationship of units to adjacent work. Show installation details at special and substrate conditions.

F. Qualification data for firms and persons specified in "Quality Assurance" article to demonstrate their capabilities and experience. Include list of completed projects with project name, addresses, names of Architects and Owners, and other information specified.

G. Reports for granite tests prepared by the independent testing agency for the following specified tests of the granite and grout properties:

1. Absorption.
2. Compressive Strength.
3. Modulus of Rupture.
4. Minimum abrasive hardness.
5. Flexural Strength.
6. Abrasion Resistance.
7. Slip Resistance.

1.08 QUALITY ASSURANCE

A. Fabricator Qualifications: Firm experienced in supplying products similar to those indicated for this Project with a record of successful in-service performance.

B. Installer Qualifications: Engage an experienced Installer who has completed interior stone flooring installations that are similar in material, design, and extent as that indicated for this Project and that have performed successfully. Installer must be approved by the fabricator of the stone.

C. Single-Source Responsibility for Stone: Obtain each color, grade, finish, type, and variety of stone from a single source with resources to provide materials of consistent quality in appearance and physical properties, including capacity to cut, detail, and finish material without delaying the progress of the stone installation.

D. Single-Source Responsibility for Setting Materials: Obtain mortar and grout mix ingredients of uniform quality, from one manufacturer for each cementitious and admixture

component, and from one source or producer for each aggregate.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Comply with fabricator's instructions and specifications for delivery, storage, and handling requirements.

B. Deliver all materials to site in an undamaged condition.

C. Store and handle paving stones, and related materials to prevent deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breakage, chipping, or cracking.

1. Do not use pinch or wrecking bars to move stone units.
2. Lift stones with wide belt-type slings where possible. Do not use wire rope or ropes containing tar or stain-causing substances. Use cushion-protected wood rollers and lifting devices when required to move stone.
3. Store stones on protected wood skids or pallets, covered with non-staining, water-protective membrane. Place skids and stack stones to distribute weight evenly and to prevent stones from breaking or cracking. Allow air to circulate around stones.
4. Store cementitious materials off ground, under cover, and in a dry location.
5. Store aggregate materials covered and in a dry location.

1.10 PROJECT CONDITIONS

A. Do not set stone when air temperature or material temperature is below 50 deg F.

B. Maintain minimum ambient temperatures of 50 deg F during installation and for 7 days after completion, unless higher temperatures are required by manufacturer's instructions.

C. Determine that recess in concrete floor slab is sufficient enough for flush installation of the stone pavers.

1.11 SEQUENCING AND SCHEDULING

A. Schedule and sequence stone flooring and finishes installation with adjoining and related work to minimize damage and soiling during and after installation.

PART 2 PRODUCTS

2.01 STONE FLOORING, GENERAL

A. Comply with referenced standards and product requirements indicated and applicable to each stone type required.

B. Provide matched blocks from a single quarry for each type, variety, color, and quality of stone required. Texture, graining, tone, size and frequency of voids to match approved samples.

1. Extract blocks from a single bed of quarry stratum reserved for this Project.
2. Select stones from selected blocks visually acceptable to Authority.

C. Source Approval by Authority: Make quarried and cut blocks available for Authority's approval during quarry operation and prior to shipment to fabricator or prior to fabrication.

D. Require fabricator to coordinate and inspect quarrying for this Project to ensure quarried block orientations produce finished stone with specified characteristics.

E. Provide stone that is sound and free of cracks, seams, and other defects starts impairing structural integrity, durability, appearance or function of stone.

2.02 GRANITE

A. Granite Dimension Stone Standard: ASTM C 615.

1. Granite: As specified by National Building Granite Quarries Association, Inc. (NBGQA) in "Specifications for Architectural Granite."

B. Granite Properties: Conform to the following physical requirements:

1. Absorption: Maximum 0.4% by weight per ASTM C97. Density: Minimum 160 pcf.
2. Compressive Strength: Minimum 19,000 psi per ASTM C170.
3. Modulus of Rupture: Minimum 1500 psi per ASTM C99.
4. Minimum abrasive hardness of 25 for stone subjected to foot traffic.
5. Flexural Strength: Minimum 1200 psi per ASTM C 880.
6. Abrasion Resistance: ASTM C241.
7. Slip Resistance: Granite walking surface to have a minimum value of 0.42 DCOFmeasured with the BOT-3000E and using a 0.05% SLS water solution per the specified test method.

C. Finish of Granite Flooring and Stairs: Finish of exposed surfaces of granite flooring to be as indicated on the drawings or as selected by the Authority from one of the following; depending on location, application or adherence to COF requirements:

1. Velvet Finish.
2. Flamed / Thermal Finish.
3. Water Jet Finish.
4. Polished Finish.

Water Jet is the most abrasive. If finish is not indicated otherwise, use the Flamed / Thermal Finish.

D. Match Authority's sample for each type, variety, group, color, finish and related visual and textural characteristics for the floor and other stone finishes.

E. Granite Color and Grain:

1. For Floor Pavers: Match existing granite flooring colors, follow schedules in drawings; or as selected by the Authority.
2. For wall base and stone bases: Match existing granite colors, or follow schedules in drawings; or provide colors as selected by the Authority.

F. Granite Thickness:

1. For Floor Pavers: Minimum thickness 1-1/4 inch or as indicated on Drawings.
2. For solid stone bases: Provide profiles as shown in drawings.

G. Granite Types and Sources: Subject to compliance with requirements, provide one of the following:

1. Cold Spring Granite at Isle, MI.
2. North Carolina Granite Corp. at Mount Airy, NC.
3. Approved equal.

2.03 MORTAR AND GROUT

A. Thick-Bed Leveling Mortar for Stone:
Proprietary mortar for leveling beds, factory proportioned in dry blend to be mixed with specified manufacturer's liquid additive, suitable for mortar bed up to 2" thickness.

Laticrete International "Laticrete 226 Thick Bed Mortar", "Laticrete 3701 Admix" MAPEI "Mapecem", "Planicrete 50" additive.

TEC Incorporated "TA-325Quick Patch", TA-861 Primer and Patch Additive".

B. Latex-Portland Cement Thin-Set Mortar for Stone:
ANSI A118.4, latex-modified cement mortar for thin set application. Factory proportioned cement and fillers in dry blend to be mixed with specified manufacturer's liquid additive. Suitable for mortar bed up to ¼" thickness.

Laticrete International "Laticrete 226 Thick Bed Mortar", "Laticrete 3701 Admix" MAPEI "Ultra/Flor Mortar", "Keraply" additive.

TEC Incorporated "TA-373 Medium Bed Mortar", "Full Bond" additive

C. Latex-Portland Cement Sanded Grout:
ANSI A118.6, polymer-modified cement grout suitable for use with stone flooring. Factory proportioned cement, sand, polymer, additives and alkali resistant non-fading mineral pigments in dry blend to be mixed with water. Grout color as selected by the Authority.

Laticrete International "Laticrete 1500 Series Sanded Grout" MAPEI "KER 200 Sanded Grout"
TEC Incorporated "TA-650 AccuColor Sanded Grout"

D. Aggregate: ASTM C144 as indicated below:

1. For joints narrower than 1/4 inch, use aggregate graded with 100 percent passing a No. 8 sieve, and 95 percent a No. 16 sieve.
2. For pointing mortar, use aggregate graded with 100 percent passing a No. 16 sieve.
3. White Aggregates: Natural washed white sand or ground white stone.
4. Colored Aggregates: Ground marble, granite, or sound colored stone acceptable to Authority.

E. Colored Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for mortar mixes. Use only pigments with records of satisfactory performance in stone mortars.

1. Products:

a. SGS Mortar Colors, Solomon Grind-Chem Services, Inc.
b. True Tone Mortar Colors, Davis Colors, A Subsidiary of Rockwood Industries.
c. Sonobrite, Sonneborn.

F. Water: Potable.

G. Latex-Portland Cement Mortar: CTI A118.4, composition as follows:

1. Water Emulsion Latex Additive: Add at Project site to the factory-packaged dry mortar mix specified or as specified by latex additive manufacturer.

H. Mixing: Combine and thoroughly mix cementitious materials, water, and aggregates in a mechanical batch mixer. Comply with referenced ASTM or ANSI standards, as applicable for setting mortar and joint grout, for mixing time and water content, unless indicated otherwise.

1. Do not use admixtures, including coloring pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or calcium chloride, unless indicated otherwise.

2.04 ACCESSORIES

A. Non-slip Abrasive Bars: Fabricate stair tread nosings as detailed. Provide tapered abrasive bars of 3/8" (10mm) width by nominal 1/2 " (25 mm) depth; material of two-part epoxy combined with aluminum oxide grits; Balco brand "AS" or similar; black in color.

B. Cleaner: Provide stone cleaners specifically formulated for stone types, finishes, and applications indicated as specified by stone producer, and if a sealer specified, by sealer manufacturer. Do not use cleaning agents containing acid or cleaning compounds and solutions containing caustic or harsh fillers, except where expressed by written approval from the stone producer for stone type condition.

C. Floor Sealer: Colorless, slip- and stain-resistant sealer, not affecting color or physical properties of stone surfaces as specified by stone manufacturer for application indicated.

D. Backer Stone: 13/16 inch thick smooth granite slab. One piece cut to size of entire granite assembly.

E. Epoxy: Use AKA-BOND or approved equal epoxy as recommended and approved by the granite fabricator to set and secure granite pieces to backer stone and to each other for finishes.

2.05 FLOOR PAVER FABRICATION

A. General: Fabricate stone flooring in sizes and shapes required to comply with requirements indicated, including details on Drawings and final shop drawings.

B. Cut stones to fit stone pattern as indicated on Drawings and final shop drawings. Produce units to minimize field cutting for thickness, face sizes, and within fabrication tolerances specified by applicable stone association or stone source.

1. Fabricate to required profiles, shapes, and sizes within a maximum 3/64" deviation in 48". Maximum variation from required thickness must not exceed 1/4" on pieces up to 2" thick.

C. Workmanship: Accurately cut, dress, drill, fit and finish stone work to shapes and dimensions shown and/or as indicated on final shop and setting drawings. Make exposed plane surfaces true in line. Cut external corners with quirk-miter joints where shown. Cut

all other joints and edges square and at right angles to face, and with backs parallel to face. Make arrises straight, sharp, true, and continuous at joints. Cut and drill stones in shop as required for supports, anchors, ties, bolts, and other inserts.

D. Produce joints of uniform width as indicated.

1. Allow for expansion and contraction within the limits of the joint material when cutting for anchorage devices.

E. Clean sawn backs of stones to remove rust stains and free iron particles.

F. Flatness Tolerances: Maximum variations for honed, and fine-rubbed surfaces at bed and joint arris lines; 3/64 inch or 1/16 of specified joint width, whichever is greater.

1. Beds and Joints: Bed and joint surfaces cut or sawn full square for specified minimum thickness of unit.
2. Backs sawn or roughly dressed to approximate true planes. Maximum variation plus or minus 1/8 inch.

G. Finish exposed faces and edges of stones to comply with requirements indicated for finish under each type and application of stone and to match approved samples and field-constructed mockup.

H. Carefully inspect finished stones at fabrication plant for compliance with requirements relative to qualities of appearance, material, and fabrication. Replace defective stones with units that comply.

1. Grade and mark stones for overall uniform appearance when assembled in place. Natural variations in appearance are acceptable if installed stones match range of colors and other appearance characteristics are represented in approved samples and field-constructed mockups.

2.06 STAIR TREAD NOSE FABRICATION

A. General: Fabrication required for non-slip abrasive nosings shall be performed by stone fabricator.

B. Fabricate stone stair treads in sizes and shapes required to comply with requirements indicated, including details on Drawings and final shop drawings.

C. Shop fabricate rabbets into stone tread nosings. Profile of rabbet shall be as required by manufacturer of abrasive strip.
Place leading edge of rabbet not more than 3/4 “ from nose radius edge; locate additional rabbets at 1” O.C. or as shown on drawings.
Hold rabbet back from face of stone stringers a distance to match existing stone stairs.

D. Install abrasive bars with epoxy base construction adhesive. Clamp and protect bars until adhesive is fully cured.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine surfaces to receive stone flooring and finishes assembly and conditions where stone will be installed. Review with the Installer present for compliance with requirements for tolerances and conditions affecting installation performance. Report in writing conditions not complying with requirements. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. At new concrete slabs or paving, lower floor or provide recess of required depth for stone and setting bed. Extent of lowered floor or recess to accommodate stone and grout joints. At installation of new stone or in existing concrete; sawcut existing concrete with straight, even lines and 90 degree corners and remove concrete as required.

3.02 PREPARATION

A. Before installing stone flooring and finishes; clean substrates, including concrete recesses, to remove dust, debris, and contaminants such as curing compounds and surface sealer or other deleterious substances not compatible with setting material.

B. Substrates shall be free of previously applied surface material. Saturate bare concrete substrate with clean water and remove any surface water just prior to application of the setting bed.

C. Provide filling, patching, or leveling of substrate as required for stone installation.

3.03 STONE FLOOR INSTALLATION

A. Install stone flooring only on sound substrates.

B. Layout and set stones to comply with Drawings and final shop drawings. Layout in required pattern, center in both directions and adjust to minimize cutting.

C. Do not use stone units with chips, cracks, voids, stains, or defects visible in the finished Work.

D. Match stones for color and pattern by using units numbered in sequence as indicated on final shop drawings.

1. Wash stone unit faces to remove loose material and soil.
2. Scribe and field-cut stone if necessary to fit at obstructions. Produce tight and neat joints.
3. Where grinding is required to completely align and level flooring joints, permit a minimum of six days of setting time to elapse before commencing. Perform grinding by wet abrasion, in a manner as to retain the finish, to match the balance of stone flooring and so as to be free of depressions and grind marks. Exercise care to avoid damage or soiling of adjacent work.

3.04 INSTALLATION OF SETTING BED FOR STONE FLOOR

A. Mortar and Grout Mix Requirements: Provide specified latex-Portland cement mixes, machine mixed to specified proportions. Shovel measurement not permitted. Prepare the mixes in quantities that are usable before initial set occurs, but not more than 45 minutes before delivery to points of use. Do not re-temper nor use partially set mixes. Apply mortar only on such area as can be immediately covered by stone within the working life of the

setting material and remove mortar that dries or begins to set before stone is installed.

B. Cement Mortar Leveling Bed: Apply thick-bed leveling mortar as slurry bond coat and screed bed filling, patching and leveling of substrate as required to make ready for stone installation. Place leveling bed, screed to the level or slope as required to conform to the subsequent finish stone elevation, and allow the screed leveling bed to properly cure.

3.05 INSTALLATION OF STONE FLOOR

A. Set individual stones into screeded and fully compacted setting bed material. Tamp and beat stone into setting bed with a rubber headed mallet or wooden block to ensure 100 percent contact between back of stone and setting material. Take care to maintain accurate surface, joint alignment, and spacing. Do not realign stone after bed material has taken initial set.

B. Terminate the stone flooring neatly at obstructions, edges, and corners, without disruption

of pattern or joint alignment. Apply setting material only on such area as can be immediately covered by stone flooring within the working life of the setting material. Remove setting material that dries or begins to set before stone is installed. Thoroughly beat stone into setting material to obtain 100% contact and permanent bond.

3.06 STONE FLOOR JOINTS

A. Joint widths to be a maximum of 1/4" wide and consistent throughout the project.

B. Control and Expansion Joints: Form control joints where indicated and where flooring intersects with vertical surfaces. Make expansion Joints the same width as joints the same width as joint in substrate, but not less than the typical paver joint width.

C. Grouting of Joints: After setting, rake joints and completely fill joints solid with specified grout, free from voids or pits. Tool grout flush with top surface of stone. Promptly remove excess and spillage from stone faces to prevent staining or defacement. Cover areas to provide proper moist curing.

3.07 INSTALLATION TOLERANCES

A. Variation in Surface Plane of Flooring: Do not exceed 1/8 inch in 10 feet from level or slope indicated when tested with a 10-foot straight edge. Do not exceed ± 1/32” joint width variation at any location and 1/16” in 3’ run variation in alignment of joints.

3.08 ADJUSTING

A. Remove stone flooring with the following defects:

1. Broken, chipped, stained, or otherwise damaged stones.
2. Defective joints.
3. Stones and joints not matching approved samples and field-constructed mockups.
4. Stone flooring not complying with requirements indicated.

B. Replace damaged stone flooring with new units to match approved samples and field-constructed mockups without evidence of replacement.

3.10 CLEANING

A. Upon completion of the Work, remove unused materials, debris, containers and equipment from the project site.

B. Clean stone floors and finishes after setting and grouting is complete. Remove excess mortar and sealant from surfaces as the work progresses and before it hardens on the surface. Clean the stone by washing with water and bristle brushes or approved cleaner according to manufacturer's recommendations. Remove stains, dirt and other discolorations. Use procedures specified by stone fabricator for type of application. Do not use acids or wire brushes.

3.11 SEALER

A. Apply sealer to cleaned stone flooring according to sealer manufacturer's printed instructions.

3.12 PROTECTION

A. Prohibit traffic from installed stone for a minimum of 72 hours.

B. Protect set and grouted stone floor during construction with non-staining kraft paper. Where adjoining areas require construction work access, cover stone flooring with a minimum of 3/4-inch untreated plywood over Kraft paper.

C. Before inspection for Substantial Completion, remove protective covering and clean surfaces using procedures, products, and materials specified by the stone producer.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of STONE FLOORING AND TRIM shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of STONE FLOORING AND TRIM shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000.

END OF SECTION

SECTION 09 65 13
RESILIENT WALL BASE AND ACCESSORIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and other specification sections apply to this section.

1.02 SUMMARY

A. Section includes: Vinyl wall base and accessories as indicated on the drawings and asspecified including adhesive and accessories.

B. Related Sections include the following:

1. Division 09 Section “Resilient Floor Tile” for resilient floor tile.

1.03 SUBMITTALS

A. Product Data: Submit data for each type of product specified including base, preformedcorners, adhesive and accessories.

B. Installation Instructions and Recommendations: For all materials.

C. Samples: Samples consisting of actual wall base showing height of wall base, base type, base style and showing full range of colors and patterns available for each type of resilient wall baseindicated.

D. Maintenance Data: Submit maintenance data for resilient wall base, to include in Operating and Maintenance Manual.

E. Qualification Data: For qualified installer.

F. Warranty: Copy of warranty covering materials and installation for Authority’s review andapproval.

1.04 QUALITY ASSURANCE

A. Single-Source Responsibility for Resilient Wall Base: Obtain each size, type and color of wall base including preformed corners from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.

B. Installer Qualifications: A qualified installer who employs workers for this Project who arecompetent in techniques required by manufacturer for floor tile installation indicated.

1. Engage an installer who employs workers for this Project who are trained or certified bymanufacturer for installation techniques required.

C. Fire Performance Characteristics: Provide resilient floor tile with the following fire performance characteristics as determined by testing products per ASTM test method indicated below by ULor another testing and inspecting agency acceptable to authorities having jurisdiction.

1. Critical Radiant Flux: 0.45 watts per sq cm or more per ASTM E 648.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver resilient products and installation materials to Project site in original manufacturer's unopened cartons and containers each bearing names of product and manufacturer, Projectidentification, and shipping and handling instructions.

B. Store resilient products and installation materials in dry spaces protected from the weather withambient temperatures maintained between 50 deg F and 90 deg F.

C. Store resilient base on flat surfaces. Move resilient products and installation materials intospaces where they will be installed at least 48 hours in advance of installation.

1.06 PROJECT CONDITIONS

A. Maintain a minimum temperature of 70 deg F in spaces to receive wall base for at least 48 hours prior to installation, during installation, and for not less than 48 hours after installation.After this period, maintain a temperature of not less than 55 deg F.

B. Install wall base after other finishing operations, including painting, have been completed.

1.07 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packagedwith protective covering for storage and identified with labels describing contents.

1. Furnish not less than 10 linear feet for every 250 linear feet or fraction thereof of eachtype, color, style and size of resilient wall base.
2. All whole units of all leftover material.

1.08 WARRANTY

A. All materials and workmanship shall be warrantied for a period of one year after date of substantial completion. Any resilient base that becomes discolored shall be replaced at no cost to the Authority. Any wall base that becomes dislodged from the substrate must be re-installed or replaced at no cost to the Authority and to the satisfaction of the Authority.

PART 2 - PRODUCTS

2.01 RESILIENT BASE

A. Resilient Base Standard: ASTM F 1861. Vinyl base; of solid, homogeneous construction; withrequirements specified.

1. Style: Cove base with shoe or straight.
2. Surface: Smooth.
3. Thickness: 0.125 inch.
4. Height: 2 ½ inches or 4 inches as indicated on the drawings or as selected by theAuthority.
5. Colors and Patterns: As selected by the Authority from manufacturer's full range ofcolors and patterns produced for the wall base.
6. Lengths: 48 inches.
7. Outside Corners: Preformed or job formed as indicated on the drawings or as selected bythe Authority.
8. Inside Corners: Preformed or job formed as indicated on the drawings or as selected bythe Authority.
9. Finish: Satin, Matte or Low Luster as indicated on the drawings or as selected by theAuthority.
10. Manufacturers:

    a. Armstrong –Standard Excelon, Imperial Texture
    b. Burke Mercer Flooring Products; Division of Burke Industries, Inc.
    c. Johnsonite.
    d. Roppe Corporation, USA.
    e. Approved Equal.

2.02 INSTALLATION MATERIALS

A. Adhesives: Water-resistant type recommended by tile manufacturer to suit resilient floor tileproducts and substrate conditions indicated.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas where installation of base will occur, with Installer present, to verify that substrates and conditions are satisfactory for tile installation and comply with tile manufacturer'srequirements and those specified in this Section.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other sections of the specifications and that substrates are free of cracks, ridges, depressions,scale and foreign deposits that might interfere with adhesion of floor tile.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Prepare substrates according to manufacturer’s written instructions to ensure adhesion ofresilient products.

B. Fill cracks, holes and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

C. Do not install floor tiles until they are at the same temperature as space where they are to beinstalled.

1. Move resilient products and installation materials into spaces where they will be installedat least 48 hours in advance of installation.

D. Sweep and vacuum clean substrates and areas where resilient products are to be installedimmediately before installation. Remove dust and dirt.

E. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.03 RESILIENT BASE INSTALLATION

A. Comply with tile manufacturer's installation directions and other requirements indicated that areapplicable to each type of tile installation included in the Project.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces and otherpermanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practicable without gaps at seams and with tops ofadjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base incontinuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilientbase with manufacturer’s recommended adhesive filler material.

G. Preformed Corners: Install preformed corners before installing straight pieces.

H. Job-Formed Corners:

1. Outside Corners: Use straight pieces of maximum lengths possible. Form withoutproducing discoloration (whitening) at bends.
2. Inside Corners: Use straight pieces of maximum lengths possible.

3.04 CLEANING AND PROTECTION

A. Comply with manufacturer’s written instructions for cleaning and protection of resilient products.

B. Perform the following operations immediately after completing tile installation:

1. Remove visible adhesive and other surface blemishes using cleaner recommended bymanufacturer from exposed surfaces.
2. Sweep or vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

C. Protect resilient products from mars, marks, indentations, and other damage from constructionoperations and placement of equipment and fixtures during remainder of construction period.

1. Cover resilient products until Substantial Completion.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 09 65 130, Resilient Wall Base and Accessories shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 09 65 130, Resilient Wall Base and Accessories shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 09 67 23
EPOXY RESINOUS FLOORING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Book 1 Terms and Conditions for Construction, Book 2 Instructions and Execution Documents, Additional Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes resinous flooring systems as shown on the drawings and in the schedules.

B. Related Requirements:

1. Section 09 96 00, High – Performance Coating for special-usecoatings.
2. Section 09 90 10, Cleaning of Existing Surfaces (No Abatement).
3. Section 09 90 50, Painting Communication Rm and Electrical Rm.
4. Section 09 91 00, Interior Painting.
5. Division 03, Concrete.

1.03 SYSTEM DESCRIPTION

A. The work shall consist of preparation of the substrate, the furnishing and application of an epoxy based multi roller applied flooring system with flintshot aggregate and urethane topcoat. The system shall have the color and texture as specified by the Owner with a nominal thickness of 1/8 inch. It shall be applied to the prepared area(s) as defined in the plans strictly in accordance with the Manufacturer's recommendations.

B. Cove base (if required) to be applied where noted on plans and per manufacturers standard details unless otherwise noted.

1.04 SUBMITTALS

A. Product Data: For each type of product. Include manufacturer's technical data, application instructions, and recommendations for each resinous flooring component required.

B. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.

C. Material Certificates: For each resinous flooring component, from manufacturer.

D. Material Test Reports: For each resinous flooring system, by a qualified testing agency.

E. Material certificates signed by manufacturer certifying that the resinous flooring

complies with requirement specified herein.

1.05 CLOSEOUT SUBMITTALS

A. Maintenance Data: For resinous flooring to include in maintenance manuals.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer or applicator who has specialized in installing resinous flooring, types similar to that required for this Project.

B. The Applicator shall have been approved by the flooring system manufacturer in all phases of surface preparation and application of the product specified.

C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Apply full-thickness mockups on 60-inch- square floor area selected by Commissioner.

a. Include 60-inch length of integral cove base with inside corner.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Commissioner specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

D. Samples:

1. Submit paint colors for approval by the Commissioner.

1.07 DELIVERY, STORAGE AND HANDLING

A. Packing and Shipping

1. All components of the system shall be delivered to the site in the Manufacturer's packaging, clearly identified with the product type and batch number.
2. The Applicator shall be provided with a storage area for all components. The area shall be between 60 F and 90 F, dry, out of direct sunlight and in accordance with the Manufacturer's recommendations and relevant health and safety regulations.
3. Copies of Material Safety Data Sheets (MSDS) for all components shall be kept on site for review by the Engineer or other personnel.

1.08 FIELD CONDITIONS

A. Site Requirements

1. Application may proceed while air, material and substrate temperatures are between 60 F and 90 F providing the substrate temperature is above the dew point. Outside of this range, the Manufacturer shall be consulted.
2. The relative humidity in the specific location of the application shall be less than

85% and the surface temperature shall be at least 5 F above the dew point.

3. The Applicator shall ensure that adequate ventilation is available for the work area.
4. The Applicator shall be supplied with adequate lighting equal to the final lighting level during the preparation and installation of the system.

B. Conditions of new concrete to be coated with epoxy material.

1. Concrete shall be moisture cured for a minimum of 7 days and have fully cured a minimum of twenty eight days in accordance with ACI-308 prior to the application of the coating system pending moisture tests.
2. Concrete shall have a flat rubbed finish, float or light steel trowel finish (ahard steel trowel finish is neither necessary or desirable).
3. Sealers and curing agents should not to be used.
4. Concrete surfaces on grade shall have been constructed with a vapor barrier to protect against the effects of vapor transmission and possible delaminationof the system.

C. Safety Requirements

1. All open flames and spark-producing equipment shall be removed from thework area prior to commencement of application.
2. "No Smoking" signs shall be posted at the entrances to the work area.
3. Non-related personnel in the work area shall be kept to a minimum.

PART 2 – PRODUCTS

2.01 EPOXY-BASED SEAMLESS FLOORING SYSTEM RESILIENT BASE

A. System Materials:

1. Primer.
2. Broadcast and Grout Coat.
3. Aggregate.
4. Topcoat.
5. Patch Materials

B. Manufacturers: Subject to compliance with requirements, products that maybe incorporated in the Work include, but are not limited to the following:

1. Dur-A-Flex,
2. Dex-O-Tex
3. Florock Polymer Flooring

2.02 PROPERTIES

A. Physical Properties: Provide resinous flooring system that meets or exceeds the listed minimum physical property requirements when tested according to the referenced standard test method:

B. Primer:

1.	Percent Solids	56 %
2.	VOC	2 g/L
3.	Bond Strength to Concrete ASTM D 4541	550 psi, substrates fails
4.	Hardness, ASTM D 3363	3H
5.	Elongation, ASTM D 2370	9 %
6.	Flexibility (1/4: Cylindrical mandrel) ASTM D 1737	Pass
7.	Impact Resistance, MIL D-2794	>160
8.	Abrasion Resistance ASTM D 4060, CS 17 wheel, 1,000 g Load	30 mg loss

C. Broadcast and Grout Coat:

1.	VOC	7.9 g/L
2.	Compressive Strength, ASTM D 695	17,500 psi
3.	Tensile Strength, ASTM D 638	4,000 psi
4.	Flexural Strength, ASTM D 7906	,250 psi
5.	Flexural Modulus of Elasticity, ASTM D 790	6.2 x 105
6.	Abrasion Resistance, ASTM D 4060 C-10 Wheel, 1,000 gm load, 1,000 cycles	24 mg loss
7.	Flame Spread/NFPA-101, ASTM E 84	Class A
8.	Flammability, ASTM D 635	Self Extinguishing
9.	Indentation, MIL D-3134	0.025 Max
10.	Impact Resistance MIL D-3134	Pass
11.	Water Absorption. MIL D-24613	0.04%

D. Topcoat:

1.	Percent Solids	95 %
2.	VOC	0 g/L
3.	Tensile Strength, ASTM D 2370	7,000 psi
4.	Adhesion, ASTM 4541	Substrate Failure
5.	Hardness, ASTM D 3363	4H
6.	Abrasion Resistance, ASTM D4060	Gloss Satin
	CS 17 wheel (1,000 g load) 1,000 cycles	4 - 8 mg loss with grit 10 - 12 mg loss without grit
7.	Pot Life, 70 F, 50% RH	2 Hours
8.	Full Chemical Resistance	7 days

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas and conditions, with Applicator present, for compliance with requirements for maximum moisture content, installation tolerances and other conditions affecting flooring performance.

B. Verify that substrates and conditions are satisfactory for flooring installation and comply with requirements specified.

3.02 PREPARATION

A. General:

1. New and existing concrete surfaces shall be free of oil, grease, curing compounds, loose particles, moss, algae growth, laitance, friable matter, dirt, and bituminous products.
2. Moisture Testing: Perform tests recommended by manufacturer and as follows.

    a. Perform relative humidity test using is situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75% relative humidity level measurement.
    b. If the relative humidity exceeds 75% then Primer moisture mitigation system must be installed prior to resinous flooring installation. Slab-on grade substrates without a vapor barrier may also require the moisture mitigation system.

3. There shall be no visible moisture present on the surface at the time of application of the system. Compressed oil-free air and/or a light passing of a propane torch may be used to dry the substrate.
4. Mechanical surface preparation

    a. Shot blast all surfaces to receive flooring system with a mobile steel shot, dust recycling machine (Blastrac or equal). All surface and embedded accumulations of paint, toppings hardened concrete layers, laitance, power trowel finishes and other similar surface characteristics shall be completely removed leaving a bare concrete surface having a minimum profile of CSP 4-5 as described by the International Concrete Repair Institute.
    b. Floor areas inaccessible to the mobile blast machines shall be mechanically abraded to the same degree of cleanliness, soundness and profile using diamond grinders, needle guns, bush hammers, or other suitable equipment.
    c. Where the perimeter of the substrate to be coated is not adjacent to a wall or curb, a minimum 1/4 inch key cut shall be made to properly seat the system, providing a smooth transition between areas. The detail cut shall also apply to drain perimeters and expansion joint edges.
    d. Cracks and joints (non-moving) greater than 1/8 inch wide are to be chiseled or chipped-out and repaired per manufacturer's recommendations.

5. At spalled or worn areas, mechanically remove loose or delaminated concrete to a sound concrete and patch per manufactures recommendations.

3.03 APPLICATION

A. General

1. The system shall be applied in seven distinct steps as listed below:

    a. Substrate preparation
    b. Priming
    c. First broadcast coat application with first aggregate broadcast
    d. Second broadcast coat with second aggregate broadcast
    e. Grout coat application, sand floor (if required)

f. Topcoat application, urethane

2. Immediately prior to the application of any component of the system, the surface shall be dry and any remaining dust or loose particles shall be removed using a vacuum or clean, dry, oil-free compressed air.
3. The handling, mixing and addition of components shall be performed in a safe manner to achieve the desired results in accordance with the Manufacturer's recommendations.
4. The system shall follow the contour of the substrate unless pitching or other leveling work has been specified.
5. A neat finish with well-defined boundaries and straight edges shall be provided by the Applicator.

B. Primer:

1. The primer shall consist of a liquid resin and hardener that is mixed at the ratio of 1 parts resin to 4 part hardener per the manufacturer's instructions.
2. The primer shall be applied by flat squeegee and back rolled at the rate of 200-250 sf/gal to yield a dry film thickness of 4 mils.

C. Broadcast Coat:

1. The broadcast coat shall be applied as a double broadcast system.
2. The broadcast coat shall be comprised of two components, a resin, and hardener as supplied by the Manufacturer and mixed in the ratio of 2 parts resin to 1 part hardener.
3. The resin shall be added to the hardener and thoroughly mixed by suitably approved mechanical means.
4. The broadcast coat shall be applied over horizontal surfaces using "v" notched squeegee and back rolled at the rate of 90-100 sf/gal.
5. Quartz aggregate shall be broadcast to excess into the wet material at the rate of 0.5 lbs/sf.
6. Allow material to fully cure. Vacuum, sweep and/or blow to remove all loose aggregate.
7. Apply a second coat of resin with a coverage rate of 90-100 sf/gal and broadcast aggregate to excess at the rate of 0.5 lbs/sf.
8. Allow material to fully cure. Vacuum, sweep and/or blow to remove all loose aggregate.

D. Grout Coat

1. The grout coat shall be comprised of liquid components, combined at a ratio of 2 parts resin to 1 part hardener by volume and shall be thoroughly blended by mechanical means such as a high speed paddle mixer.
2. The grout coat shall be squeegee applied with a coverage rate of 90 sf/gal (flintshot).
3. The grout coat will be back rolled and cross rolled to provide a uniform texture and finish.

E. Topcoat (Urethane)

1. The topcoat of shall be roller applied at the rate of 500 sf/gal to yield a dry film thickness of 3 mils.
2. The topcoat shall be comprised of a liquid resin, hardener and grit that is mixed per the manufacturer's instructions.

3. The finished floor will have a nominal thickness of 1/8 inch.

F. Floor Finish: The Floor Finish shall be slip-resistant, firm and stable. The friction coefficient of the surface shall be no less than 0.8 wet or dry, when measured by static means using U.L. Friction Test Method/Card Data Method No. U.L 239. With final approval by Commissioner selected from samples (or on-site mock up) submitted by the selected installation contractor / installer.

3.04 FIELD QUALITY CONTROL

A. Tests, Inspection:

1. The following tests shall be conducted by the Applicator:

a. Temperature

1) Air, substrate temperatures and, if applicable, dew point.

b. Coverage Rates

1) Rates for all layers shall be monitored by checking quantity of materialused against the area covered.

3.05 CLEANING AND PROTECTION

A. Cure flooring material in compliance with manufacturer’s directions, taking care to prevent their contamination during stages of application and prior to completion of the curing process.

B. Remove masking. Perform detail cleaning at floor termination, to leave cleanable surface for subsequent work of other sections.

C. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

D. After completing application, clean spattered surfaces. Do not scratch or damage adjacent finished surfaces.

E. Protect work of other trades against damage. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Commissioner, and leave in an undamaged condition.

3.06 COLOR SCHEDULE

A. **EPF-1:** Match Dex-O-Tex solid color (#411 Silver Bullet), or as selected byCommissioner from manufacturer's full range

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 09 67 23, Resinous Flooring shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 09 67 23, Resinous Flooring shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 09 90 00

PAINTING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions and Division 01 Specification sections, apply to this section.

1.02 SUMMARY

A. This Section includes surface preparation, painting, and finishing of exposed new and existing interior and exterior items and surfaces. Surface preparation, priming, and finish coats specified in this section are in addition to galvanizing, shop priming and surface treatment specified under other sections.

1. For surface preparation of previously painted surfaces, if existing lead based paint is present or suspected to be encountered, notify the Authority for direction. The existing lead paint must be abated according to mandated procedures. See Section 02 72 00, “Lead Abatement” and/or Section 09 90 10, “Cleaning and Painting of Existing Surfaces”.

2. Exception: The coating and painting requirements of the structural steel of the canopy, bridge and other structures, which are designated as architecturally exposed structural steel, are defined in specification Section 05 12 50, “Architecturally Exposed Structural Steel”. Refer to the Drawings for definition of the scope of the architecturally exposed structural steel for the canopy, bridge, and other structural elements.

B. See drawings or otherwise verify which galvanized steel items are to have their galvanized finish left exposed and which items are to be painted after galvanized.

C. Paint exposed surfaces whether or not colors are designated in "schedules," except where a surface or material is specifically indicated not to be painted or is to remain natural. Where an item or surface is not specifically mentioned, paint the same as similar adjacent materials or surfaces. If color or finish is not designated, the Authority will select from standard colorsor finishes available.

D. Painting includes field painting exposed bare and covered pipes and ducts (including color coding), exposed conduit, hangers, exposed steel and iron work, and primed metal surfacesof mechanical and electrical equipment.

E. Painting is not required on prefinished items, finished metal surfaces, concealed surfaces, operating parts, and labels. Unless noted otherwise, provide finish coats of paint over galvanized and primed surfaces.

1. Prefinished items not to be painted include the following factory-finished components:

a. Prefinished roofing.
b. Finished mechanical and electrical equipment.
c. Light fixtures.

2. Concealed surfaces not to be painted include wall or ceiling surfaces in the following generally inaccessible areas:

a. Pipe spaces.

3. Finished metal surfaces not to be painted include:

   a. Anodized aluminum.
   b. Stainless steel.
   c. Chromium plate.

4. Operating parts not to be painted include moving parts of operating equipment.
5. Labels: Do not paint over Underwriter's Laboratories, Factory Mutual or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

F. Related Sections: The following sections contain requirements that relate to this section:

1. Division 05 Section “Historic Cast Iron Repair” for repair of existing historic surfaces.
2. Division 05 Section "Structural Steel" including shop priming steel.
3. Division 05 Section “Architecturally Exposed Structural Steel (AESS)" including fabricator finished steel.
4. Division 05 Section "Metal Fabrications" for shop priming ferrous metal.
5. Division 05 Section “Cleaning and Painting of Existing Surfaces” for cleaning, preparation and painting of existing surfaces.

1.03 DEFINITIONS

A. "Paint" includes coating systems materials, primers, emulsions, enamels, sealers and fillers, and other applied materials whether used as prime, intermediate, or finish coats.

1.04 SUBMITTALS

A. Product Data: Manufacturer's technical information, label analysis, and application instructions for each material proposed for use. List each material and cross-reference the specific coating and finish system and application. Identify each material by the manufacturer's catalog number and general classification.

B. Warranty: Provide a copy of the written warranty, in a form acceptable to the Authority, from the coating manufacturer, countersigned by the applicator, stating that the system provided is as specified and any defects due to materials and/or workmanship shall be repaired and/orreplaced at no cost to the Authority the specified time period.

C. The coating manufacturer shall submit certification that the products in a multi-layer coating system are of the same manufacturer, appropriate for the intended use, are compatible with each other and with project substrates, and are compatible with any existing coatings.

D. Color Samples: Submit sample paint drawdowns from the coating manufacturer in the specified color and sheen.

E. Samples for verification purposes. Provide samples of each color and material to be applied, with texture to simulate actual conditions, on representative samples of the actual substrate. Define each separate coat, including block fillers and primers. Use representative colors when preparing samples for review. Resubmit until required sheen, color, and texture areachieved.

1. Provide a list of material and application for each coat of each sample. Label eachsample as to location and application.

F. Provide certification that the installer(s) are approved by the manufacturer(s) for

installationof their products.

G. Installer shall provide approval of the preparation of the new or existing surfaces prior to installing the new primers and protective finishes.

H. Process Plan: Provide a detailed process plan for each material being coated explaining each step in the coating process including, but not limited to, the following:

1. Surface preparation and verification with the specification.
2. Primer application and verification with the specification.
3. Finish coat(s) application and verification with the specification.
4. How testing is incorporated into the above process plans.

1.05 QUALITY ASSURANCE

A. Single-Source Responsibility: Provide primers and undercoat paint produced by the samemanufacturer as the finish coats.

B. Coordination of Work: Review other sections in which primers are provided to ensure compatibility of the total systems for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers. Notify the Authorityof problems anticipated using the materials specified.

C. Material Quality: Provide the manufacturer's best quality trade sale paint material of the various coating types specified. Paint material containers not displaying manufacturer's product identification will not be acceptable.

1. Proprietary names used to designate colors or materials are not intended to imply that products named are required or to exclude equal products of other manufacturers.
2. Federal Specifications establish a minimum quality level for paint materials, except where other product identification is used. Provide written certification from the manufacturer that materials provided meet or exceed these criteria.
3. Products that comply with qualitative requirements of applicable Federal Specifications, yet differ in quantitative requirements, may be considered for use when acceptable to the Authority. Furnish material data and manufacturer's certificate of performance to Authority for proposed substitutions.

D. Certification of Contractor: Contractor performing the work shall be approved by the paint manufacturer as a trained and certified installer of the manufacturer’s paint products.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the job site in the manufacturer's original, unopened packages andcontainers bearing manufacturer's name and label and the following information:

1. Product name or title of material.
2. Product description (generic classification or binder type).
3. Federal Specification number, if applicable.
4. Manufacturer's stock number and date of manufacture.
5. Contents by volume, for pigment and vehicle constituents.
6. Thinning instructions.
7. Application instructions.
8. Color name and number.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg. F. Maintain containers used in storage in a

clean condition, free of foreign materials and residue. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing,and application.

1.07 JOB CONDITIONS

A. Apply water-based paints only when the temperature of surfaces to be painted andsurrounding air temperatures are between 50 deg. F and 90 deg. F.

B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 deg. F and 95 deg. F.

C. Do not apply paint in snow, rain, fog, or mist, when the relative humidity exceeds 85 percent, at temperatures less than 5 deg. F above the dew point, or to damp or wet surfaces.

D. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by the manufacturer duringapplication and drying periods.

1.08 WARRANTY

A. All painting work and the painting system shall be warranted by both the manufacturer(s) of all the materials and the installer(s) of all the materials to not fail in adhesion, color retention, gloss retention, chalking, cracking, fading, peeling, blistering, rust prevention, lack of protection of the surface or other malfunction as determined herein. The warranty shall include a statement that the substrate has been examined by the parties involved and that it was in proper condition or prepared properly for application of the specified paint system. The warranty shall also include a statement indicating that the specified paint system is compatible with the substrate, the various coatings specified, the conditions under which the system will be applied and the conditions under which the system will be used to protect thesubstrate.

1. For previously painted substrates, the warranty for the new paint system shall bethree (3) years from the date of acceptance by the Authority.
2. For new substrates, the warranty for the paint system shall be for ten (10) years fromthe date of acceptance by the Authority.

B. Painting systems that fail within the specified warranty periods shall be replaced by preparing the surfaces and re-applying according to manufacturer’s directions and the Authority’s approval. The extent of re-application shall be determined by the Authority. The work shallbe done at no cost to the Authority for materials or labor.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. General Coatings: Subject to compliance with requirements, manufacturers offering products may be incorporated in the work include but are not limited to the following:

1. PPG Industries, Pittsburgh Paints (Pittsburgh).
2. The Sherwin-Williams Company (S-W).
3. Carboline Company (Carbo)
4. International Paint/Devoe (IP)

B. For Structural Steel Coatings:

1. Carboline
2. International Paint
3. PPG Industries, Pittsburgh Paints
4. The Sherwin-Williams Company

2.02 PRIMERS (OTHER THAN FOR STRUCTURAL STEEL)

A. Interior Flat Latex-Based Paint: Flat latex paint used as a primer over concrete and masonryunder alkyd flat and semi-gloss enamel:

1.	Pittsburgh:	Seal Grip Acrylic Universal Primer 17-921
2.	S-W:	Pro-Mar 200 Latex Flat B30W200.
3.	Carboline:	Sanitile 120 Primer Sealer

B. Interior Flat Latex-Based Paint: Flat latex paint used as a primer on cement plaster under flat,semi-gloss, and full-gloss alkyd finishes:

1.	Pittsburgh:	Perma-Crete Alkali Resistant Primer 4-603
2.	S-W:	Wall and Wood Primer B49W2.
3.	Carboline:	Sanitile 120 Primer Sealer

C. Synthetic, Rust-Inhibiting Primer: Quick-drying, rust-inhibiting primer for priming ferrous metal on the exterior under full-gloss and flat alkyd enamel and on the interior under flat latex paint or odorless alkyd semi-gloss or alkyd gloss enamels:

1.	Pittsburgh:	6-208 Red Inhibitive Metal Primer.
2.	S-W:	Kem Kromik Universal Metal Primer B50Z Series.
3.	Carboline:	# 150 or # GP 5 UP Rust proof Primers
4.	International Paint:	Devprime 1409

D. Galvanized Metal Primer: Primer used to prime interior and exterior zinc-coated (galvanized)metal surfaces:

1.	Pittsburgh:	Pitt-Tech Plus Acrylic Primer 90-912
2.	S-W:	Pro Industrial Pro Cryl Universal Primer.
3.	Carboline:	Galoseal Industrial Wash Primer
4.	International Paint:	Devprime 1409

E. High-Performance Latex Block Filler: Heavy-duty latex block fillers used for filling open textured interior concrete masonry block before application of top coats:

1.	Carboline:	Sanitile 120 Filler Sealer
2.	Pittsburgh:	6-7 Latex Masonry Block Filler.
3.	S-W:	Heavy-Duty Block Filler B42W46.
4.	International Paint:	Tru-Glaze WB 4015

2.03 UNDERCOAT MATERIALS (OTHER THAN FOR STRUCTURAL STEEL)

A. Interior Enamel Undercoat: Ready-mixed enamel for use on the interior as an undercoat overa primer on concrete or masonry under odorless semi-gloss enamel:

1.	Pittsburgh:	Seal Grip Acrylic Primer 17-921
2.	S-W:	Prep Rite 200 Latex Wall Primer B28W200.
3.	Carboline:	Sanitile 120 Primer Sealer
4.	International Paint:	Devprime 1409

B. Interior Enamel Undercoat: Ready-mixed enamel for use as an undercoat over a primer oncement plaster under full gloss or odorless semi gloss enamels.

1.	Pittsburgh:	Seal Grip Acrilic Primer 17-921
2.	S-W:	Wall and Wood Primer B49W2.
3.	Carboline:	Sanitile 120 Primer Sealer
4.	International Paint:	Devprime 1409

C. Interior Enamel Undercoat: Ready-mixed enamel for use as an undercoat over a primer on ferrous or zinc-coated metal under interior alkyd semi-gloss enamel or full-gloss alkyd enamel:

1.	Pittsburgh:	Seal Grip Acrylic Primer 17-921
2.	S-W:	Pro-Mar 200 Alkyd Semi-Gloss B34 Series.
3.	Carboline:	3358 Acrylic Primer
4.	International Paint:	Devprime 1409

2.04 EXTERIOR FINISH PAINT MATERIAL (OTHER THAN FOR STRUCTURAL STEEL)

A. Alkyd Gloss Enamel: Weather-resistant high-gloss enamel for use over primed ferrous metal surfaces:

1.	Pittsburgh:	DevGuard Alkyd Gloss 4309
2.	S-W:	Industrial Enamel VOC B54Z Series.
3.	Carboline:	Carbocoat 30 or GP 14 H/S
4.	International Paint:	Devlac 1432

B. Alkyd Gloss Enamel: Weather-resistant high-gloss enamel for use over primed, zinc-coated(galvanized) metal surfaces and aluminum:

1.	Pittsburgh:	DevGuard Alkyd Gloss 4309
2.	S-W:	Industrial Enamel VOC B54Z Series.
3.	Carboline:	Carbocoat 30 or GP 14 H/S
4.	International Paint:	Devlac 1432

2.05 INTERIOR FINISH PAINT MATERIAL (OTHER THAN FOR STRUCTURAL STEEL)

A. Interior Semi-gloss Odorless Alkyd Enamel: Low-odor, semi-gloss, alkyd enamel for use over a primer and undercoat on concrete, masonry (including concrete masonry block), cement plaster, gypsum board, and both ferrous and zinc-coated (galvanized) metal surfaces.

1.	Pittsburgh:	DevGuard S/G 4306
2.	S-W:	Pro-Mar 200 Alkyd Semi-Gloss B34 Series.
3.	Carboline:	3359 Acrylic Enamel

B. Latex-based, Interior Flat Paint: Ready-mixed, latex based paint for use over plaster and gypsum board surfaces.

1.	Pittsburgh:	Speedhide Zero VOC Latex Flat 6-4110 XI
2.	S-W:	Pro-Mar 200 Latex Flat B30W200 Series.
3.	Carboline:	3359 Acrylic Enamel

C. Exterior alkyd gloss enamel for use over above specified primer and undercoat on interiorplaster or gypsum board surfaces, ferrous and zinc-coated metal surfaces:

1.	Pittsburgh:	Speedhide Zero VOC S/G Latex 6-4510 XI
2.	S-W:	Industrial Enamel VOC B54Z Series.
3.	Carboline	GP 14 H/S
4.	International Paint	Devlac 1432

2.06 COATINGS FOR STRUCTURAL STEEL (OTHER THAN AESS)

A. The selected coating systems shall be suitable for long term protection of structural steel.

B. Approved Manufacturers for Coatings for Structural Steel:

1. Carboline
2. International Paint
3. PPG Industries
4. Sherwin Williams

C. New Steel - (Protective Coat):

1.	Carboline:	Carbomastic 15/ Carbomastic 615 Al (Low Temp)
2.	International Paint:	Interseal 670HS
3.	PPG:	Amerlock 2 Aluminum & Amerlock 400 Aluminum
4.	Sherwin Williams:	Macropoxy 646-100 FC Epoxy

D. New Steel - (Finish Coat Aliphatic Urethane):

1.	Carboline:	Carbothane 133 H/B Urethane Finish
2.	International Paint:	Interthane 990HS
3.	PPG:	Amercoat 450H
4.	Sherwin Williams:	Waterbased Acrolon 100 Polyurethane

E. Existing Steel - Previously painted metal surfaces cleaned as approved by the Authority and coated as follows: Spot prime, full protective coat, and full finish coat.

F. Existing Steel - Full Protective Coat:

1.	Carboline:	Carbomastic 15/ Carbomastic 615 Al (Low Temp)
2.	International Paint:	Interseal 670HS
3.	PPG:	Amerlock 2 Aluminum & Amerlock 400 Aluminum
4.	Sherwin Williams:	Macropoxy 646-100 FC Epoxy

G. Existing Steel - Full Finish Coat:

1.	Carboline:	Carbothane 133 H/B Urethane Finish
2.	International Paint:	Interthane 990HS
3.	PPG:	Amercoat 450H
4.	Sherwin Williams:	Waterbased Acrolon 100 Polyurethane

2.07 PROTECTIVE COAT PAINT FOR STRUCTURAL STEEL

A. Protective Coat; 3-5 mils dry film thickness over galvanized steel and 7-11 mils dry film thickness over non-galvanized steel. Self-priming, two-component, modified epoxy mastic, aluminum pigment. The epoxy mastic shall be a one (1) coat, high-build complete protective coating system certified by the manufacturer as being appropriate for use over marginally prepared rusted, pitted and coated steel surfaces. It shall be supplied as two- part material with a one-to-one volume mix ratio, and shall be well ground and not caked, skinned or substantially settled in the container.

B. Composition:

1. Pigment: The pigment shall be leafed aluminum. Secondary pigments shall be rust-inhibiting and adhesion-promoting types.
2. Vehicle: The vehicle shall be of the epoxy-type modified with a bitumen like substance. The curing agent shall have suitable insensitivity to moisture to

allow trouble-free application during normal humidity conditions.

3. The epoxy mastic shall contain 90% minimum solids by volume, tested according to ASTM D3960 modified to a dry time of seventy-two (72) hours at 100 degrees Frather than three (3) hours at 105 degrees F.
4. The shelf life of the epoxy mastic components shall be no shorter than (12) months,so that no caking of fillers, skins or gelation occurs.
5. Viscosity: Component A and Component B shall have mixed viscosity of 110-140KU, at 75 degrees F plus or minus 2 degrees F.

C. Properties of Mixed Paint:

1. The epoxy mastic shall air cure at temperatures of 75 degrees F or above to a hard and tough film within five (5) days by evaporation of solvent and chemical reaction. At 75 degrees F, within twenty-four (24) hours, it shall be dry to the touch and ableto receive foot traffic within forty-eight (48) hours.
2. The pot life of the epoxy mastic shall not be shorter than four (4 hours at 75 degreesF, un-thinned.
3. The mixed paint weight per gallon shall be 10.2 pounds minimum at 75 degrees FFahrenheit plus or minus 2 degrees F.
4. Film Build: The catalyzed mixture, thinned 10% by volume with the manufacturer's specified thinner, shall be spray applied at 10 mils wet film thickness without exhibiting runs or sags.
5. The average dry film thickness of the one-coat finish system shall be 7 to 11 mils.
6. The epoxy mastic shall not be applied when the surrounding air temperature is below 50 degrees F and shall not be applied when the temperature is expected to drop to40 degrees F or below before the coating has cured.

D. Test Requirements: The epoxy-mastic manufacturer shall provide test data acceptable to the Engineer demonstrating that the epoxy-mastic coating system has been subjected to, andhas successfully performed in testing equal in severity to the following tests.

1. Test Panel Preparation: The test panels shall be steel, having dimensions of 2" x 5" x 1/8" or as otherwise required by ASTM specification. The panels shall have coating surfaces prepared by sandblasting to a white metal in accordance with SSPC-SP-5-63 specification after which they shall be exposed to Midwest weather for thirty (30) days so that a uniform rusting occurs. They shall then be hand-cleaned with a wire brush in accordance with SSPC-SP-2-63 specification. Test panels shall then be coated and cured with epoxy mastic as follows: The epoxy-mastic shall be spray applied to the steel panels at 5 mils dry film thickness in one (1) coat. The coating shall be cured as specified by the manufacturer. Unless otherwise noted, panels shall then be scribed down to the substrate metal with an "X" of at least two.
   (2) inch legs prior to being subjected to resistance testing.
2. Flexibility Test: ASTM D 552. The panel shall be sandblasted in accordance with SSPC-SP5-63 Specification.
3. Temperature Cycling Test: ASTM D 2246 (15 cycles).
4. Weathering Resistance Test: ASTM G 53 (1000 hour).

   a. The coated and scribed test panels shall then be exposed to ultra-violet and condensation exposure as outlined in the specification for the total exposure period.
   b. Upon examination after 1000 hours of exposure, the panels shall be unaffected except for discoloration of the epoxy-mastic coating. There shall be no blistering, softening or visible rusting on the coating beyond 1/16 ofan inch from the center of the scribe marks.

5. Fresh Water Resistance Test:

   a. The coated and scribed panels shall be immersed in fresh tap water at 75 degrees F plus or minus 5 degrees F.
   b. Upon examination after thirty (30) days immersion, the panels shall be unaffected except for discoloration of epoxy-mastic coating; there shall be no blistering, softening or visible rusting on the coating beyond 1/16 of aninch from the center of the scribe marks.

6. Salt Water Resistance Test:

   a. The coated and scribed panels shall be immersed in 5% sodium chloride solution at 75 degrees F plus or minus 5 degrees F for a period of 30 days.
   b. The panels shall be unaffected except for discoloration of the epoxy-mastic coating upon inspection after 7, 14 and 30 days. There shall be no blistering, softening or visible rusting on the coating beyond 1/16 of an inch from the center of the scribe marks. The sodium chloride solution shall be replenished with fresh solution after each examination.

7. Salt Fog Resistance Test:

   a. The coated and scribed panels shall be tested in a salt fog cabinet using 10% synthetic sea salt solution.
   b. After 1,000 hours of continuous exposure, the coating shall show no loss of bond, nor shall it show rusting or blistering beyond 1/16" from the center ofthe scribed marks.

8. Gloss Test:

   a. The standard for measuring gloss level is ASTM D523, “Standard Test Method for Secular Gloss” of 70 degrees and above.

E. Field History:

1. Documentation shall be provided verifying successful use of the epoxy mastic coating in the field. The coating should have been successfully used on at least 100 projects that required at least 100 gallons per project. The performance history must also be for a minimum of three (3) years in a similar environment as the intended use.

F. Packaging and Labeling:

1. The epoxy-mastic coating shall be packaged in two (2) containers, labeled Part A and Part B. The components shall be packaged in such proportions that the Part A when mixed with the Part B will yield ten (10) gallons of mixed paint. Each container shall bear a label on which shall be clearly shown the manufacturer or brand name of the paint, the batch or lot number and the date of manufacture.
2. The label on the vehicle container shall also include complete instructions for the use of this paint. The container shall be coated if necessary to prevent attack by the paintcomponents.

G. Protective coat and top coat material shall be made by the same manufacturer.

2.08 TOP COAT PAINT FOR STRUCTURAL STEEL (OTHER THAN AESS)

A. Top Coat; Aliphatic Acrylic Urethane, 2 mils minimum 5 mils maximum single coat dry film thickness, for ultraviolet protection and aesthetics. Finish colors for track structure (when not left galvanized), elevated structure from grade level to platform level, platform stringers, station structure, canopy, elevator towers, stairs, railings, and all miscellaneous steel shall match Federal Standard Color Numbers as indicated on the drawings or as directed by engineer. Sheen for all colors is "gloss".

B. Manufacturer: Protective coat and top coat material shall be made by the same manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions under which painting will be performed for compliance with requirements for application of paint. Do not begin paint application until unsatisfactory conditions have been corrected. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.

3.02 PREPARATION

A. General Procedures: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items in place that are not to be painted, or provide surface applied protection prior to surface preparation and painting. Remove these items if necessary for complete painting of the items and adjacent surfaces. Following completion of painting operations in each space or area, have items reinstalled by workers skilled in the trades involved. Clean surfaces before applying paint or surface treatments. Remove oil and grease prior to cleaning. Schedule cleaning and painting so that dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

B. Surface Preparation: General: Clean and prepare surfaces to be painted in accordance with the manufacturer's instructions for each particular substrate condition and as specified.

1. Provide barrier coats over incompatible primers. Notify the Authority in writing of problems anticipated with using the specified finish-coat material with substrates provided by others.
2. Previously Painted Surfaces: Scrape to remove existing flaking or loose paint. Fill in voids. Sand smooth. Removal of existing lead based paint requires containmentand proper disposal.
3. Cementitious Materials: Prepare concrete masonry block, and cement plaster surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.

    a. Use abrasive blast-cleaning methods if specified by the paint manufacturer.
    b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause blistering and burning of finish paint, correct this condition before application. Do not paint surfaces where moisture content exceeds that permitted in manufacturer'sprinted directions.

4. New Ferrous Metals Non-Galvanized: Clean non-galvanized ferrous metal

surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with specifications of the Steel Structures Painting Council. Pressure hose to rinse andallow to dry.

a. Blast steel surfaces clean as specified by the paint system manufacturer and in accordance with requirements of SSPC specification SSPC-SP 6.
b. Treat bare and sandblasted or pickled clean metal with metal treatment wash coat before priming.
c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents specified by the paint manufacturer, and touch up with the same primer as the shop coat.

5. Existing Ferrous Metals: Clean existing ferrous metal surfaces with Ultra High Pressure Water Wash SSPC-SP 12 with containment and disposal.

a. Cleaning shall leave the surface free of all visible oil, grease, dirt, dust, loose mil scale, loose rust, and loose paint. Mill scale, rust, and paint are considered adherent if they cannot be removed by lifting by a dull putty knifeor cracked off by impact by a hand chipping hammer.
b. The standards established by Visual Surface preparation definition WJ-1 and non-visual surface preparation definition SC-1 of SSPC-SP 12 shall besatisfied.
c. As part of surface preparation, deposits of oil, grease and foreign matter must be removed by ultrahigh-pressure water jetting, by steam cleaning with detergent, by methods in accordance with SSPC-SP 1 or by anothermethod approved by the Authority.
d. It is necessary to use an inhibitor that prevents rust forming after rinsing.

6. Galvanized Surfaces: Clean galvanized surfaces with non-petroleum based solvents so that the surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanicalmethods.
7. Repair of damaged galvanizing: The maximum area to be repaired is defined in accordance with ASTM A 123 Section 4.6 current edition. Minimize the area to berepaired in the field.
8. Repair areas damaged by welding, flame cutting or during handling, transport or erection, by one of the approved methods in accordance with ASTM A 780 whenever damage exceeds 3/16” in width. Minimum thickness requirements for the repair arethose described in ASTM A 123 Section 4.6 current edition.

a. Submit proposed galvanizing repair work, including locations, to the Authority for review and approval.

9. Preparing Hot Dip Galvanized Steel Surfaces for Painting:

a. All exposed galvanized steel items are to be finished with field applied protective and finish coats.
b. Zinc high spots should be removed by cleaning with hand or power tolls as described in SSPC Surface Preparation Specification 2 or 3. The zinc should be removed until it is level with the surrounding area, taking care that the base coating is not removed by the cleaning methods. After cleaning, inspect for conformance to the required zinc thickness. Repair all areas falling below required zinc thickness.

c. For surfaces that have been galvanized for at least 24 hours, clean surfaces with an alkaline solution to remove traces of oil, grease, or dirt. Solution can be applied through immersion in a tank filled with the solution, sprayed on, or brushed on with a soft bristle brush. Rinse thoroughly with water and allow to dry.

d. Surfaces may also be cleaned of oil and grease using cleaning solvents such as mineral spirits in SSPC Surface Preparation Specification 1. Wipe galvanized surfaces using rags or brushes. After cleaning, rinse with waterand allow to dry.

e. Hand or power tool cleaning may be used to clean light deposits of zinc reaction by-products as specified in SSPC Surface Preparation Specification 2 or 3.

10. Galvanized steel surfaces to be prepared per ASTM D6386 for painting.

11. All newly galvanized surfaces to be field painted shall be roughened by using oneof the following methods:

a. Abrasive sweep or brush blasting, taking care to not remove excess zinc layers. After abrasive blast cleaning, surfaces should be blown down withclean, compressed air.

b. Conversion-coating process with an acidic zinc phosphate solution containing oxidizing agents and other salts for accelerating the conversion action. After 3 to 6 minutes, wash with clean water and allow to dry.

c. Wash primer treatment consisting of a metal conditioner to neutralize surface oxides and hydroxides and to etch the surface.

d. Passivation/pretreatment process consisting of applying and acidic acrylic solution to the newly galvanized surface and then allowing it to dry, forminga thin film coating.

C. Materials Preparation: Carefully mix and prepare paint materials in accordance with manufacturer's directions.

1. Maintain containers used in mixing and application of paint in a clean condition, freeof foreign materials and residue.

2. Stir material before application to produce a mixture of uniform density; stir as required during application. Do not stir surface film into material. Remove film and,if necessary, strain material before using.

3. Use only thinners approved by the paint manufacturer, and only within specified limits.

D. Tinting: Tint each undercoat a lighter shade to facilitate identification of each coat where multiple coats of the same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat so that missed areas will be visually apparent.

3.03 APPLICATION - STEEL

A. General: For field applied coatings, the coatings shall be applied only when weather conditions and steel surface conditions comply with the coating manufacturer's specifications or as modified herein. The contractor shall take whatever steps are necessary to maintain controlled environment in order to ensure that pre-application, application and post application conditions are in accordance with these documents and the coating manufacturer's specifications. Coatings shall be applied at the specified spreading rates, but thickness shall not be less than the minimum dry film thickness specified. Should the spreading rate fail to produce the required thickness in one coat, additional coating shall beapplied until the minimum requirements are met.

B. Coatings shall be handled and applied in strict compliance with the manufacturer's specifications or as modified herein, including storage, mixing, environmental conditions, and additives for accelerated drying if necessary. All coating materials shall be delivered to the applicator in the manufacturer's original containers, unopened and with the label bearing the manufacturer's name, product identification and application instructions.

1. No coating work shall be conducted when the steel substrate surface temperatureis less than 5 degrees F above the dew point.
2. The protective coat shall not be applied when the surrounding air temperature is below 50 degrees F and shall not be applied when the temperature is expected to drop to 40 degrees F or below before the coating has cured unless approved otherwise by the manufacturer. The use of a special Part B for the epoxy may be required for the lower temperatures.

C. New Steel (Other than AESS):

1. Zinc Rich Primer: Two component solvent based inorganic zinc rich ethyl silicate primer.

2. Intermediate Coat: Polyamine Adduct Cured Epoxy: Low VOC, high solids, high build, two component.

3. Top Coat: Aliphatic Acrylic Polyurethane: Low VOC, two component, acrylic polyurethane.

D. Existing Steel:

1. Previously painted metal surfaces shall be cleaned as approved by the Authority andthen field coated as follows:

a. Protective Coat: All cleaned areas of the entire metal structure plus 3 inches of adjacent concrete surfaces shall receive one (1) coat of protective coating material seven (7) mils dry film thickness, minimum, and eleven (11) mils dry film thickness, maximum above the metal substrate.
b. Top Coat: 2.0 mils min. D.F.T. and 5 mils max. D.F.T. in one single coat aliphatic acrylic urethane (greater D.F.T. shall be used if required to achieve uniform surface finish. Increase D.F.T. by 1 heavier coat or by additional coat as required by manufacturer’s directions).

3.04 APPLICATION - GENERAL

A. Apply paint in accordance with manufacturer's directions. Use applicators and techniquesbest suited for substrate and type of material being applied.

B. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.

1. Some paint colors, surface treatments, and finishes are indicated in "schedules."
2. Provide finish coats that are compatible with primers used.
3. The number of coats and film thickness required is the same regardless of the application method. Do not apply succeeding coats until the previous coat has cured as specified by the manufacturer. Sand between applications where sanding is required to produce an even smooth surface in accordance with the manufacturer'sdirections.
4. All welds, inside corners, crevices, and exposed fasteners as well as areas where spray guns cannot reach shall be free of dirt, dust, etc. and shall receive a

stripe coat of primer, applied by brush, before application of the main coating. Stripe coat must be color contrasting and must be dry before any overcoating takes place.

5. Apply additional top coat(s) when undercoats, stains, or other conditions show through final coat of paint until paint film is of uniform finish, color, and appearance.
6. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, grilles, and similar components are in place. Extend coatings in these areas as required to maintain the system integrity and provide desired protection.
7. Surfaces which will be inaccessible after erection of other elements shall be painted prior to the installation of the obstructing item. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Paint surfaces behind permanently fixed equipment or furniture with prime coat only before final installationof equipment.
8. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint.
9. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
10. Finish exterior doors on tops, bottoms, and side edges same as exterior faces.
11. Sand lightly between each succeeding enamel coat.
12. Omit primer on metal surfaces that have been shop-primed and touch up painted.

C. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration. Allow sufficient time between successive coats to permit proper drying and according to manufacturer’s directions. Do not recoat until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure and where application of another coat of paint does not cause lifting or loss of adhesion of theundercoat.

D. Minimum Coating Thickness: Apply materials at not less than the manufacturer's specified spreading rate or as specified in this specification whichever is greater. Provide a total dry film thickness of the entire system as specified by the manufacturer or as specified in thisspecification whichever is greater.

E. Block Fillers: Apply fillers to concrete masonry block at a rate to ensure complete coveragewith pores filled.

F. Prime Coats: Before application of finish coats, apply a prime coat of material as specified by the manufacturer to material that is required to be painted or finished and has not been prime coated by others or galvanized. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to assure a finish coat with no burn through or other defects due to insufficient sealing. Where the primer is faulty, or has been damaged, and at on-site welded areas the primed surface shall be cleaned (blasted if required) and re-primed.

G. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

H. Completed Work: Match approved samples for color, texture, sheen and coverage. Remove, refinish, or repaint work not in compliance with specified requirements.

I. To prevent low film thickness, all angles, welds, crevices, external edges, corners, nuts and bolts, shall, for each coating to be applied, be coated once prior to the coating of the whole area. The Contractor shall ensure that the whole surface is covered with paint being appliedto all sides of obstructions such as bolts and nuts.

J. Avoid excessive film build-up which may result in “mud cracking”. If such areas do occur theymust be blast cleaned in accordance with this specification and repaired.

K. Paints should be applied in the correct sequence at the required spreading rate to enable the coating system to perform the function for which it was formulated. Full drying time should be allowed between successive coats of paint.

L. The minimum coating thickness shall be as specified for each paint system and the maximum thickness in any one application (single coat) must not exceed that recommended by the paint manufacturer or the maximum DFT specified in this specification.

M. Recoating: If film thickness is insufficient or recoating is required for any reason, maximum intervals between successive topcoats shall be in accordance with the manufacturer’s recommendations, but in no case shall be more than seven days. If the intervals exceed seven days, the entire surface shall be lightly blasted with a fine abrasive to provide adequatemechanical bond.

N. Reinstatement of Damaged Topcoats: Where an item which has been partially or fully top coated is subject to coating damage, the primer surface at the damaged area shall be reinstated as specified above and then top coated in accordance with the procedures for original top coating. If the damage is confined to the topcoat only and the primer surface is not exposed, the topcoat shall be lightly brush blasted, cleaned and recoated as for the original topcoat.

3.05 PAINTING OF MECHANICAL AND ELECTRICAL ITEMS

A. Painting mechanical and electrical work is limited to items exposed in equipment rooms, occupied spaces, and all exposed conduit, pipe and fittings below the platform.

B. Mechanical items to be painted include but are not limited to:

1. Piping, pipe hangers, and supports.
2. Heat exchangers.
3. Tanks.
4. Ductwork.
5. Insulation, including aluminum jacketed insulation.
6. Supports.
7. Motors and mechanical equipment.
8. Accessory items.

C. Electrical items to be painted include but are not limited to:

1. Conduit and fittings.
2. Conduit supports.
3. Junction boxes.
4. Exposed electrical raceways.

D. After cleaning of surfaces, remove all traces of rust, mill scale, corrosion, and loose or flakypaint with power or hand tools.

3.06 FIELD QUALITY CONTROL

A. The Authority reserves the right to invoke the following test procedure at any time and asoften as the Authority deems necessary during the period when paint is being applied:

1. Test paint for minimum required film thickness.
2. The Contractor shall engage the services of an independent testing laboratory to inspect, sample and test the paint material being used. Samples of material delivered to the project shall be taken, identified, sealed, and certified in the presence of the Contractor.
3. The testing laboratory shall perform appropriate tests for the following characteristics as required by the Authority:

    a. Quantitative materials analysis.
    b. Abrasion resistance.
    c. Apparent reflectivity.
    d. Flexibility.
    e. Washability.
    f. Absorption.
    g. Accelerated weathering.
    h. Dry opacity.
    i. Accelerated yellowness.
    j. Recoating.
    k. Skinning.
    l. Color retention.
    m. Alkali and mildew resistance.

4. Paint System Adhesion to Galvanized Steel: Test adhesion as required by ASTM 3359 Standard Test for Adhesion by Tape Test for each paint system over galvanized steel on the project.

    a. Number of locations for the test as directed by the Authority or as recommended by the testing agency for scope of the project; a minimum ofthree.
    b. Repair installation areas damaged by testing.

5. If test results show material being used does not comply with specified requirements, the Contractor may be directed to stop painting, remove noncomplying paint, pay for testing, repaint surfaces coated with rejected paint, and remove rejected paint from previously painted surfaces if, upon repainting with specified paint, the two coatings are not compatible, at no cost to the Authority.
6. Testing agency to prepare a test and inspection report.

3.07 CLEANING

A. Cleanup: At the end of each work day, remove empty cans, rags, rubbish, blasting material,and other discarded paint materials from the site.

B. Oily or paint-filled rags or waste and other combustible materials shall be the responsibility of the Contractor. The Contractor shall dispose of these materials in metal containers with tight fitting lids on a daily basis. The proper disposal of these materials is the responsibilityof the Contractor.

C. Prior to final completion and acceptance, the Contractor shall examine all painted and finished surfaces and retouch or refinish as necessary to leave all surfaces in

acceptable condition.

D. Upon completion of work, the Contractor shall remove all paint and varnish spots from floors, glass and other surfaces and remove all rubbish and accumulated materials of whatever nature from premises. Work areas shall be left in a clean, orderly and acceptable condition.

3.08 PROTECTION

A. Protect work of other trades, whether to be painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as acceptable to Engineer.

B. Provide "wet paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others for protection of their work after completion of painting operations. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.09 PAINT SCHEDULES

A. NOTE REGARDING PAINT SCHEDULES: REGARDLESS OF LOCATION, UNLESS INDICATED OTHERWISE WITHIN THE CONTRACT DOCUMENTS OR APPROVED OTHERWISE BY THE AUTHORITY IN WRITING, ALL SURFACES FOR CTA PROJECTS SHALL BE CONSIDERED AS “EXTERIOR” SURFACES ONLY.

3.10 EXTERIOR PAINT SCHEDULE

A. General: Provide the following paint systems for the various exterior substrates indicated.

B. Ferrous Metal Other Than Structural Steel: Primer is not required on shop-primed items. Full-Gloss Alkyd Enamel, two finish coats over primer.

1. Primer: Synthetic rust-inhibiting primer.

a.	International Paint:	Devprime 1409.
b.	PPG:	Speedhide Red Rust Inhibitive Steel Primer 6-208.
c.	S-W:	Kem Bond HS Universal Metal Primer.

2. Undercoat and Finish Coat:

a.	International Paint:	Devlac 1432.
b.	PPG:	DevGuard Alkyd Gloss 4309.
c.	S-W:	Industrial Enamel HS.

C. Zinc-Coated Metal other than Structural Steel: Semi-Gloss Alkyd Enamel, two finish coatsover primer.

1. Primer:

a.	International	Devprime 1409.
b.	PPG:	Speedhide 6-209 Galv Primer.
c.	S-W:	Pro Industrial Pro-Cryl Universal primer.

2. Undercoat and Finish Coats:

a. International Paint: Devlac 1432.
b. PPG: DevGuard Alkyd Gloss 4309.
c. S-W: Metalastic DTM Acrylic Modified Enamel.

D. Zinc-Coated Metal other than Structural Steel: High-Gloss Alkyd Enamel, two finish coatsover primer.

1. Primer:

a. International Paint: Devprime 1409.
b. PPG: 90-709 Pitt-Tech One Pack Interior/Exterior Primer finish DTM Industrial Enamel.
c. S-W: Pro Industrial Pro-Cryl Universal Primer.

2. Undercoat and Finish Coats: Gloss alkyd enamel.

a. International Paint: Devlac 1432.
b. PPG: DevGuard Alkyd Gloss 4309.
c. S-W: Industrial Enamel HS.

E. Wood: Alkyd Gloss Finish: three coats.

1. Primer:

a. International Paint: Devprime 1409.
b. PPG: Seal Grip Acrylic Primer 17-921.
c. S-W: Industrial Enamel HS.

2. Undercoat and Finish Coats: Gloss alkyd enamel.

a. International Paint: Devlac 1432.
b. PPG: Speedhide Ext. Gloss 6-8534.
c. S-W: Industrial Enamel HS.

F. Paint Color Schedule for Exterior Structural Steel:

1. PT-1: City of Chicago Bordeaux (To match Sherwin Williams SW2717), Gloss.
2. PT-2: Federal # 27722 (CTA Standard White), Gloss.
3. PT-3: Color to match Benjamin Moore - Kendall Charcoal, gloss.
4. PT-4: Color to match Benjamin Moore - Kendall Charcoal, semi-gloss.
5. All track and platform structure below platform level shall be painted PT-1.
6. All other structural steel above platform level; station building steel, canopy steel, all miscellaneous steel above platform level, and all steel for elevator towers, escalators, stairs, railings (including to street); shall be PT-2, except where otherwise indicated in Drawings to be PT-3 or PT-4, and with the exception of steel designated as AESS, shall be painted after galvanizing. Refer to Section 05 12 50, “Architecturally Exposed Structural Steel” for requirements applicable to steel indicated as AESS in the Drawings.
7. Historic canopy steel to be PT-3. Refer to Section 05 03 83, “Historic Cast Iron Repair” for additional requirements.

3.11 INTERIOR PAINT SCHEDULE

A. General: Provide the following paint systems for the various interior substrates, as

indicated. The color to match PT-02, or as selected by Commissioner.

B. Gypsum Board: Satin or semi-gloss latex finish: three coats.

1. Primer:

a.	International:	Devcryl 1440.
b.	PPG:	Speedhide Primer 6-2.
c.	S-W:	ProMar 200 Zero VOC Interior Primer.

2. Undercoat and Finish Coat:

a.	International Paint:	Devcryl 1449.
b.	PPG:	Speedhide Zero VOC S/G 6-4510 XI.
c.	S-W:	ProMar 200 Zero VOC Interior Latex Egg-Shel.

C. Gypsum Board: Water-based epoxy, gloss finish: three coats.

1. Primer:

a.	International:	Devcryl 203.
b.	PPG:	Seal Grip Acrylic Primer 17-921.
c.	S-W:	ProMar 200 Zero VOC Interior Primer.

3. Undercoat and Finish Coat:

a.	International Paint:	Tru-Glaze WB 4438.
b.	PPG:	Pitt-Glaze WB Acrylic Epoxy 16-551/16-598.
c.	S-W:	ProMar 200 Latex Gloss.

D. Ferrous Metal other than Structural Steel, Columns, and Stairways: Full-Gloss, Alkyd-Enamel Finish, three coats.

1. Primer:

a.	International:	Devprime 1409.
b.	PPG:	Speedhide Interior/Exterior Rust Inhibitive Steel Primer 6-208.
c.	S-W:	Kem Bond HS.

2. Undercoat:

a.	International Paint:	Devlac 1432.
b.	PPG:	DevGuard Alkyd Gloss 4309.
c.	S-W:	Industrial Enamel HS.

3. Finish Coat:

a.	International Paint:	Devlac 1432.
b.	PPG:	DevGuard Alkyd Gloss 4309.
c.	S-W:	Industrial Enamel HS.

E. Zinc-Coated Metal: Full-Gloss, Alkyd-Enamel Finish, three coats.

1. Primer:

a.	International:	Devprime 1409b.
b.	PPG:	Speedhide Galv. Primer 6-209.
c.	S-W:	Pro Industrial Pro-Cryl Universal Primer.

2. Undercoat:

a.	International Paint:	Devlac 1432
b.	PPG:	Dev Guard Alkyd Gloss 4309
c.	S-W:	Industrial Enamel HS

3. Finish Coat:

a.	International Paint:	Devlac 1432
b.	PPG:	DevGuard Alkyd Gloss 4309
c.	S-W:	Industrial Enamel HS

F. Concrete Masonry Units - Semi gloss Alkyd Enamel Finish: 2 coats over filled surface withtotal dry film thickness not less than 3.5 mils, excluding filler coat.

1.	Block Filler:	High-Performance Latex Block Filler. Speedhide Latex Block Filler 6-7.
2.	Undercoat:	Interior Enamel Undercoat
3.	Finish Coat:	Interior Semi-gloss Odorless Alkyd Enamel.

3.12 MECHANICAL AND ELECTRICAL ITEMS

A. The coating system shall be suitable for long term protection; expected life to first maintenance to be 15 to 20 years. The coating system and dry film thickness shall be suitable for the required performance considering the expected service life and environmental condition. Paints shall be applied so that an even film of uniform thickness, tint and consistency covers the entire surface, and is free of pin holes, runs, sags, bubbles, dry spray, cracking or other imperfections.

B. Steel plate and all rolled steel sections including brackets and supports shall be given an application of cold phosphatizing compound before being prime coated.

C. Prime Coat: Inorganic zinc silicate or red zinc chromate primer, 3 mils nominal dry film thickness.

D. Intermediate and Top Coat: High-build epoxy/High build epoxy and epoxy enamel (interior); High build polyurethane (exterior).

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 09 90 00, “Painting” shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 09 90 00, “Painting” shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 09 90 10

CLEANING AND PAINTING OF EXISTING SURFACES

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Unless noted otherwise, existing surfaces to be re-used shall be cleaned of old coating prior to re-coating. The Contractor should assume that all the existing coatings contain lead or other heavy metals unless otherwise noted in the documents, and all residue generated during the cleaning process shall be fully contained and properly disposed of. The Contractor shall determine if coatings in certain areas do not contain lead or other heavy metals by means of chemical and physical analyses approved by the Authority.

B. The Contractor shall furnish all labor, materials, insurance, testing and cleaning equipment, including tools, receptacles, scaffolding, material for enclosures, and other necessary apparatus required to contain, clean, dispose of all lead-base and non-lead base paint and other material on structural steel, castings and other designated elements of the track structure, station, platform, canopy, and other designated elements of the rapid transit structures and facilities of the CTA rapid transit system at the locations specified herein to remain or be reused. This would include all elements of the historical stations designated to be re-used. Surface preparation, protective coating and top coating material shall be furnished and installed by the Contractor.

C. Elements that are to remain or be reused that will require cleaning and protective coatings include, but are not limited to, the following:

1. All surfaces and edges of all metal surfaces of the line structure members.
2. The exposed top surfaces of top flanges and the top surfaces of lateral bracing on which platform timbers remain in place shall be cleaned and coated.
3. In general, track ties and rail are to remain in place during this project. Exposed surfaces of track stringers, top surfaces of lateral bracing between stringers and top surfaces of cross girders are included in the cleaning and protective coating requirements of this project.

D. Definitions:

1. The term “bridge structure” as used herein shall include all structural members of the train carrying elevated structure and bridges, such as castings, cross girders, longitudinal girders, bridge girders, girders extensions trusses, floor beams, track stringers, any bracing steel foot walk supports, signal platforms and railings, etc., continuous from beginning to end of the Project.
2. The term “cross girder” means a horizontal member supporting stringers or beams, and is a part of the line structure.
3. "Abatement site" means the location of the site where the lead abatement operations are being performed by the Contractor.
4. "Containment area" means the area established by the Contractor at an abatement site to demarcate the area where operations are being performed to abate lead.

5. "Final clearance" means the approval given by an independent engineer after the lead abatement operations are completed.
6. "Lead" means all lead, lead-based products, lead-containing materials, lead- containing waste, or any goods, products, or structures containing lead, which are the subject of the lead abatement operations.
7. "Lead abatement operations" means operations performed by the Contractor to abate lead-based products, lead-containing soil and/or water, or those operations performed on the abatement site by the Contractor which are incidental to any of the above.
8. "Scheduled project" means lead abatement operations being performed by the Contractor at an abatement site commencing with the beginning date and terminating upon the completion date of the lead abatement operations, as reported on an “Application For Lead Abatement Specific Project Certificate of Insurance” for which the issuance of a Certificate of Insurance to the Contractor has been authorized by the Insurer.
9. “DFT” means dry film thickness.
10. “Workmanship”: All work shall be performed in strict accordance with this specification and the coating manufacturer’s current printed instructions and/or Tech data sheet for materials to be used on this project. Work shall be performed by skilled workmen in a safe and workmanlike manner. Application shall be in accordance with the principles of good workmanship described in SSPC-PA 1. Operators working on this project shall be qualified according to ASTM D4227 or ASTM D4228 or to the NACE International Guide to Qualification of Industrial Maintenance Painters.

E. Related Sections: The following sections contain requirements that relate to this Section.

1. Section 02 72 00 – Lead Abatement
2. Section 05 10 30 – Structural Steel
3. Section 09 90 00 – Painting

1.03 QUALITY ASSURANCE

A. Codes, Regulations, Reference Standards and Specifications:

1. The latest editions of Codes and regulations of all local, state and federal jurisdictional authorities.
2. Steel Structures Painting Council (SSPC).
3. Society of Automotive Engineers (SAE): J 872, and grit values.
4. Environmental Protection Agency protection of Environment - 40 CFR
5. Occupational Safety and Health Standards for the Construction Industry (29 CFR Part 1926) with particular emphasis on Lead, Part 1926.62. Also, if applicable:

Inorganic Arsenic	29CFR 1910.1018
Cadmium	29 CFR 1926.1127
Chromium	29 CFR 1920.55

6. Illinois Department of Transportation (IDOT), 2002

7. Illinois Department of Public Health Lead Poisoning Prevention Code, 77 IL ADM, Code 845

8. City of Chicago Municipal Code, 11-4-2180.

9. ASTM B244, ASTM D714, ASTM D1212, ASTM D1730, ASTM D2092, ASTM D2200, ASTM D3359, ASTM D4138, ASTM D4212, ASTM D4214, ASTM D4227, ASTM D4228, ASTM D4262, ASTM D4285, ASTM D4414, ASTM D4417, ASTM D5064, ASTM D6677, ASTM E337, ASTM F2170.

B. Lead Abatement Liability Insurance: With respect to the coverage afforded under the lead abatement liability insurance policy, it is agreed that the following Paragraphs 1 through 9 are conditions precedent to coverage and are added to Contractors/Subcontractors Insurance Requirements, Part 3, Article 2 of the Contract.

1. Records: The Contractor is required to maintain written records for every scheduled project to show compliance with Conditions 2 through 9 below and to send the Authority, its designee and the Insurer copies of these records at such times as the Insurer may request
2. Employee and Environmental Monitoring:

   a. Initial employee air monitoring must be conducted on each project to characterize the airborne lead (and also arsenic, cadmium, and/or chromium, if applicable) exposure of workers involved in different functions during abatement. Additional employee monitoring shall be conducted periodically throughout the project, and whenever abatement methodologies or job functions change. Frequency of monitoring shall be as dictated by governing regulations and/or OSHA.
   b. Environmental monitoring shall consist of continuous ambient air monitoring outside containment to demonstrate effectiveness of containment unit.
   c. The Contractor shall hire a third-party consultant (independent of the Contractor), for monitoring environmental issues and all employees. An Illinois Department of Public Health (IDPH) licensed lead inspector shall collect all samples.

3. Sampling Requirements:

   a. Pre-abatement, abatement and final clearance sampling shall be conducted by an independent third-party consultant on every containment (including paint chip, wipe, air, soil and sediment sampling as deemed appropriate by the Authority). Soil, water and sediment sampling shall be conducted whenever soil or water is in the immediate vicinity of the abatement site.
   b. A lead abatement project shall be deemed to be in compliance if:

      1) Lead levels on horizontal surfaces shall be below 200 micrograms per square foot except floor areas shall be below 50 micrograms per square foot. All soil areas shall be below 400 parts per million (ppm).

   c. Methods of Sampling and Analyses:

      1) Employee air monitoring shall be conducted in accordance with National Institute for Occupational Safety and Health (NIOSH) analytical Method 7400 for Lead, Method 7048 for Cadmium, Method 7300 for Chromium, and Method 7900 for Arsenic as appropriate.
      2) Ambient air monitoring shall be conducted in accordance with 40 CFR Part 50, Appendix G, "Referenced Method for the Determination of Lead in Suspended Particulate Matter Collected from Ambient Air" and Appendix J "Reference Method for the Determination of PM10 in the Ambient Air". Results shall be available within 24 Hours of collection until a base line level is achieved.
      3) All other sampling shall be conducted in accordance with accepted methodologies approved by the Authority.

4) Use analytical methods for determination of lead content in paint (and other heavy metal) that are acceptable to the Authority. TCLP Waste Characterization sampling is not an acceptable method to determine the presence of lead in the structure's existing coatings.
5) Soil, sediment, and groundwater sampling shall be conducted using the ASTM method SW-846 Test Methods for Evaluating Solid Waste.

d. Analysis of Samples: All employee air samples shall be analyzed by an independent American Industrial Hygiene Association (AIHA) accredited laboratory, hired by the Contractor. All ambient air, wipe, soil, and other lead samples shall be analyzed by a qualified independent laboratory which holds the AIHA, American Association of Laboratory Accreditation (AALA) or other appropriate accreditation, or which is a contractor for inorganic analysis in the U.S. EPA Contract Laboratory Program (CLP).

4. Blood Lead Monitoring: Blood lead and Zinc Protoporphyrin (ZPP) level sampling and analysis in the form of blood sampling shall be made available to each employee exposed to lead above the OSHA action level.

a. Monitoring of every site worker shall be conducted before the start of each project to establish baseline levels, at least every two months for the first six months thereafter until the project is completed, and upon termination of work from this project.
b. All medical examinations and procedures shall be performed by or under the supervision of a licensed physician. Analysis of samples shall be performed by a laboratory using OSHA approved methods.
c. Employees whose blood lead levels exceed 40 mg/dl shall be temporarily removed from the work area. A follow-up blood test shall be provided within two weeks after the employer receives the results of the first blood test. Employees exceeding 40 mg/dl shall be sampled at least every two months. This frequency shall continue until two consecutive blood samples and analysis indicate a blood level below 40 mg/dl.

5. Hygiene Facilities and Practices:

a. Eating, drinking, smoking and applying cosmetics are not allowed in the work area. Any person leaving the work site or work area shall rinse his or her mouth with potable water and wash hands and face thoroughly before eating, drinking, or smoking. All individuals shall wash or shower before leaving the work site or work area at the end of a shift or at the end of the work day.
b. A decontamination facility equipped with shower(s), lavatory(s), and potable water supply shall be provided on every job site. All hygiene procedures outlined in OSHA 29 CFR 1926.62 shall be followed unless the Contractor can demonstrate to the satisfaction of the Authority that the lead PEL (50 ug/m;) shall not been exceeded and upon approval of the Authority.

6. Signs: Signs, in accordance with 29 CFR 1926.62, including warning signs for other desired requirements stating “Caution, Lead Hazard - Keep Out” or “Warning – Lead Work Area – Keep Out”, are to be utilized to identify encased, encapsulated or enclosed lead to warn others of the hazard. In addition, plans identifying the location of encased, encapsulated or enclosed lead shall be prepared and submitted to the Authority with written notice of the hazards that may arise due to activities that may disturb or destroy the encasement, encapsulate or enclosure.
7. Conformance with Regulations: All lead abatement operations must conform to 29 C.F.R. 1926.62 and all other applicable federal, state, and local laws and regulations. In the event of a conflict between regulations and guidelines, the stricter regulation or guideline

is to be followed, provided this will not result in a violation of the regulations.

8. Containment Negative Pressure: All lead abatement operations, including clean- up, shall be conducted in containment under a negative differential air pressure as described in Section 3.03 A of this specification.
9. Personnel Training: All employees working on this project shall have completed the Illinois Department of Public Health (IDPH) approved Lead Workers Training Program and receive training as specified in 29 CFR 1926, 40 CFR 265 and any other applicable federal, state and local codes or regulations and pass the exanimations administered at the conclusion of the courses. If the initial classes were taken more than three years prior to the project, the lead worker must submit a current refresher class certification.

C. Coordination with other Agencies or Entities:

1. Illinois Department of Transportation (IDOT) and local municipalities.
2. CTA forces working in the project area.
3. Other contractors working in the project area.

D. Permits:

1. Contractor must obtain all required local permits and approvals. Work in the City of Chicago requires a permit and notification to all residents and businesses within 75 feet of the abatement project.

E. The painting contractor must be certified and approved by the manufacturer(s) of the coating materials as qualified for the installation of their products.

1.04 SUBMITTALS

A. Submit the following for approval by the Authority in accordance with the General and Special Conditions and with the additional requirements as specified:

B. Coating Materials

1. The coating manufacturer’s current printed technical data for the proposed coatings. The technical data submittal shall include all coating properties pertinent to the specifications outlined in Sections 2.2 and 2.3 as well as material safety data sheets for all coatings, solvents and any other material being used by the Contractor and Sub-Contractors on this project.
2. The coating manufacturer’s current printed instructions for application of the coatings.
3. Field History of Epoxy-Mastic Coating: Submit documentation by the coating manufacturer verifying successful use of the epoxy-mastic coating in the field. The coating shall have been successfully used on at least ten (10) projects which required at least 100 gallons per project. The performance history shall also be for a minimum of three (3) years in a similar environment as the intended use.
4. Warranty: Provide a written warranty, in a form acceptable to the Authority, from the coating manufacturer, countersigned by the applicator, stating that the system provided is as specified and any defects due to materials and/or workmanship shall be repaired and/or replaced at no cost to the Authority for a period of three (3) years from time of final acceptance by the Authority.
5. The coating manufacturer’s certification that the products in a multi-layer coating system are appropriate for the intended use, and are compatible with each other and with project substrates.
6. Color Samples: Submit a color chip chart from the coating manufacturer for selection of colors for topcoat. The Authority shall prepare a schedule locating color placement in the project. Up to five (5) colors may be selected.
7. Samples for verification purposes: Provide samples of each color and material to be

applied, with texture to simulate actual conditions, on representative samples of the actual substrate. Resubmit until required gloss, colors, and textures are achieved.

C. Hazardous Waste and Pollution Control:

1. Documentation verifying that arrangements for the transport and disposal of special waste (including hazardous waste), contaminated materials and supplies have been made, including the name and location of the disposal site, and a copy of the handling procedures. Certification that all these elements comply with all local, state, and federal laws and regulations in effect at the time of execution of the Contract shall be required in writing.
2. The Contractor shall furnish proof that employees have successfully completed a training program as specified in 29 CFR 1926, 40 CFR 265, and all other applicable federal, state and local codes and regulations.
3. Submit a copy of the application to the Illinois EPA or applicable local and state agency for permission to haul special waste (including hazardous waste) to the disposal site. The Contractor shall submit for the Authority's approval the name, address, phone number, state and federal operating permit ID numbers for each special or hazardous waste transporter and disposal facility to be used on this project. A list of CTA approved disposal sites can be obtained from the Authority.
4. The Contractor shall provide completed manifests ready for signature to the Authority. The Manager of Health and Environmental shall sign the manifests.
5. Provide copies of all abrasive blasting permits issued by local agencies.
6. A copy of the Site Specific Safety and Health Plan for lead paint removal developed for this project shall be submitted two weeks prior to the start of sandblasting. This plan shall be approved by the Authority prior to the start of sand blasting. The Site Specific Safety and Health Plan shall cover all site worker's activities for lead abatement and application of new coatings and shall include as a minimum: work objective, personnel protective procedures by task and zone, work hazards, project organizational structure, employee training, medical surveillance program, work procedures and practices, air monitoring and environmental sampling protocol, decontamination procedures, site emergency plan, and all regulations applicable to this project.
7. A copy of the Contractor Contingency Plan shall be submitted two (2) weeks prior to the start of the work. The plan shall follow the Illinois Department of Transportation plan for lead removal projects entitled: "Hazardous Waste Contingency Plan for Lead Based Paint Removal Projects" (IDOT Form 5843I). Contractor shall also submit to the Authority copies of notification letters to local police, fire departments and hospital facilities to inform them of the project. Projects within the City Limits of Chicago require notification to all businesses and residents within 75 feet of all work areas.
8. The written air monitoring program shall be submitted two (2) weeks prior to the start of the work and include the name(s) of the air monitoring technician(s) appointed and his (their) qualifications, types of equipment and materials proposed, and the testing laboratory proposed. An independent third-party consultant shall conduct this written program and all employee and environmental air monitoring.

D. Lead Abatement Plan: A written job specification for the lead abatement plan shall be prepared and submitted two (2) weeks prior to the start of the work. This plan must be approved by the Authority prior to the start of the work.

1. This plan shall include drawings of the arrangement and type of material to be used for the containment, size of the containment, hygiene facilities, location of the negative air machine, and procedures for the collection, temporary storage, transportation and disposal of the blasting debris.
2. All details for the Lead Abatement Plan shall be submitted to the Authority in the form of Drawings and Specifications and shall be approved prior to the start of work. The plan should provide detailed information regarding the method of containment, the

containment structure design, method of recycling blast abrasive, the hazardous waste temporary storage and disposal system, equipment specifications, and all other pertinent information related to the pollution control plan. The decision of the Authority as to the acceptability of the plan shall be final. However, approval of the plan by the Authority shall in no way relieve the Contractor of his obligation to supply and maintain a pollution control plan in full compliance with this Specification and all government agency regulations.

E. Employee Medical Qualification Forms: Submit certification of employee medical examination by a qualified occupational physician and respirator fit testing results for each employee who works on this project. These documents shall be current, within one year from the commencement of this project. No employee shall be permitted to operate on this project unless this documentation has been submitted and copies kept at the site.

F. All of the above shall be in full compliance with all laws, regulations, etc. in effect at the time of Contract execution.

G. Test Methods: Prior to beginning lead abatement work, the Contractor shall submit for approval by the Authority, test methods for determining the presence of lead and the heavy metals arsenic, cadmium and chromium, and their content in existing coating.

H. Abrasive Certifications: Submit manufacturer's written certification that abrasive blasting materials comply with specifications. Independent laboratory sample analysis shall be conducted to determine if the new abrasive contains lead, arsenic, cadmium and/or chromium.

I. Enclosure: Submit Blast Enclosure Construction Details and Method of maintaining Negative Pressure.

J. Warranty: Provide a copy of the written warranty, in a form acceptable to the Authority, from the coating manufacturer, countersigned by the applicator, stating that the system provided is as specified and any defects due to materials and/or workmanship shall be repaired and/or replaced at no cost to the Authority the specified time period.

K. “NACE Coating Inspector Level1- Certified” current certification of the paint inspector.

L. Process Plan: Provide a detailed process plan for each material being coated explaining each step of coating process, including, but not limited to:

1. Surface preparation and verification with specification.
2. Primer application and verification with specification.
3. Finish coat(s) application and verification with specification.
4. How testing is incorporated into the above process plans.

1.05 WARRANTY

A. All painting work and the painting system shall be warranted by both the manufacturer(s) of all the materials and the installer(s) of all the materials to not fail in adhesion, color retention, gloss retention, chalking, cracking, fading, peeling, blistering, indicating evidence of rust, lack of protection of the surface or other malfunction as determined herein. The warranty shall include a statement that the substrate has been examined by the parties involved and that it was in proper condition or prepared properly for application of the specified coating system. The warranty shall also include a statement indicating that the specified coating system is compatible with the substrate, the various coatings specified, the conditions under which the system will be applied and the conditions under which the system will be used to protect the substrate.

1. For previously painted substrates, the warranty for the new coating system shall be three

(3) years from the date of final acceptance by the Authority.

2. For new substrates, the warranty for the coating system shall be for ten (10) years from the date of final acceptance by the Authority.

B. Painting systems that fail within the specified warranty periods shall be replaced by preparing the surfaces and re-applying according to manufacturer's directions and the Authority's approval. The extent of re-application shall be determined by the Authority. The work shall be done at no cost to the Authority for materials or labor.

PART 2 – PRODUCTS

2.01 ABRASIVE FOR BLAST CLEANING

A. Disposable, clean, non-conductive abrasive.

1. Commercially available crushed slag capable of producing a blast cleaned surface with a profile of 2-3 mils and with a minimum of residual embedment.

B. The abrasive shall be non-conductive in the vicinity of the existing wood ties or power distribution cables which are to remain. Non-conductive abrasive shall not be reused.

C. Abrasive type and size shall ensure maximum allowable profile height for a particular coating application. The abrasive should be clean and dry and selected as appropriate. Profile height is to be measured by an Elcometer 224 Model T Digital or similar Surface Profile Gauge.

D. Calcium Silicate Abrasive Additive for lead abatement (Optional):

1. Particle size distribution of at least 95% greater than 50 mesh and less than 12 mesh.
2. Bulk density of greater than 80 pounds per cubic foot and less than 100 pounds per cubic foot.
3. Hardness greater than 60 on the Mohs scale.
4. Must be capable of rendering leachable lead in the untreated spent abrasive wastes from up to 100 mg / 1 to less than 5.0 mg / 1 (non-hazardous) according to the TCLP.
5. Must not be a hazardous material under the US OSHA Hazard Communication Standard.
6. Must not create an additional work place health hazard as defined by the US OSHA Hazard Communication Standard.
7. Must be approved for use without RCRA (or equivalent) treatment permit by State Environmental Officials.

E. All equipment required for blast cleaning operations including air compressors shall be supplied and maintained by the Contractor. Compressors shall be of adequate size and in good repair. Compressed air shall be free of oil and water and shall have a minimum working pressure of 180 inches of mercury.

F. Surface salts: Where a surface shows discoloration within a short time after blast cleaning, this is an indication that the surface contains salt which will be detrimental to the coating. Under these circumstances, the surface shall be thoroughly washed with fresh water, dried and re-blasted. If necessary, the procedure may need to be repeated for as many times as are necessary.

2.02 GENERAL FOR COATINGS

A. The coating system described herein provides for a self-priming, two-part aluminum pigmented epoxy mastic protective coat and an aliphatic acrylic urethane top coat. Contractor shall furnish all coating materials. The Authority reserves the right to select the colors (Federal Standard Colors).

B. The same manufacturer shall supply all products in a multi-layer coating system. The coating

manufacturer shall certify that the products are appropriate for the intended use and are compatible with each other.

C. All coatings used for this project to be lead-free.

2.03 PROTECTIVE COAT-EPOXY MASTIC

A. Protective Coat: 3-5 mils dry film thickness over galvanized steel and 7-11 mils dry film thickness for non-galvanized steel, Self-priming, two-component, modified epoxy mastic, aluminum pigment. The epoxy mastic shall be a one (1) coat, high-build complete protective coating system certified by the manufacturer as being appropriate for use over marginally prepared rusted, pitted and coated steel surfaces. It shall be supplied as two- part material with a one-to-one volume mix ratio, and shall be well ground and not caked, skinned or substantially settled in the container.

B. Composition

1. Pigment: The pigment shall be leafed aluminum. Secondary pigments shall be rust-inhibiting and adhesion-promoting types.
2. Vehicle: The vehicle shall be of the epoxy-type modified with bitumen like substance. The curing agent shall have suitable insensitivity to moisture to allow trouble-free application during normal humidity conditions.
3. The epoxy mastic shall contain 90% minimum solids by volume, tested according to ASTMD3960 modified to a dry time of seventy-two (72) hours at 100 degrees F rather than three (3) hours at 105 degrees F.
4. The shelf life of the epoxy mastic components shall be no shorter than twelve (12) months, so that no caking of fillers, skins or gelatin occurs.
5. Viscosity: Component A and Component B shall be mixed viscosity of 110- 140KU, at 75 Degrees F plus or minus 2 degrees F.
6. The Volatile Organic Compounds (VOC) shall not exceed 340 g/L (2.8 lb/gal) as applied when tested according to ASTMD 3960.

C. Mixing: No partial containers shall be mixed and mixing shall be accomplished by the use of air driven stirrers.

D. Properties of Mixed Paint

1. The epoxy mastic shall air cure at temperatures of 75 Degrees F or above to a hard and tough film within five (5) days by evaporation of solvent and chemical reaction. At 75 Degrees F, it shall be dry to the touch within twenty-four (24) hours, and able to receive foot traffic within forty-eight (48) hours.
2. The pot life of the epoxy mastic shall not be shorter than four (4) hours at 75 Degrees F, un-thinned.
3. The mixed paint weight per gallon shall be 10.2 pounds minimum at 75 Degrees F plus or minus 2 Degrees F.
4. Film Build: The catalyzed mixture, thinned 10% by volume with the manufacturer's recommended thinner, shall be capable of being applied at 10 mils wet film thickness without exhibiting runs or sags.

E. Test Panel Preparation: the test panels shall be steel, having dimensions of 2" x 5" x 1/8" or as otherwise required by ASTM D 609 specification. The panels shall have coating surfaces prepared by abrasive blasting in accordance with NACE No. 1/SSPC-SP5, White Metal Blast Cleaning, with a surface profile of 1-2 mils after which they shall be exposed to Midwest weather for thirty (30) days so that a uniform rusting occurs. They shall then be hand-cleaned with a wire brush in accordance with SSPC-SP2 specification. Test panels shall then be coated and cured with epoxy mastic as follows: The epoxy mastic shall be spray applied to the steel panels at 5 mils dry film thickness in one (1) coat. The coating shall be cured as recommended by the

manufacturer. Unless otherwise noted, panels shall then be scribed down to the substrate metal with an “X” of at least two (2) inch legs prior to being subjected to resistance testing.

F. Test Requirements: The epoxy-mastic manufacturer shall provide test data acceptable to the Authority demonstrating that the epoxy-mastic coating system has been subjected to, and has successfully performed in testing equal in severity to the following tests:

1. Flexibility Test: ASTM D552. The panel shall be sandblasted in accordance with SSPC-SP 5-63 Specification.
2. Temperature Cycling Test: ASTM D2246 (15 cycles).
3. Weathering Resistance Test: ASTM G53 (1000 cycles).

    a. The coated and scribed panels shall then be exposed to ultra-violet and condensation exposure as outlined in the specification for the total exposure period.

    b. Upon examination after 1000 hours of exposure, the panels shall be unaffected except for discoloration of the epoxy-mastic coating. There shall be no blistering, softening or visible rusting on the coating beyond 1/16” from the center of the scribe marks.

4. Fresh Water Resistance Test

    a. The coated and scribed panels shall be immersed in fresh tap water at 75 Degrees F. plus or minus 5 Degrees F.
    b. Upon examination after thirty (30) days immersion, the panels shall be unaffected except for discoloration of epoxy-mastic coating; there shall be no blistering, softening or visible rusting on the coating beyond 1/16” from the center of the scribe marks.

5. Salt Water Resistance Test

    a. The coated and scribed panel shall be immersed in 5% sodium chloride solution at 75 Degrees F. plus or minus 5 Degrees F. for a period of 30 days.
    b. The panels shall be unaffected except for discoloration of the epoxy-mastic coating upon inspection after 7, 14, and 30 days. There shall be no blistering, softening or visible rusting on the coating beyond 1/16” from the center of the scribe marks. The sodium chloride solution shall be replenished after each examination.

6. Salt Fog Resistance Test

    a. The coated and scribed panels shall be tested in a salt fog cabinet using 10% synthetic sea salt solution.
    b. After 1,000 hours of continuous exposure, the coating shall show no loss of bond, nor shall it show rusting or blistering beyond 1/16” from the center of the scribed marks.

7. Gloss Test

    a. The standard for measuring gloss level is ASTM D523, “Standard Test Method for Secular Gloss” of 70 degrees and above.

G. Packaging and Labeling

1. The epoxy-mastic coating shall be packaged in two (2) containers, labeled Part A and Part B. The components shall be packaged in such proportions that the Part A when

mixed with the Part B will yield ten (10) gallons of mixed paint. Each container shall bear a label on which shall be clearly shown the manufacturer or brand name of the coating, the batch or lot number and the date of manufacture. No partial containers shall be mixed and mixing shall be accomplished by the use of air driven stirrers.

2. The label on the vehicle container shall also include complete instructions for the use of this coating. The container shall be coated if necessary to prevent attack by the coating components.

H. The following, or equal products approved by the Authority, are acceptable for the protective coating material:

1. Carboline – Carbomastic 15/Carbomastic 615 Al (Low Temp)
2. International Paint - Interseal 670 HS
3. PPG – Amerlock 2/400 Epoxy Mastic Aluminum
4. Macropoxy 646-100 FC Epoxy

2.04 TOP COAT

A. Aliphatic Acrylic Urethane, 2 mils minimum dry film thickness, for the purposes of ultraviolet protection and aesthetics. Color shall be high gloss CTA colors matching Color Numbers of the Federal Standards or such colors as designated by the Authority. The Authority may select up to five (5) colors for various locations and elements. Urethane shall have the same field history as required in 1.04, B, 3.

B The following, or equal products approved by the Authority, are acceptable for the protective coating material:

1. Carboline – -Carbothane 133 H/B Urethane Finish
2. International Paint – Interthane 990HS
3. PPG – Amercoat 450H Acrylic Polyurethane Gloss
4. Waterbased Acrolon 100 Polyurethane

PART 3 – EXECUTION

3.01 GENERAL

A. Work shall be conducted over contiguous work areas to permit systematic and continuous cleaning and coating operations.

B. Provide the necessary equipment and operator, which may include truck-mounted manlifts, bucket trucks or other approved equipment suitable to the Engineer, which will permit the Authority to inspect the cleaning and coating operations, both inside and outside of the containment. The equipment shall be in good, clean and safe working condition at all times, and shall be available for the Authority's use at all times, including night and weekend work, whenever work is performed.

C. Properly protect all adjacent surfaces not to be cleaned and refinished including walls, glazing, gaskets, caulking, fixtures, etc. from damage during the cleaning and finishing operations with masking and materials that will not deteriorate during the cleaning operations.

D. Provide intrinsically safe artificial lighting in areas where natural illumination is inadequate, as determined by the Authority, to allow proper cleaning, inspection, and painting. Illuminance surrounding blasting and painting work shall be at least 30 foot- candles. Illuminance of the working platforms, access and entry shall be at least 20 foot- candles.

E. At no time during the execution of the work shall the Contractor employ less than six (6) workers

at one location without approval of the Authority.

F. No blasting work shall be conducted when the steel substrate surface temperature is less than 5 degrees F. above the dew point.

G. All cleaned surfaces to be coated shall be inspected, in accordance with the inspection requirements outlined in the Contractor's Quality Program as specified and accepted by the Authority before any coating is applied.

3.02 CLEANING OF SURFACES

A. General: The Contractor shall determine if coatings in certain areas do not contain lead by means of chemical and physical analysis subject to approval by the Authority. Unless the existing coatings are determined to be non-hazardous or indicated to remain, one hundred percent (100%) of all surfaces to be coated shall be cleaned by the appropriate method as described below and as approved by the Authority.

B. The Contractor shall completely remove all existing coatings unless indicated otherwise. The Contractor shall assume that all existing coatings contain lead, arsenic, cadmium, and/or chromium unless determined otherwise. Laboratory analysis of the samples is required and all residue generated during the cleaning process shall be fully contained and properly disposed of as hazardous waste.

1. The Contractor shall provide a schedule of specific existing surfaces and their respective method of cleaning proposed, for the Authority's approval.
2. Prior to blast cleaning, all visible grease and oil shall be cleaned and removed with a solvent acceptable to the Authority in accordance with SSPC SP 1.
3. Dry abrasive blast cleaning shall be used for all cleaning methods, to class 2 (Near White metal blast cleaning). The Contractor shall use proper blasting equipment and use oil-free and moisture-free compressed air.
4. Particular attention shall be paid to joints, angles, pits and weld areas to ensure that the treated surface is brought to the standard required.
5. After blasting, all dust and loose matter shall be removed from the surfaces. All dust and grit shall be removed from pockets and corners using dry compressed air. The steel shall not be allowed to rust or be contaminated in any way before coating. Rust formed after cleaning shall be removed by re- blasting prior to coating. All surfaces shall be thoroughly cleaned and dried to the satisfaction of the Authority and the coatings applicator before any coating is applied. Operators shall wear clean gloves when handling the steel.
6. All work cleaned on one day shall be prime coated on that day before the dew point is reached and before any contamination or discoloration of the surface can take place. However, in any case, coating shall be applied within twenty-four (24) hours of blast cleaning, unless directed otherwise by the Authority. Any blasted area not coated within the above specified period shall be re-blasted to the satisfaction of the Authority before coating application.
7. The Contractor's representative shall ensure that weather conditions, wind borne dust, non-availability of labor or equipment do not prevent the application of a priming coat within the prescribed period.

C. Where existing coatings are approved by the Authority to remain, the existing coatings must be secure, in good condition, and determined and approved to be compatible with the new coating system. Where peeling coatings are encountered, the Contractor shall remove the peeling layer in its entirety not only at the peeling locations, but the entire member or surface where ever that layer is detected.

3.03 CLEANING METHODS

A. Method #1 Cleaning (dry abrasive blasting in enclosure, containment and disposal):

1. Method #1 Cleaning is a method of preparing steel surfaces which is to be in accordance with NACE No. 3/SSPC-SP 6 Commercial Blast Cleaning and be a visual match when compared to SSPC VIS 1 for SP 6 cleaned surfaces and, when viewed without magnification, shall leave the cleaned surface free of all visible oil, grease, dirt, dust, mill scale, rust, coating, oxides, corrosion products, and other foreign matter except for staining. Random staining shall be limited to no more than thirty-three percent (33%) of each unit area approximately 9 square inches (i.e. a square (3in x 3in)) and may consist of light shadows, slight streaks of minor discolorations caused by stains of rust, stains of mill scale, and stains of previously applied coating. Acceptable variations in appearance that do not affect surface cleanliness include variations caused by type of steel, original surface condition, thickness of steel, weld metal, mill or fabrication marks, heat treatment, heat-affected zones, blasting abrasive, and differences in the blast pattern. Blast profile shall be 1.0 mil minimum, 1.5 mils maximum.
2. Hazardous waste containment and control procedures shall be utilized for lead- based paint removal.
3. Rust formed after cleaning shall be removed by re-blasting prior to coating. Dust from blasting shall be removed from cleaned surfaces by brushing, vacuum or blow-off with clean dry air prior to coating.
4. The maximum time allowed between cleaning and application of prime coat shall be twenty-four (24) hours. Under no circumstances shall steel exhibit visual evidence of rusting before coating regardless of time elapsed.
5. No blasting work shall be conducted when steel surface temperature is less than five (5) Degrees F above the dew point or the relative humidity is above 85%.

B Method #2 Cleaning (Wet Abrasive blasting with containment and disposal):

1. Method #2 Cleaning is a method of preparing steel surfaces which, when viewed without magnification, shall leave the cleaned surface free of all visible oil, grease, dirt, dust, mill scale, rust, coating and other foreign materials. Generally, evenly dispersed very light discoloration caused by stains of rust, stains of mill scale or stains of previously applied coatings may remain on no more than thirty- three percent (33%) of each unit area approximately 9 square inches (i.e. a square (3in x 3in)). The Contractor shall completely remove all existing coatings. Blast profile shall be 1.0 mil minimum, 1.5 mils maximum.
2. Hazardous waste containment and control procedures shall be utilized for lead- based paint removal.
3. Rust formed after cleaning shall be removed by re-blasting prior to coating.
4. After wet blasting, rinse cleaned surface to remove spent abrasives with fresh water to which sufficient corrosion inhibitor has been added to prevent rusting, or with fresh water followed by an inhibitor treatment. Supplement this cleaning by brushing if necessary to remove any residues.
5. The use of inhibitors or the application of coating over slight discoloration should be in accordance with the requirement of the coating manufacturer.
6 The maximum time allowed between cleaning and application of prime coat shall be twenty-four (24) hours. Under no circumstances shall steel exhibit visual evidence of rusting before coating regardless of time elapsed.
7 No blasting work shall be conducted when steel surface temperature is less than 5 degrees F above the dew point.

C. Method #3 Cleaning (Ultra High Pressure Water Wash NACE No. 5/SSPC-SP12 with containment and disposal):

1. Method #3 Cleaning is a method of preparing steel surfaces which, when viewed without

magnification, shall leave the cleaned surface free of all visible oil, grease, dirt, dust, loose mill scale, loose rust, and loose coating. Mill scale, rust and coating are considered adherent if they cannot be removed by lifting by a dull putty knife or cracked off by impact a hand chipping hammer.

2. The standards established by Visual Surface preparation definition WJ-1 and non-visual surface preparation definition SC-1 of SSPC-SP 12 shall be satisfied.

3. As part of surface preparation, deposits of oil, grease and foreign matter must be removed by ultrahigh-pressure water jetting, by steam cleaning with detergent, by methods in accordance with SSPC-SP 1 or by another method approved by the Authority.

4. It is necessary to use an inhibitor that prevents rust forming after rinsing. The use of inhibitors or the application of coating over slight discoloration should be in accordance with the requirement of the coating manufacturer.

D Method #4 Power Tool Cleaning to Bare Metal (SSPC-SP 11):

1. Power tool cleaning to bare metal shall produce a bare metal surface and be a visual match when compared to SSPC VIS 3. The surface must be roughened to a degree suitable for the coating system specified in this specification, with a profile not less than 1 mil, and when viewed without magnification the cleaned surface shall be free of all visible oil, grease, dirt, dust, mill scale, rust, coating, oxide, corrosion products, and other foreign matter. Slight residues of rust and coating may be left in the bottom of pits if the original surface is pitted.

2. Areas inaccessible for cleaning by power tools shall be cleaned by “Hand Tool Cleaning” as outlined in Method #6.

3. After power tool cleaning is completed, dust and other loose matter shall be removed from the surface.

4. Hazardous waste control procedures shall be utilized for lead based paint removal.

E Method #5 Solvent Cleaning (SSPC-SP 1):

1. This step must be done before any other surface preparation can proceed.

2. Solvent Cleaning is a method for removing all visible grease, oil, dirt, soil, drawing and cutting compounds, and other soluble contaminants from steel surfaces. Solvent cleaning does not remove rust or mill scale. Change rags and cleaning solution frequently so that deposits of oil and grease are not spread over additional areas in the cleaning process. Be sure to allow adequate ventilation.

F Method #6 Hand Tool Cleaning (SSPC-SP 2):

1. Hand tool cleaning shall be used where applicable; using hand brushing, hand sanding, hand scraping, hand chipping or combined methods to remove loose millscale, loose rust, loose coating and other detrimental foreign matter. Mill scale, rust, and coating are considered adherent if they cannot be removed by lifting with a dull putty knife. After hand tool cleaning is completed, dust and other loose matter shall be removed from the surface.

G Method #7 Cleaning (dry Brush-Off Blast cleaning, non-lead-based paint):

1. Method #7 Cleaning is a method of preparing steel surfaces which is to be in accordance with NACE No. 4/SSPC-SP 7 Brush-Off Blast Cleaning and, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, loose mill scale, loose rust, and loose coating. Tightly adherent mill scale, rust, and coating may remain on the surface. Mill scale, rust, and coating are considered tightly adherent if they cannot be

removed by lifting with a dull putty knife. The entire surface shall be subjected to the abrasive blast. The remaining mill scale, rust, or coating shall be tight. When painting is specified, the surface shall be roughened to a degree suitable for the specified coating system. Immediately prior to coating application, the surface shall comply with the degree of cleaning as specified herein.

H. Method #8 Near-White Metal Blast Cleaning (NACE No. 2/SSPC-SP 10):

1. Method #8 Cleaning is a method of preparing steel surfaces which when viewed without magnification, shall be free of oil, grease dust, dirt, mill scale, rust, coating, oxides, corrosion products, and other foreign matter except for staining. Staining shall be limited to no more than 5% of each unit area of surface approximately 9 square inches (i.e. a square (3 in x 3 in)) and may consist of light shadows, slight streaks or minor discolorations caused by rust, mill scale, and previously applied coatings.

I. Method #9 Cleaning (shrouded vacuum blasting without enclosure, lead paint containment and disposal):

1. Method #9 cleaning is utilized if and only if it is specifically allowed by CTA. Method #9 cleaning is a method of preparing steel surfaces using mechanical self-containing shrouded vacuum blasting equipment so as to remove and contain the blasting residue and removed paint without need for a separate enclosure. No surface is to be blasted if shrouds are not in contact with the steel surface. The prepared surface is to be in accordance with NACE No. 3/SSPC-SP 6 Commercial Blast Cleaning and be a visual match when compared to SSPC-VIS 1 for SP 6 cleaned surfaces and, when viewed without magnification, shall leave the cleaned surface free of all visible oil, grease, dirt, dust, mill scale, rust, coating, oxides, corrosion products, and other foreign matter except for staining. Random staining shall be limited to no more than thirty-three percent (33%) of each unit area of surface approximately 9 square inches (i.e. a square (3 in x 3 in)) and may consist of light shadows, slight streaks of minor discolorations caused by stains of rust, mill scale, and previously applied coatings. The Contractor shall completely remove all existing coatings. Acceptable variations in appearance that do not affect surface cleanliness include variations caused by type of steel, original surface condition, thickness of steel, weld metal, mill or fabrication marks, heat treatment, heat-affected zones, blasting abrasive, and differences in the blast pattern. Blast profile shall be 1.0 mil minimum, 1.5 mils maximum.
2. Hazardous waste containment and control procedures shall be utilized for lead-based paint removal.
3. Rust formed after cleaning shall be removed by re-blasting prior to coating. Dust from blasting shall be removed from cleaned surfaces by brushing, vacuum or blown-off with clean dry air prior to coating.
4. The maximum time allowed between cleaning and application of prime coat shall be twenty-four (24) hours. Under no circumstances shall steel be permitted to rust before coating regardless of time elapsed.
5. No blasting work shall be conducted when steel surface temperature is less than five (5) Degree F above the dew point.
6. The Contractor, when authorized by the Authority, may utilize Method #9 Cleaning in lieu of Method #1 Cleaning in order to achieve the project milestones, or at specific locations requiring unrestricted access to adjacent businesses.

3.04 SURFACE PREPARATION

A. Cleaning Structural Steel: All steel structure defined in this contract to be cleaned shall be cleaned by using Method #1, except as follows:

1. Hand Tool Cleaning (SSPC-SP 2) or Power Tool Cleaning (SSPC-SP 3) may be used as

supplement to Method #1 Cleaning for top surface of track stringer, cross girder and top lateral bracing between the track ties and top surfaces of track thru girders.

2. The Contractor, when authorized by the Authority, may utilize Method #4 Cleaning as a supplement or in lieu of Method #1 Cleaning at no additional cost to the Authority.
3. A modified Method #1 Cleaning procedure involving less stringent waste containment and disposal controls may be utilized when the Contractor demonstrates to the satisfaction of the Authority that the coating to be removed does not contain lead, arsenic, cadmium, and/or chromium.

B. Cleaning Architectural and Miscellaneous Structural Elements: All existing coatings to be removed shall be removed by using Method #1 Cleaning, except as follows:

1. All surfaces not accessible with ladders or requiring access from or above track level may be cleaned using Method #2 (wet abrasive blasting) upon approval by the Authority.
2. All other Station Architectural Elements may be cleaned using Method #3(High Pressure Water Wash). The Contractor is responsible for using a filtration system in all drainage areas during all High Pressure Water Wash. In addition, the Contractor shall employ Cleaning Method #6 (hand tool cleaning) or Cleaning Method #4 (power tool cleaning) or a combination of the two, where required to satisfactorily remove existing coatings and rust.
3. All exterior metal railings adjacent to roadways and on bridges and bridge supports, shall be cleaned using Cleaning Method #1 (dry abrasive blasting with enclosure) or #2 (wet abrasive blasting). The Contractor shall completely remove all existing coatings.
4. All galvanized metal surfaces shall be cleaned of dirt and grease using cleaning method #5 (Solvent Cleaning) prior to using cleaning method #6 (Hand Tool Cleaning) and cleaning method #4 (Power Tool Cleaning). Extra care shall be exercised with perforated surfaces.
5. All wooden surfaces shall be thoroughly cleaned using Cleaning Method #6 (Hand Tool Cleaning) and the surfaces shall be sandpapered with coarse, medium, and fine sandpaper to a smooth, even and uniform surface. Remove sanding dust from entire surface using air pressure before first coat is applied.
6. All painted concrete surfaces shall be cleaned using Cleaning Method #3 (High Pressure Water Wash). The Contractor is responsible for using a filtration system in all drainage areas during all cleaning operations.

C. Test Area: The Contractor shall, at the Contractor's own expense, clean minimum two- foot by two-foot area of the structure for each cleaning method to be utilized. After inspection and acceptance of the cleaned sample by the Authority, the sample shall become the standard for the remainder of this project. The Contractor shall, immediately upon acceptance, provide a clear protective coating to preserve these samples in their conditions as approved. Upon completion of the project, the test area shall be re-blasted and coated in accordance with this Specification.

D. Removal and Restoration of Attachments: Prior to commencement of cleaning work, station signs, advertisements and other attachments, including traffic and street lights that interfere with cleaning operations shall be removed by the Contractor without damage and stored in locations approved by the Authority. The Contractor shall be responsible for inventorying, storing and protecting all removed items. Upon completion of the coating work, only such items designated by the Authority shall be reinstalled by the Contractor; all other items shall be delivered to the Authority’s storage location as designated by the Authority.

E. Any adjacent surfaces, railroad ties, wires, cables or other appurtenances that must remain in close proximity to blast cleaning or subsequent coating operations shall be suitably protected by the Contractor to avoid damage from these operations. These items shall not be painted. Contractor will be held liable for any damage done to cables, wires or other appurtenances that remain in close proximity.

3.05 HAZARDOUS WASTE DISPOSAL AND POLLUTION CONTROL

A. Containment:

1. As a minimum requirement, the Contractor shall completely enclose the structure being blast-cleaned during all blasting operations and maintain the enclosure at a negative pressure relative to ambient of 0.3 inches water column. Negative pressure relative to ambient of 0.3 inches water column shall be maintained throughout the enclosure. The Contractor shall confirm daily with a manometer that the negative pressure requirement is maintained throughout the enclosure. The enclosure shall be constructed of a rigid support with positive joint seal. The material used as a cover shall be impermeably equivalent to 6-mils-thickness of polyethylene. A clearly marked, securable opening for ingress and egress shall be provided having minimum dimensions of 2' x 6'. The negative pressure system shall use HEPA filters and shall operate continuously, 24 hours a day, at the start of the lead abatement work through clean-up.
2. The blast enclosure shall have a complete ground cover which shall be sealed to the side and end closures to prevent any leakage of contamination. The ground cover shall be non-permeable, shall withstand vehicle movement and not tear by shoveling/scooping or other means of cleaning the waste. Plastic covers are not acceptable within 12 inches of any item which will be sandblasted.
3. The Contractor shall thoroughly clean the interior of the blast enclosure at the end of each work day and properly handle all waste as herein specified. Dust collected on the floor following abrasive air blasting shall not be removed by blowing with compressed air, brushing, broom, or by any other method that would re-suspend residues in the air. All dust and residue generated during the cleaning process shall be removed by HEPA vacuuming equipment.
4. All air exhausted from the enclosure to create a negative pressure within the enclosure shall be filtered to remove all hazardous and other particulate matter, in full compliance with all regulatory requirements of all governmental agencies.
5. All rigid elements of the enclosure shall be designed to sustain the maximum anticipated wind forces per Chicago Building Code Section 13-52, latest edition, for the period during which they will be maintained.
6. The Contractor shall be responsible for maintenance of the physical and structural integrity of the blast enclosure at all times of operation and during off hours. Any cracks or holes that may occur during the course of the work shall be repaired immediately. Improper construction or maintenance of the containment enclosure resulting in visible clouds of dust outside the containment, or particulate in the air above EPA allowable limits, will be considered unacceptable. The Contractor shall immediately remove or clean any dust or residue which is found outside of the containment.
7. The Contractor shall appoint personnel to inspect and maintain the enclosure at all times of the operation.
8. The Authority will have the right to stop the progress of work if the Contractor fails to maintain a sound enclosure or is found in violation of any safety rules, including safety rules of the Authority or of the site specific health and safety plan. No time extensions will be given for any lost time.

B. Disposal:

1. Waste materials shall be contained in receptacles approved by U.S. Department of Transportation (49 CFT) for the classification of waste involved. All containers of waste shall remain covered at all times except when adding waste.
2. All blasting residues shall be collected daily and deposited in all-weather containers supplied by the Contractor as temporary storage. Blast residues shall be collected and transferred carefully and shall not result in suspension of residues in air or contamination of surrounding surfaces. No residues shall remain on surfaces overnight. The all-weather

containers shall meet the requirements for the transportation of hazardous materials. At a minimum the containers shall be equipped with liners and have a tarpaulin cover. All containers shall be approved by the Authority prior to use on the site.

3. Comply with all methods and procedures required by governing agencies for the temporary storage, transport and disposal of all waste.
4. Provide the Authority with the Generator's copy of the manifests for disposal of all waste removed from the site. All waste transportation shall be provided by a licensed special waste hauler. When completing the Uniform Hazardous Waste Manifest for special/hazardous waste, Boxes 1,3 and B should be completed as follows: (1) ILD 005532205; (3) Chicago Transit Authority, 567 W. Lake Street, Chicago, Il 60661; (B) 0316005915.
5. The containers used for temporary storage and transport of the special waste, including hazardous waste, shall be managed in accordance with 40 CFR Part 265 Subpart I entitled "Use and Management of Containers". The containers shall be inspected on a daily basis.
6. Hazardous abrasive blast/paint debris: The Contractor shall conduct TCLP analysis for lead, arsenic cadmium and chromium to determine if waste generated is hazardous. Waste shall be stored off-site prior to land disposal in accordance with the treatment standards set forth in 40 CFR 26D.
7. Non-hazardous abrasive blast/paint debris: The Contractor shall test existing coatings, by methods approved by the Authority, to verify that they do not contain lead. For these areas, the Contractor shall propose an alternate method for disposal to be approved by the Authority and its designee.
8. The Contractor shall make arrangements to have other special waste, such as used paint solvent, paint cans and liners, and contaminated personal protective equipment (PPE) which it generates, transported to the Contractor's facility at the end of each day of which the waste is generated. The Contractor shall not combine solvents, PPE or any other hazardous or non-hazardous waste with the blast residue waste. All waste streams must be tested prior to transporting to avoid illegal transportation and storage of hazardous waste materials.
9. The containers used for temporary storage and transport of the waste shall placed within the enclosure or within a maximum distance of no more than 10 feet from the enclosure area in which work is being performed.
10. The Contractor shall collect and filter all contaminated water for power washing, steam cleaning, hygiene purposes, laundering of clothing if done on site, and cleanup activities. Filter visible paint chips and particulate from the water prior to placing it into the containers. Test the water for total toxic metals and provide ample filtration until the water is not classified as hazardous. Conduct the necessary laboratory testing as described above.
11. Make disposal arrangements with an Authority approved disposal facility.

C. Protective Equipment:

1. The Contractor shall provide and require all employees to wear all personal protective equipment required in 29 CFR 1926.
2. Adequate personal protective equipment shall be provided and maintained on the job at each specified work location job for use by up to three qualified Authority employees and each inspector from the Authority assigned to the project. This equipment shall be suitable to allow the Authority's personnel access to any area in which work is being performed.

3.06 COATINGS ON CLEANED METAL SURFACES

A. General

1. The coatings shall be applied only when weather conditions and steel surface conditions

comply with the coating manufacturer's recommendations or as modified herein. The Contractor shall take whatever steps are necessary to maintain controlled environment in order to ensure that pre-application, application and post-application conditions are in accordance with these documents and the coating manufacturer's recommendations.

2. Coatings shall be applied at the recommended spreading rates, but thicknesses shall not be less than the minimum dry film thickness specified. Should the spreading rate fail to produce full coverage of the required thickness in one coat, additional coating shall be applied until the minimum requirements are met.
3. Coatings shall be applied in strict compliance with the manufacturer's recommendations or as modified herein, including storage, mixing, handling, environmental conditions, surface temperature and additives for accelerated drying if necessary. All coating materials shall be delivered to the applicator in the manufacturer's original containers, unopened and with the label bearing the manufacturer's name, product identification and application instructions.
4. No coating work shall be conducted when the steel substrate surface temperature is less than five (5) degrees F above the dew point; or below or above the manufacturer's recommended steel surface temperature; or the surrounding air temperature is below 50 degrees F or expected to drop to 40 degrees F or below before the coating has cured or the relative humidity is over 85%; unless approved otherwise in writing by the manufacturer. The use of a special part B for the epoxy may be required.
5. Ties are to remain in place. Apply coating to 100% of the top surfaces of track stringers and bracing between the ties, and to 100% of the surfaces of the cross girders.
6. Contractor shall contain over-spray during coating spray operations. Contractor shall not build-up coating in vicinity of wood ties or power distribution cables.

B. In preparation of previously painted surfaces when it is approved by the Authority not to remove all existing coating or the existing coatings are determined to not contain lead; it is necessary to remove all corrosion and all coating which shows evidence of corrosion, peeling, excessive thickness, brittleness, blistering, scaling or general disintegration. It is essential that the removal of the old coating be carried back around the edges of the spot or area until an area of completely intact and adhering coating film, with no rust or blisters underneath, is attained. Edges of tightly adherent coating remaining around the area to be recoated shall be feathered so that the repainted surface can have a smooth appearance. The remaining old coating should have sufficient adhesion so that it cannot be lifted as a layer either by inserting a blade of dull putty knife under it or cracked off by impact of a hand chipping hammer. Priming, protective coating, and top coating are required for surfaces where the old coating and primer has been fully removed. For surfaces where the old primer is in sound adhesion to the substrate, protective coating and a top coating are only required.

C. Inspection: All surfaces to be coated shall be thoroughly cleaned to the satisfaction of the Authority and shall be inspected in accordance with the inspection requirements outlined in the Contractor's Quality Program as specified in guidelines for contractor's quality program of this contract and accepted by the Authority before any coating is applied.

D. Epoxy-Mastic Protective Coat

1. Deeply pitted areas shall receive one (1) brush-applied spot coat of protective coating material, 5 mils dry film thickness.
2. All cleaned areas of the entire metal structure, plus three (3) inches of adjacent concrete surfaces and the deeply pitted spot-prime areas, shall receive one (1) coat of protective primer material between seven (7) mils minimum and eleven (11) mils maximum dry film thickness, above the metal substrate.

E. Top Coat

1. The entire structure shall receive a minimum of one (1) spray coat or two (2) rolled coats

of Aliphatic Acrylic Urethane top coat material, between three (3) mils minimum and five (5) mils maximum dry film thickness. When applying recoats, all additional coats are to be within manufacturer's recoat window.

2. Top coating should be applied as soon as recommended by the manufacturer, as specified in the Contract Documents, and/or as approved by the Authority.
3. All material shall be applied within recoat windows per manufacturer's requirements.

F. Clean-Up

1. Oily or paint-filled rags or waste and other combustible materials shall be the responsibility of the Contractor. The Contractor shall dispose of these materials in metal containers with tight fitting lids on a daily basis. The proper disposal of these materials is the responsibility of the Contractor.
2. Prior to final completion and acceptance, the Contractor shall examine all painted and finished surfaces and retouch or refinish as necessary to leave all surfaces in acceptable condition to the Authority.
3. Upon completion of the work, the Contractor shall remove all coating and varnish spots from floors, glass and other surfaces and remove all rubbish and other accumulated materials of this nature from the premises and dispose of same legally. Work areas shall be left in a clean and orderly condition acceptable to the Authority.
4. The areas where surface preparation work is being performed shall be cleaned of all residue and be in broom clean condition upon completion of each day's work.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of CLEANING AND PAINTING OF EXISTING SURFACES shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of CLEANING AND PAINTING OF EXISTING SURFACES shall be included in the contract lump sum price as shown in the Schedule of Prices for STRUCTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Structural Work: 030000

END OF SECTION

SECTION 09 96 23

GRAFFITI RESISTANT COATINGS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this section.

1.02 SUMMARY

A. This Section specifies requirements for furnishing and installing a graffiti resistant coatingsystem, including all labor, materials and equipment.

B. The Work under this Section shall include surface preparation and graffiti resistant coatingsystem application for the following areas:

1. Exposed exterior concrete.
2. Architectural precast concrete.
3. Masonry walls including brick, concrete block, glazed brick, structural glazed tile andterra cotta.
4. Limestone, cast stone.
5. Metal surfaces.
6. Wood surfaces.

C. Related Sections: The following sections contain requirements that relate to this Section.

1. Division 03 Sections, Concrete.
2. Division 04 Sections, Masonry.
3. Division 04 Sections, Cast Stone.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's technical information, label analysis and applicationinstructions.

B. Samples: The Contractor shall provide a sample area, which is representative of a job site application. Based upon the Authority’s approval, the sample shall serve as a standard ofacceptance for all further work.

1. Sample to be a 48” X 48” board of material similar to that being treated with graffiti resistant coatings or a similar area of the actual wall and material to be treated; the location of which shall be selected and approved by the Authority. Provide a sample of each different type of material to be treated. Apply according to manufacturer’sapplication instructions.
2. Allow the test panel(s) to dry 3 to 7 days before inspection.
3. Keep the test panel(s) available for comparison throughout the cleaning project.

C. Certifications: Provide installer’s certification from the manufacturer indicating he is an acceptable installer of the manufacturer’s anti-graffiti products.

D. VOCs: Provide certification by the manufacturer that the products supplied comply with requirements indicated that limit the amount of VOCs in coating products.

E. Warranty: Submit a copy of the warranty signed by the manufacturer and installer for review and approval.

1.04 QUALITY ASSURANCE

A. Material Quality: Provide the manufacturer's best quality trade sale graffiti resistant coatingproducts, from one manufacturer, for the anti-graffiti system.

B. Material shall be delivered in original, sealed containers, clearly labeled with manufacturer's name, brand name and batch number of the material.

C. The Contractor shall provide evidence indicating that the proposed applicators are certifiedby the manufacturer indicating that they are fully qualified to perform the work.

1.05 PERFORMANCE REQUIREMENTS

A. Provide anti-graffiti coating system complying with the following:

1. Coatings shall not require re-application regardless of number of graffit taggingsduring the life of the 10 year performance warranty period.
2. Coatings shall show no signs of deterioration or change of appearance after graffitiremoval during the warranty period, including no ghosting, staining or shadowing.
3. Coatings shall be such that all types of paint and other graffiti materials shall beremovable from treated surfaces without damaging the coating or the substrate.
4. Upon graffiti removable, no evidence of graffiti shall remain.
5. Coatings shall be capable of withstanding a minimum of 120 cleaning cycles overthe same area without measureable coating deterioration.
6. Coatings shall not increase the dirt pick-up of the substrate.
7. Coatings shall not change the appearance, including color, texture and sheen, of the substrate finish nor cause deterioration of the substrate material.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the project site in manufacturer’s original, unopened packages and containers bearing manufacturer’s name and label with the following information:

1. Name or title of material.
2. Product description (generic classification or binder type).
3. Manufacturer’s stock number and date of manufacture.
4. Contents by volume, for pigment and vehicle constituents.
5. Thinning instructions.
6. Application instructions.
7. Color name and number.
8. Handling instructions and precautions.

B. Store materials not in use in tightly covered containers in a well ventilated area at a minimum ambient temperature of 45 degrees F. Keep from freezing. Maintain containers in a clean condition, free of foreign materials and residue.

1. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fireand health hazards resulting from handling, mixing and applying coatings.

1.07 PROJECT CONDITIONS

A. Apply coatings only when temperature of surfaces to be coated and surrounding air

temperatures are between 45 and 95 degrees F.

1. If freezing conditions exist prior to application, adequate time shall be allowed forsurfaces receiving coating to warm.

B. Do not apply coatings in snow, rain, fog or mist when relative humidity exceeds 85 percent; at temperatures less than 5 degrees F above the dew point; or to damp or wet surfaces.

1. Allow wet surfaces to dry thoroughly and attain temperature and conditions specifiedbefore proceeding with or continuing coating operation.

1.08 EXTRA MATERIALS

A. Furnish graffiti coating materials and removal materials in quantities described below. Package materials in unopened, factory sealed containers for storage and identify with labels describing contents.

1. Coating materials: One half case (6, 16 ounce bottles) of each type.
2. Removal materials: One full case (12, 16 ounce bottles) of each type.

1.09 WARRANTY

A. System Warranty: Provide a written warranty signed by the manufacturer and installer, agreeing to repair or replace work that exhibits defects in materials or workmanship. Defects are defined to include failure to withstand complete graffiti removal, ghosting, shadowing, chemical staining, yellowing and normal environmental effects.

1. Warranty Period: ten (10) years from the date of final acceptance.

PART 2 - PRODUCTS

2.01 PRODUCTS

A. Graffiti Resistant Coatings: Manufacturer's penetrating water repellent, clear, one-component silicone elastomer graffiti-resistant coatings, designed to protect against penetration of water and graffiti, suitable for use on masonry, stone, concrete, steel or wood, with no surface build-up or gloss, with treated surfaces retaining natural color, texture andappearance:

B. All products for the anti-graffiti systems shall be from a single manufacturer including, if applicable, base coating, top coating and removal agent.

C. Anti-graffiti products shall be “breathable” so as not to trap moisture.

D. Manufacturers providing products that may meet the requirements of this specification include, but are not exclusive of, the following:

1. American Polymer Corp.
2. ProSoCo, Inc.
3. CSL Silicones.
4. Approved equal.

E. Provide one system that shall be suitable for all substrates or provide different systems fordifferent substrates.

2.02 ANTI-GRAFFITI COATING MATERIALS

A. VOC Classification: Provide materials that comply with South Coast Air Quality Management District's VOC classification.

B. Coatings shall meet requirements of the following:

1. ASTM B 117 and ASTM D 714 (salt spray minimum acceptable of 8000 hours).
2. ASTM D 530 (hardness).
3. ASTM D 412 (tensile strength and elongation).
4. ASTM D 522 (pass 3/8 inch mandrel).
5. ASTM D 968 (abrasion test).
6. ASTM E 96 (vapor transmission).
7. Water clear, non-yellowing, free of waxes and urethanes.
8. Non-toxic, non-flammable, biodegradable with a PH 7 – 8.5.
9. Shall allow moisture vapor transmission.

C. Undercoating: GSS Barrier; water-based undercoating used as a sealer over porous surfaces. Provide high-solids version for use over porus or uneven surfaces.

D. Topcoating: GSS-10; permanent anti-graffiti top coating.

1. Finish: Matte (Matte is defined as the finish of the top coating reading less than fivedegrees on a Gardener Gloss Meter).

E. Graffiti Remover: GSS Erasol; non-caustic, biodegradable and recyclable, allowing graffiti removal without the use of blasting equipment, hot water or high pressure wash equipment.

2.03 COLOR

A. Color: Clear unless specified otherwise.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine surfaces to be clean and free of oil, grease, laitance, efflorescence and any other contaminants that could prevent good adhesion. Do not begin application until unsatisfactory conditions have been corrected. Start of coating application will be construed as the applicant's acceptance of surface and conditions within a particular area.

1. Do not coat surfaces if moisture content exceeds manufacturer's recommendationfor installation of coating materials.

B. Coordination of Work: Ensure compatibility of total system for various substrates. Coatings shall be from one manufacturer and recommended for the specific substrate and finish materials.

3.02 PREPARATION

A. Surface Preparation: Concrete surfaces scheduled to receive anti-graffiti coating shall be cleaned with a non-etching acidic cleaner specifically formulated for cleaning concrete, brick and cast stone. Cleaners containing muriatic acid shall not be used. Follow manufacturer's printed instructions for cleaning and neutralizing. Final rinse shall be with clean water. Allow surfaces to dry a minimum of 24 hours before application of graffiti resistant coating.

1. Schedule cleaning and coating application so dust and other contaminants

fromcleaning process will not fall on wet newly coated surfaces.

2. Clean and prepare surfaces to be coated according to manufacturer's writteninstructions for each substrate condition and as specified.
3. Cementitious Substrates: Remove efflorescence, chalk, dust, dirt, grease, oils andrelease agents from concrete and masonry substrates. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, usemechanical methods to prepare surfaces.
4. Metal Substrates: Clean ferrous metal surfaces that have been shop coated, removeoil, grease, dirt and other foreign substance.

B. Protection of Adjacent Surfaces: Protect all adjacent surfaces that may come in contact with the product using polyethylene or other proven protective materials. Protect work of other trades. Protect areas and objects nearby from wind drift during application. Protect glass and plastics. Remove plates and similar items if practical and re-install upon completion of coating work.

C. Prepare and mix materials according to manufacturer's directions. Do not dilute or alter.

D. Material Preparation: Carefully mix and prepare coatings materials according to manufacturer's written instructions.

1. Maintain containers used in mixing and applying coatings in a clean condition, freeof foreign materials and residue.
2. Stir materials before applying to produce a mixture of uniform density. Stir asrequired during application.

3.03 APPLICATION

A. General: Apply all coatings according to manufacturer's written instructions.

1. Use applicators and techniques best suited for the material being applied and thesubstrate that is being coated.

    a. Do not apply coatings over dirt, rust scale, grease, moisture, scuffed surfaces or conditions detrimental to forming a durable coating film.
    b. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until coating has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and application of another coat does not cause undercoat to lift or lose adhesion.

B. Application Over Cementitious Surfaces:

1. Base: One coat or as many coats as necessary to achieve a pinhole free surface of barrier undercoating as specified by manufacturer; 3 to 4 mils minimum dry filmthickness or more if required by the manufacturer.
2. Finish: One coat of clear top coating; 3 to 4 mils minimum dry film thickness or more if required by the specific substrate and/or as required by the manufacturer to satisfythe warranty requirements.

C. Application Over Primed Metal Surfaces:

1. Finish: One coat of top coating; 3 to 4 mils minimum dry film thickness.

D. Application Over Painted Wood:

1. As recommended by anti-graffiti coatings manufacturer.

E. Smooth or protected surface application: Apply liberally with saturated cloth.

F. Rough/Porous or unprotected surface application: Apply with a brush or low-pressure spray.

G. Match the Authority's approved sample for color, texture and coverage. If the results are unsatisfactory as determined by the Authority, remove, reapply or recoat work that does notcomply with specified requirements.

3.04 FIELD QUALITY CONTROL

A. If required by the Authority, Contractor to engage and pay for the services of an independent qualified testing agency, approved by the Authority, to sample the coating material being used.

B. Testing agency shall perform the appropriate tests for the following characteristics:

1. Quantitative materials analysis.
2. Absorption.
3. Accelerated weathering.
4. Accelerated yellowness.
5. Alkali and mildew resistance.
6. Abrasion resistance.
7. Washability.

C. Work or materials found not to be as specified herein shall be either removed and reapplied or corrected and reapplied at the direction of the Authority and at no cost to the Authority.

D. Demonstration: Apply alkyd based graffiti to a 2 foot square treated area selected by the Authority. Five (5) days minimum after application, demonstrate complete removal of the graffiti in the presence of the Authority.

3.05 CLEANING AND PROTECTION

A. Upon completion of work, clean all areas, using care not to damage adjacent finished surfaces. Properly dispose of rubbish, empty cans, rags and other discarded materials fromthe project site.

B. After completion of coating application, remove temporary protective wrapping provided by others for protection of their work. Remove spattered coatings by washing, scraping or otherapproved methods. Do not scratch or damage adjacent finished surfaces.

C. Provide "wet paint" signs to protect newly coated areas.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 09 96 23, Graffiti Resistant Coatings shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 09 96 23, Graffiti Resistant Coatings shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 10 14 16
PLAQUES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes providing and installing metal identifying, informational and/or way-finding plaques at interior and exterior locations as shown on the drawings and specified herein.

B. Related Requirements:

1. Section 07 90 00, “Joint Sealants”.
2. Section 10 42 50, “Vitreous Enameled Steel Signs”.
3. Section 10 42 60, “Illuminated Signs”.
4. Section 10 42 70, “Fiberglass Embedded Signs”.
5. Section 10 42 80, “Aluminum Signs”.
6. Section 10 42 90, “Braille Tactile Signs”.

1.03 DEFINITIONS

A. Accessible: In accordance with the local accessibility standards and requirements.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals.

C. Shop Drawings: For plaques.

1. Include fabrication and installation details and attachments to other work.
2. Show plaque mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
3. Show message list, typestyles, graphic elements, including raised characters and Braille (if applicable), and layout for each plaque; at least at half size scale.

D. Samples for Initial Selection: For each type of plaque, exposed component, and exposed finish.

1. Include representative Samples of available typestyles and graphic symbols.

E. Samples for Verification: For each type of plaque showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:

1. Plaques: Full-size Sample.
2. Exposed Accessories: Full-size Sample of each accessory type.

3. Full-size Samples, if approved, will be returned to Contractor for use in the Project.

F. Product Schedule: For plaques. Use same designations indicated on Drawings or specified.

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and manufacturer.

B. Sample Warranty: For special warranty.

1.06 CLOSEOUT SUBMITTALS

A. Maintenance Data: For plaques to include in maintenance manuals.

1.07 QUALITY ASSURANCE

A. Manufacturer Qualifications: Provide experience and performance qualifications for providing plaques of similar type and scope indicated for this project.

B. Installer Qualifications: An entity that employs installers who are experienced, trained and approved by manufacturer.

1.08 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of plaques that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Deterioration of finishes beyond normal weathering.
b. Deterioration or delamination of embedded graphic image.
c. Installation failures.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design"; the ABA standards of the Federal agency having jurisdiction and ICC A117.1.

2.02 PLAQUES

A. Etched Plaque: Chemically etched or photochemically engraved metal sheet or plate with texture, border, and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. A.R.K. Ramos.
b. ACE Sign Systems, Inc.
c. Advance Corporation.
d. Doyle.
e. Erie Landmark Company; a division of Paul W. Zimmerman Foundries.
f. Gemini Incorporated.
g. Metallic Arts.
h. Mohawk Sign Systems.
i. Nelson-Harkins Industries.
j. Signs & Decal Corp.
k. Southwell Company (The).
l. St. Paul Stamp Works, Inc.
m. Steel Art Company.
n. Approved equal.

2. Plaque Material: Sheet or plate aluminum or stainless steel; as shown on the drawings or as selected by the CTA.
3. Plaque Thickness: 0.250 inch; as shown on the drawings or as selected by the CTA.
4. Finishes:

a. Integral Stainless-Steel Finish: Acid etched.
b. Acrylic Baked-Enamel or Powder-Coat Finish: Manufacturer's standard, in color as selected by the CTA from manufacturer's full range.
c. Overcoat: Manufacturer's standard baked-on clear coating.

5. Integral Edge Style: Square cut, polished, Plain bevel, brushed; or as shown on the drawings or selected by the CTA.
6. Applied Frame Material, Style, and Finish: As indicated on Drawings or as selected by the CTA.
7. Mounting: Concealed studs, Rosette-head through fasteners, Countersunk flathead through fasteners, Adhesive, Two-face tape; as shown on the drawings or as selected by the CTA.
8. Text and Typeface: Accessible raised characters and Braille, Typeface as selected by CTA, Typeface matching approved samples or as selected by the CTA from manufacturer's full range. Finish raised characters to contrast with background color, and finish Braille to match background color.

2.03 MATERIALS

A. Aluminum Sheet and Plate: ASTM B209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

B. Stainless-Steel Sheet: ASTM A240 or ASTM A666, Type 304 or Type 316 as shown on the drawings or as selected by the CTA; stretcher-leveled standard of flatness.

2.04 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of plaques, noncorrosive and compatible with each material joined, and complying with the following:

1. Use concealed fasteners and anchors unless indicated to be exposed.
2. For exterior exposure, furnish nonferrous-metal or stainless-steel devices unless otherwise indicated.

3. Exposed Metal-Fastener Components, General:

a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.
b. Fastener Heads: For nonstructural connections, use flathead or oval countersunk screws and bolts with tamper-resistant Allen-head, spanner-head or one-way-head slots unless otherwise indicated.

4. Plaque Mounting Fasteners:

a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of plaque, screwed into back of plaque, or screwed into tapped lugs cast integrally into back of plaque unless otherwise indicated.
b. Through Fasteners: Exposed metal fasteners matching plaque finish, with type of head indicated, installed in predrilled holes.

B. Adhesive: As recommended by plaque manufacturer.

C. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch thick, with adhesive on both sides.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187.

2.05 FABRICATION

A. General: Provide manufacturer's standard plaques according to requirements indicated.

1. Preassemble plaques in the shop to greatest extent possible. Disassemble plaques only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
4. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
5. Provide rabbets, lugs, and tabs necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match plaque finish.

B. Surface-Engraved Graphics: Machine-engrave characters and other graphic devices into indicated plaque surface to produce precisely formed copy, incised to uniform depth.

1. Engraved Metal: Fill engraved graphics with manufacturer's standard baked enamel.

C. Brackets: Fabricate brackets, fittings, and hardware for bracket-mounted plaques to suit plaque construction and mounting conditions indicated. Modify manufacturer's standard brackets as required.

1. Stainless-Steel Brackets: Factory finish brackets to match plaque background with No. 4 finish unless otherwise indicated.

2.06 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Acid Etched Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

2.07 ALUMINUM FINISHES

A. Acrylic, Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

2.08 STAINLESS-STEEL FINISHES

A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

B. Polished Stainless Steel Finishes: Acid etch Grind and polish surfaces to produce uniform finish, free of cross scratches.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Verify that plaque-support surfaces are within tolerances to accommodate plaques without gaps or irregularities between backs of plaques and support surfaces unless otherwise indicated.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. General: Install plaques using mounting methods indicated and according to manufacturer's written instructions.

1. Install plaques level, plumb, true to line, and at locations and heights indicated, with plaque surfaces free of distortion and other defects in appearance.
2. Install plaques so they do not protrude or obstruct according to the accessibility standard.
3. Before installation, verify that plaque surfaces are clean and free of materials or debris that would impair installation.
4. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

B. Mounting Methods:

1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of plaque. Remove loose debris from hole and substrate surface.

    a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place plaque in position and push until flush to surface, embedding studs in holes. Temporarily support plaque in position until adhesive fully sets.
    b. Thin or Hollow Surfaces: Place plaque in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.

2. Through Fasteners: Drill holes in substrate using predrilled holes in plaque as template. Countersink holes in plaque if required. Place plaque in position and flush to surface. Install through fasteners and tighten.
3. Brackets: Remove loose debris from substrate surface and install bracket supports in position, so that plaque is correctly located and aligned.
4. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of plaque and of suitable quantity to support weight of plaque after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as plaque is applied and to prevent visibility of cured adhesive at plaque edges. Place plaque in position, and push to engage adhesive. Temporarily support plaque in position until adhesive fully sets.
5. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of plaque and of suitable quantity to support weight of plaque without slippage. Keep strips away from edges to prevent visibility at plaque edges. Place plaque in position, and push to engage tape adhesive.
6. Shim-Plate Mounting: Provide 1/8-inch-thick, concealed aluminum shim plates with predrilled and countersunk holes, at locations indicated, and where other direct mounting methods are impractical. Attach plate with fasteners and anchors suitable for secure attachment to substrate. Attach plaques to plate using method specified above.

C. Sealant: For exterior installations, provide a continuous bead of clear sealant at perimeter where plaque meets the substrate.

3.03 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed plaques and plaques that do not comply with specified requirements. Replace plaques with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as plaques are installed.

C. On completion of installation, clean exposed surfaces of plaques according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain plaques in a clean condition during construction and protect from damage until acceptance by CTA.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 10 14 16, Plaques shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 10 14 16, Plaques shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 10 20 00

LOUVERS AND VENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this section.

1.02 SUMMARY

A. This Section includes the following:

1. Fixed metal wall louvers.
2. Blank-off panels for wall louvers.
3. Bird screens.

1.03 RELATED WORK

A. Division 07 Section, Joint Sealers

1.04 REFERENCES

A. AMCA Standard 500 - Test Method for Louvers, Dampers and Shutters; Air Movement and Control Association, Inc.

B. SSPC-Paint 12 - Paint Specification No. 12: Cold-Applied Asphalt Mastic (Extra Thick Film).

1.05 DEFINITIONS

A. Louver Terminology: Refer to AMCA Publication 501-85 for definitions of terms for metal louvers not otherwise defined in this section or referenced standards.

1.06 PERFORMANCE REQUIREMENTS

A. Structural Performance: Design, engineer, fabricate, and install exterior metal wall louversto withstand the effects of loads and stresses from wind and normal thermal movement, without evidencing permanent deformation of louver components including blades, frames, and supports; noise or metal fatigue caused by louver blade rattle or flutter; and permanentdamage to fasteners and anchors:

1. Wind Load: Uniform pressure (velocity pressure) of 25 lb per sq. ft. acting inwards or outwards.
2. Normal thermal movement is defined as that resulting from the following maximum change (range) in ambient temperature. Base design calculations on actual surface temperatures of metals due to both solar heat gain and night time sky heat loss. Temperature change (range); 100 degrees Fahrenheit.

B. Air Performance, Water Penetration, and Air Leakage Ratings: Provide storm-resistant louvers complying with performance requirements indicated as demonstrated by testing manufacturers stock units, of height and width indicated, according to Air Movement and Control Association (AMCA) Standard 500.

1. Provide louvers which comply with the AMCA certified ratings program requirements

and bear the AMCA seal for the specified air performance and water penetration ratings. Louver free area velocities shall not exceed values which result in a staticpressure drop greater than 0.15 inches of water, or which result in water penetration in excess of 0.025 oz./ft^2 of free area when tested in accordance with AMCA Standard 500.

1.07 SUBMITTALS

A. Product data for each product indicated.

B. Shop drawings for the fabrication and installation of louver units and accessories. Includeplans, elevations, sections, and details showing profiles, angles, spacing of louver blades;unit dimensions related to wall openings and construction; free areas for each size indicated;and profiles of frames at jambs, heads and sills. Include location and size of screens.

C. Structural Calculations: Where installed products are indicated to comply with structural design loadings, furnish engineering calculation to show that maximum stresses and deflections do not exceed specified performance requirements under full design loading. Calculations shall be prepared and sealed by an engineer licensed to practice in the State of Illinois.

D. Samples for verification purposes of each type of metal finish required, prepared on 6-inch square metal samples of same thickness and alloy indicated for final unit of Work.

E. Product test reports evidencing compliance of units with performance requirements indicated, including the louver air performance, water penetration ratings, test data and metal thickness.

F. Product certificates signed by louver manufacturers certifying that their products comply with Project requirements and are licensed to bear AMCA Seal based on tests made in accordance with AMCA Standard 500 and complying with AMCA Certified Ratings Program.

G. Qualification data for firms and persons specified in "Quality Assurance" article to demonstrate their capabilities and experience.

1.08 QUALITY ASSURANCE

A. Single Source Responsibility: Obtain louvers and vents from a single source.

B. Qualify welding processes and welding operators in accordance with D1.3 "Structural Welding Code - Sheet Steel."

1. Certify that each welder employed in unit of Work of this section has satisfactorilypassed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.
2. Testing for recertification is Contractor's responsibility.

C. Engineer Qualifications: Professional engineer licensed to practice in jurisdiction where project is located and experienced in providing engineering services of the kind indicated which has resulted in the successful installation of louvers similar in material, design, andextent to that indicated for this Project.

D. SMACNA Standard: Comply with SMACNA "Architectural Sheet Metal Manual" specifications for fabrication, construction details, and installation procedures.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store materials in manufacturer's original packaging with labels to show name,brand, type, and grade. Store materials in protected dry location off ground in accordancewith manufacturer's instructions.

1.10 PROJECT CONDITIONS

A. Field Measurements: Check actual louver openings by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of the Work. Where field measurementscannot be made without delaying the Work, guarantee opening dimensions and proceed with fabrication of louvers and vents without field measurements. Coordinate wall construction to ensure actual opening dimensions correspond to guaranteed dimensions.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Aluminum:

1. Aluminum Extrusions: ASTM B 221, alloy 6063-T5 or T-52.
2. Aluminum Sheet: ASTM B 209, alloy 3003 or 5005 with temper as required forforming, or as otherwise recommended by metal producer for required finish.

B. Stainless Steel:

1. Stainless Steel for Frame and Louvers: ASTM A480, rollable temper steel, Type 316; No. 4 finish, vertical strokes, unless noted otherwise.
2. Stainless Steel Sheet: ASTM A 666, Type 316, with No. 4 finish.

C. Angles, Plates, Bars, and Accessories: Provide as required to join or reinforce assembly of louver components. Alloys as required to join or reinforce assembly of louver components, allow as recommended by manufacturer or fabricator. Provide ASTM A36/A36M steel members, hot-dip galvanized in accordance with ASTM A123.

D. Stainless Steel Fasteners: Stainless steel type 316, selected to prevent galvanic action with the components fastened. Where exposed in finished surfaces, use oval-head countersunk Phillips head screws with finish and color to match adjacent surfaces. Do notuse self-tapping sheet metal screws.

1. Use types, gauges, and lengths to suit unit installation conditions.

E. Anchors and Inserts: Of type, size, and material required for type of loading and installationindicated. Use nonferrous metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or expansion bolt devices for drilled-in-place anchors.

F. Bituminous Paint: SSPC-Paint 12 (cold-applied asphalt mastic).

2.02 MANUFACTURERS

A. Louvers and Vents:

1. Airline Products Co.
2. Airolite Co.
3. American Warming and Ventilating, Inc.
4. Arrow United Industries.

5. Construction Specialties, Inc.
6. Dowco Products Group; Safe-Air of Illinois, Inc.
7. Greenheck.
8. Hohmann & Barnard, Inc.
9. Industrial Louvers, Inc.
10. Penn Ventilator Co., Inc.
11. Reliable Metal; Hart & Cooley, Inc.
12. Ruskin Mfg. Div., Phillips Industries, Inc.
13. Or approved equal.

2.03 FABRICATION, GENERAL

A. General: Fabricate louvers and vents to comply with requirements indicated for design, dimensions, materials, joinery, and performance. Coordinate shop drawings, field measurements, and shop fabrication.

B. Preassemble louvers in shop to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

C. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.

D. Fabricate frames, including integral sills, to fit in openings of size indicated with allowances made for fabrication and installation tolerances of louvers, adjoining construction, and perimeter sealant joints. Fabricate frames of channel type sections to indicated profiles with features and clearances to suit installation conditions. Provide clearance or recesses as required to accommodate sealant between louver and adjacent construction.

E. Include supports, anchorages, and accessories required for complete assembly.

F. Provide vertical mullions of type and at spacings indicated but not further apart than specified by manufacturer, or 72 inches on center, whichever is less. At horizontal joints between louver units provide horizontal mullions except where continuous vertical assemblies are indicated.

G. Provide sill extensions and loose sills made of same material as louvers, where required fordrainage to exterior and to prevent water penetrating to interior.

H. Unless otherwise indicated, or size of louver assembly makes bolted connections betweenframe members necessary, join frame members to one another and to fixed louver blades with fillet welds, concealed from view; or mechanical fasteners; or a combination of these methods; as standard with louver manufacturer.

I. Workmanship: Provide continuous line louvers unless otherwise shown and conceal intermediate structural supports behind the louver blades. Carefully fit and match all Workwith continuity of line and design. Rigidly secure joints with hairline contact, unless otherwise indicated. Reinforce members and joints with plates, bars, rods or angles for rigidity and strength as needed to fulfill performance requirements. Complete the welding, cutting, drilling and fitting of joints prior to the application of finishes. Fit and assemble all Work in theshop insofar as practicable. Mark and disassemble units, which are too large for shipmentto project site, retaining units in sizes as large as possible for shipment and erection.

J. Welding: Use electrodes and methods recommended by manufacturer for material being

welded, and in accordance with applicable AWS standards. Use only methods, which prevent distortion and discoloration of exposed faces. Grind weld areas smooth and restoremechanical finish condition before proceeding with other treatments.

K. Fastenings: Conceal all fastenings unless otherwise indicated. Use concealed stainless steel fasteners for joints, which cannot be welded.

L. Dissimilar Materials: Separate dissimilar materials with a heavy coating of epoxy paint in minimum mil dry film thickness or other suitable permanent separation as required to preventgalvanic action.

2.04 FIXED LOUVER CONSTRUCTION

A. Horizontal Dual Drain Fixed Blade Louvers: Metal louver blades with supporting metal framework. Louvers to incorporate weep holes, continuous drip at sill, and integral waterstop on inside edge of sill.

B. Fabricate blades and frame from sheet metal, minimum thickness of 0.062 inch for framesand 0.052 inch for blades.

C. Minimum free area to be 50 percent; design air velocity to be 500 feet per minute; no water penetration below design velocity; maximum static pressure drop at design velocity to be 0.18 inch water.

D. Fabricate louver assemblies from galvanized sheet metal or galvanize louver assemblies after fabrication. Touch up galvanizing at welds or other abrasions prior to finish coats. Prefinish metal louver assemblies in the factory after fabrication.

2.05 DRAINABLE ALUMINUM STEEL LOUVERS

A. Size and configuration as indicated, with minimum 4" deep storm resistant blades. Exhaustfan louvers shall be strengthened and sized for fan volume and velocity through the louver by the fabricator.

2.06 DRAINABLE STAINLESS STEEL LOUVERS

A. Size and configuration as indicated, with minimum 4" deep storm resistant blades. Exhaustfan louvers shall be strengthened and sized for fan volume and velocity through the louver by the fabricator.

2.07 INSULATED BLANK-OFF PANELS

A. Insulated Blank-Off Panels: Provide insulated blank-off panels at inactive louver areas. Fabricate of galvanized steel sheet, not less than 16 gauges. Laminate foil-faced mineral fiber insulation to back side, and seal edges of foil with suitable waterproof tape.

B. Mineral Fiber Insulation for Blank-Off Panels:

1. ASTM C612, Class 2, rock fiberboard. Thermal conductivity of "k" = 0.25 Btu in./hr.ft^{2} degrees F. Nominal 4-pcf density. Integral scrim-reinforced foil vapor barrier withASTM E96 water vapor permeance rating of maximum 0.1 perms.
2. Fire Rating: ASTM E84, not greater than flame spread rating of 25, and smoke developed of
3. Thicknesses and thermal resistance ratings as indicated. Provide greater thickness or density if necessary to obtain required fire resistance.
4. Manufacturers: Subject to compliance with requirements, provide mineral

fiberinsulation by one of the following manufacturers:

a. "Thermafiber CW Insulation", U.S. Gypsum Co.
b. "FBX Curtain Wall Insulation", Fibrex, Inc.
c. Or approved equal.

2.08 LOUVER SCREENS

A. General: Cover louver openings with removable louver insect screens complying with the following requirements:

1. Screen Location for Exterior Fixed Louvers: Interior face, unless otherwise indicated.

B. Secure screens to louver frames with stainless steel machine screws, spaced at 3 inches from each corner and at 12 inch o.c. between.

C. Louver Screen Frames: Fabricate screen frames with mitered corners to louver sizes indicated and to comply with the following requirements:

1. Metal: Same kind and form of metal as indicated for louver frames to which screensare attached, aluminum or galvanized steel. Reinforce screen frames at corners withclips.
2. Finish: Same or match finish of louver frames to which louver screens are attached.
3. Type: Rewireable folded frames with a driven spline or insert for securing screen mesh.

D. Louver Screening for Louvers: Provide insect screening of 18 x 16 mesh formed with 0.012-inch diameter aluminum, stainless steel or galvanized wire as indicated on the drawings orto match the frame material.

2.09 FINISHES, GENERAL

A. Comply with NAAMM "Metal Finishes Manual" for specifications relative to application and designations of finishes.

B. Finish metal fabrications after assembly.

C. Protect finishes on exposed surfaces from damage by use of strippable temporary protectivecovering prior to shipment.

2.10 FINISH OF METAL FABRICATIONS

A. PVDF Finish Coating: Finish of exposed surfaces shall be polyvinylidene fluoride (PVDF) finish coating, containing not less than 70% Elf Atochem "Kynar 500" or Ausimont "Hylar 5000" fluorocarbon resin coating with a dry film thickness of 0.8 mil. Shop-applied and baked-on by licensed applicator. Remove die markings, scratches, abrasions, dents and other blemishes before applying finish. Finish coat color to be dark brown.

1. Air-Dry PVDF Touch-Up: Provide polyvinylidene fluoride finish coating containing Ausimont "Hylar ADS" or Elf Atochem "Kynar ADS" fluorocarbon resin and formulated for air-drying at ambient temperature. Provide for field touch-up and furnish in color to match shop-applied finishes.

B. High-Performance Organic Finish: Prepare, pretreat, and apply coating to galvanized metalsurfaces that will be exposed to view to comply with coating and resin manufacturer’s written instructions.

1. Fluoropolymer 3-Coat System: Manufacturer’s standard 3-coat, thermocured system consisting of specially formulated inhibitive primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear topcoat containingnot less than 70 percent polyvinylidene fluoride resin by weight, with a minimum totaldry film thickness of 1.5 mil; complying with physical properties and coating performance requirements of AAMA 2605, except as modified below:

    a. Humidity Resistance: 2000 hours.
    b. Salt-Spray Resistance: 2000 hours.

C. Color: As selected by Authority from the manufacturer's standard color selections.

2.11 STAINLESS STEEL SHEET FINISIHES

A. Repair sheet finish by grinding and polishing irregularities, weld spatter, scratches, and forming marks to match surrounding finish.

PART 3 - EXECUTION

3.01 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions and directions for installation of anchorages which are to be embedded in other construction. Coordinate delivery of suchitems to project site.

B. Verify that substrates and openings to receive louvers are rigidly set, at proper lines and elevation, properly sized, and ready to receive louvers.

C. Do not proceed with installation until conditions detrimental to proper installation have been corrected.

3.02 INSTALLATION

A. General: Provide in accordance with the manufacturer's printed instructions and recommendations and approved shop drawings. Coordinate installation with the Work of other trades. Provide inserts and other anchorage devices at the proper time so as to avoiddelays. Install the Work level, plumb, and true to line, with uniform joints. Support on shimsand secure in place by bolting to clip angles and similar supports anchored to supporting structure. Use only the types of equipment, wedges, spacers, shims and other items duringinstallation, which will not corrode or stain or mar the finish surfaces.

B. Locate and place louver and vent units plumb, level, and in proper alignment with adjacent work. Ensure watertight installation.

C. Use concealed anchorages where possible. Provide brass or lead washers fitted to screwswhere required to protect metal surfaces and to make a weathertight connection.

D. Form closely fitted joints with exposed connections accurately located and secured.

E. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

F. Repair finishes damaged by cutting, welding, soldering, and grinding operations required forfitting and jointing. Restore finishes so there is no evidence of corrective work. Return itemswhich cannot be refinished in field to shop, make required alterations and refinish entire unit,or provide new units.

G. Protect dissimilar metal surfaces from corrosion or galvanic action by application of a heavycoating of bituminous or epoxy paint, 2.0 mil dry film thickness minimum, or provide otherseparation as recommended by the manufacturer. Coat metal surfaces which will be in contact with concrete or masonry. Paint steel clip angles, and other ferrous metal parts, which will be concealed, using bituminous or epoxy paint in minimum 2.0-mil dry film thickness.

H. Install concealed gaskets, flashings, joint fillers, and insulation, as louver installation progresses where required to make louver joints weathertight. Install joint sealer where shown or required; installed according to manufacturer's directions.

3.03 ADJUSTING AND PROTECTION

A. Protect louvers and vents from damage of any kind during construction period including use of temporary protective coverings where needed and approved by louver manufacturer. Remove protective covering at time of completion.

B. Restore louvers and vents damaged during installation and construction period, so that no evidence remains of correction work. If results of restoration are unsuccessful, as judged bythe Authority, remove damaged units and replace with new units. Clean and touch-up minorabrasions in finishes with air-dried coating that matches color and gloss of, and is compatiblewith, factory-applied finish coating.

3.04 CLEANING

A. Clean exposed surfaces of louvers and vents, which are not protected by temporary covering, during and after construction period. After installation, wash louvers to remove dirtand stains. Maintain the louvers throughout the construction period in a clean and properlyprotected condition so as to be without any indication of use or damage at the time of final acceptance.

B. Touch up marred or abraded areas of finished elements. If satisfactory touch-up cannot beaccomplished, remove and replace the element.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 10 20 00, Louvers and Vents shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 10 20 00, Louvers and Vents shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 10 41 60
TRANSIT INFORMATION CABINETS AND PANELS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section covers the requirements to supply and install free-standing information cabinets - framed or encased or aluminum frames on panels, to display current information such as schedules/schedule changes, maps, and temporary conditions at various rapid transit stations. The design and installation of Transit Information Cabinets and Panels will make the information clearly visible to the public and ease its updating by the Authority.

B. Drawings and Division 01 Specification Sections, apply to this Section.

1.03 REFERENCES

A. ASTM B209 -Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate

B. ASTM B221 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

C. ASTM D1003 – Standard Test Method for Haze and Luminous Transmittance of Transparent

D. ASTM E84 -Standard Test Method for Surface Burning Characteristics of Building Materials

E. FS CCC-W-408 - Wall Covering, Vinyl-Coated

1.04 SPECIFICATIONS

A. It is not the purpose of this specification to specify all the intricate design characteristics of a free-standing information cabinet or panel. This specification does include typical characteristics and requirements that the free-standing information cabinet or panel shall have to comply with the Authority's intentions.

B. Free-standing information cabinet or panels required consist of 2 styles:

1. Cabinet: Either a 2 door or 3 door front access
2. Frame: 2 or 3 aluminum poster frames mounted on a stainless steel panel.

C. Cabinets or panels shall be floor-mounted with stainless steel tube supports on each end of the stainless steel board assembly. See drawings or contact the Authority to determine the number of each type of Information Cabinet or panel required for this project.

D. A sketch of a two/three door or aluminum poster frame free standing cabinet is available from the Authority as reference. The two door style is referred to as a P-18-2 and the

three door, a P-18-3. The two/three aluminum poster frames style is referred to as a P-37. The sketch is not intended to be complete with exact dimensions, however, the sketch, is representative of a design that would meet the approval of the Authority.

E. Shop drawings for fabrication and installation of Transit Information Cabinets or Panels shall be submitted to the Manager, Signage and Wayfinding for approval prior to manufacture. Drawings shall include plans, elevations, and large-scale details of character layout and show anchorages and accessories. Location template drawings shall be submitted with shop drawings.

F. Provide specifications for the materials to be used for the Transit Information Cabinets or Panels.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Cabinet fabrication shall be made of minimum 16-gauge stainless steel. Stainless steel sheets utilized shall meet or exceed the strength and durability properties specified in ASTM B209 (latest version) for 5005-H15 material. All sides shall be clad using the same material with a number 4 finish. Front access doors shall use a continuous partially concealed stainless steel piano-hinge on one end of door.

B. Cabinet Model:

1. The cabinet shall contain 2 hinged stainless steel door frames. Door frames will house 1/4 inch clear tempered glass, gasketed in a stainless steel frame.
2. Transparent sheet material provided shall be a clear colorless sheet with light transmittance of 92 percent when tested in accordance with requirements of ASTM D1003.
3. Locks: All cabinets shall have lock(s) with a cam design that can be opened with a Chicago Lock Company #1289 key. Keys shall be removable in locked or unlocked position.
4. Tackboard: Provide mildew-resistant, washable, vinyl fabric complying with FS CCC-W-408, Type II, laminated to 1/2 inch thick exterior grade plywood backing. All laminating adhesives and tackboard material shall be designed for exterior usage. Fabric shall have a flame spread rating of 25 or less when tested in accordance with ASTM E84. Provide color and texture as selected from the manufacturers standards.
5. Brackets: Brackets shall be made of steel material to suit the information board construction and mounting requirements. Brackets may be painted to match the background finish of cabinet.
6. Fasteners: All fasteners should be of a concealed design for cosmetic appearance and fasteners should be fabricated from a non-corrosive material. Fasteners required to be activated for access or maintenance shall be stainless steel and shall thread into stainless steel inserts in the enclosure. No aluminum fasteners will be permitted.
7. Legends and Headers: Two porcelain enamel on steel legends; 4 inch high by 48 inch wide (use CTA Drill Pattern Detail 'Y') are required and mounted with rivets on the front face of the Transit Information Cabinet at the top and bottom as shown on Detail 1 Elevation drawing of drawing available from the Authority. Panels shall be white on black and fabricated according to relevant CTA Specification (spec.1694-02 or latest revision). Artwork and wording for these signs shall be provided by the Authority in electronic format.
8. Both the two and three door assemblies use 2 rectangular stainless steel 2 inch by 6 inch by 1/4 inch tube supports with 1/2 inch thick welded stainless steel base

plates at the bottom of the tubes for the anchor attachment to the floor that will use 4 bolts per side.

9. Stainless steel cladding shall be welded to internal stainless steel frame. Frame shall have a minimum of 2 inch by 2 inch by 1/8 inch tubing continuously welded at joints.
10. Information cabinets shall have vertical stainless steel 3/4 inch reveals, which will be visible from front and back, running full height of cabinet at both ends between cabinet and tube supports legs.

C. Poster Frame Model:

1. Frames on stainless steel panel. Use Alpina™ branded FF-RP aluminum frame. Satin finish. Finished size: 28-3/4 inch x 41-3/4 inch. Verify with CTA Signage before ordering.
2. Fasteners: All fasteners should be of a concealed design for cosmetic appearance and fasteners should be fabricated from a non-corrosive material. Fasteners required to be activated for access or maintenance shall be stainless steel and shall thread into stainless steel inserts in the enclosure. No aluminum fasteners will be permitted. Attach fasteners to inside cavity of the aluminum frame.
3. Legends and Headers: Use supplied artwork from the Chicago Transit Authority to produce die-cut vinyl appliqué for the header and legend fields of the transit panel. Helvetica Bold is the preferred font. The vinyl material used for header and footer shall be a permanent set, electronically cuttable, high performance, opaque gloss black vinyl film, for use on stainless steel, such as Avery 1003, 3M Scotchcal 220 or equal. Follow drawings for installation location on panel.
4. The aluminum poster frame model uses 2 rectangular stainless steel 2 inch by 6 inch by 1/4 inch tube supports with 1/2 inch thick welded stainless steel base plates at the bottom of the tubes for the anchor attachment to the floor that will use 4 bolts per side.
5. Stainless steel cladding shall be welded to internal stainless steel frame. Frame shall have a minimum of 2 inch by 2 inch by 1/8 inch tubing continuously welded at joints.
6. Information panels shall have vertical stainless steel 3/4 inch reveals, which will be visible from front and back, running full height of panel at both ends between panel and tube supports legs.

2.02 FABRICATION

A. Cabinet Model:

1. Two door assembly: Upper cabinet section shall be 4 foot-9 inch high by 6 foot-1 inch length by 6 inch width (depth) with 2 hinged doors supported by 2 rectangular tube supports mounted to the floor for an overall height of 7 foot-0 inch from top to finished floor.
2. The three door is similar to the two door, except larger with 3 hinged doors supported by 2 rectangular tube supports mounted to the floor for an overall height of 7 foot-0 inch from top to finished floor. The three door upper cabinet dimensions are: 4 foot-9 inch high by 8 foot-9 inch length by 6 inch width (depth).
3. Protection of metals against galvanic action shall be provided wherever dissimilar metals are in contact. All metals, except galvanized steel which will be in contact with concrete, mortar, plaster, or other masonry, shall be protected. Protection shall consist of painting the contact surfaces with a heavy brush coat of bituminous paint.

4. Cabinet shall be delivered completely assembled. If the assembly cannot be delivered complete, the Contractor shall shop-assemble the complete assembly, mark, and dissemble before shipping to insure proper assembly in the field. Field joints in Transit Information Cabinet faces shall not be allowed.
5. Welding of assembly shall be done in accordance with appropriate specifications of American Welding Society and shall be done with electrodes and methods specified by the manufacturers of alloys being welding. Welds behind finished surfaces shall be so done as to minimize distortion and discoloration of finished side. Weld beads on exposed finished surfaces shall be ground and finished to match and blend with finish on adjacent parent metal.

B. Aluminum Poster Frame Model:

1. 96 inch length unit can hold up to three aluminum frames. Upper panel section shall be 4 foot high by 8 foot length by 4 inch width (depth) supported by 2 rectangular tube supports mounted to the floor for an overall height of 7 foot-0 inch from top to finished floor.
2. 66 inch length unit can hold up to two aluminum frames. Upper panel section shall be 4 foot high by 5 foot 6 inch length by 4 inch width (depth) supported by 2 rectangular tube supports mounted to the floor for an overall height of 7 foot-0 inch from top to finished floor.
3. Protection of metals against galvanic action shall be provided wherever dissimilar metals are in contact. All metals, except galvanized steel which will be in contact with concrete, mortar, plaster, or other masonry, shall be protected. Protection shall consist of painting the contact surfaces with a heavy brush coat of bituminous paint.
4. Panel shall be delivered completely assembled. If the assembly cannot be delivered complete, the Contractor shall shop-assemble the complete assembly, mark, and dissemble before shipping to insure proper assembly in the field. Field joints in Transit Information Panel faces shall not be allowed.
5. Welding of assembly shall be done in accordance with appropriate specifications of American Welding Society and shall be done with electrodes and methods specified by the manufacturers of alloys being welding. Welds behind finished surfaces shall be so done as to minimize distortion and discoloration of finished side. Weld beads on exposed finished surfaces shall be ground and finished to match and blend with finish on adjacent parent metal.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install Transit information cabinet or panel units level, plumb and at the height indicated with the Transit information cabinet or panel surfaces free from distortion or other defects in appearance.

B. Floor mounted information cabinet must conform to the Americans with Disabilities Act (ADA) which requires that the Transit information cabinet have a floor clearance of 27 inches. This will allow visually impaired customers to use a cane to identify the board before colliding with it and wheelchair users knee space for viewing graphic material posted inside.

C. Furnish inserts as required when setting into concrete of masonry work or installing into existing concrete. Use non-ferrous metal or hot dipped galvanized anchors and inserts. Use toothed steel or lead expansion bolt devices for drilled in place anchors.

D. Delivery: Transit Information Cabinet or panel shall be adequately protected during delivery to prevent damage from scratching, stains, discoloration or other causes. Damage to any surface during fabrication, handling, shipment, storage, and installation shall be remedied by the Contractor at the Contractor's own expense.

E. Cleaning: Upon completion of the installation, clean soiled Transit Information Cabinet or panel surfaces in accordance with the manufacturer's instructions.

3.02 ADDITIONAL INFORMATION FOR SIGN REQUIREMENTS

A. Sign shall be constructed using porcelain enamel on 16-gauge steel, in compliance with all applicable technical specifications.

B. Signs shall be used outdoors and shall be expected to withstand all weather conditions for their installed location for a minimum of 10 years with minimal fading.

C. The films listed herein were approved by the Authority for their ability to withstand numerous mechanical scrubbings with harsh alkali detergents in the Authority's rail car and bus wash racks without delaminating, peeling off or showing appreciable fading, chalking, blistering, cracking or tearing for a minimum of seven years. Substitute film(s) shall be designed to be equal in performance and submitted to the Authority for its review and approval.

D. Approved manufacturer of the Aluminum Poster Frame for the Authority: Alpina Manufacturing, 3418 North Knox Avenue, Chicago, Il 60641; 1-800-915-2828, 1-800-217-9431 (fax).

E. Frame: Graphic Size 27 inch x 40 inch silver wide round profile flip-up frame, IT=Poster, .020 inch clear overlay, .040 inch backer, assembled with drain holes.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 10 41 60, Transit Information Cabinets and Panels shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 10 41 60, Transit Information Cabinets and Panels shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 10 42 50

VITREOUS ENAMELED STEEL SIGNS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of contract, including General and Special Conditions andDivision 01 Specification sections, apply to this section.

1.02 SUMMARY

A. This specification covers the requirements for furnishing and installing vitreous enameled steel (porcelain) signs for the Chicago Transit Authority.

B. This specification is intended to be descriptive, not restrictive, and is solely for the purpose of indicating the type and quality of vitreous enamel signs which would meet the approval ofthe Authority.

C. Related Sections: The following sections contain requirements that relate to this section:

1. Division 05 Section, “Metal Fabrications”.

1.03 REFERENCES

A. The Work is subject to applicable portions of the following standards:

1. ”Specification for Architectural Porcelain Enamel on Steel for Exterior Use”, PEIS-10, Porcelain Enamel Institute (PEI).
2. ASTM A424

1.04 SUBMITTALS

A. Contractor is required to submit a sample finished sign no later than thirty (30) days after Contract award. The sample will be fabricated using artwork supplied by the Authority’s Signage and Wayfinding Department. Artwork will be furnished in Adobe® Illustrator® electronic format.

B. Sample metal blank shall follow Detail "C" of CTA Drawing OP-8442, except as noted herein. The steel blank shall measure 12 inches x 18 inches as indicated in the drawing, however the four (4) holes shall be 3/8 inch diameter rather than 5/16 inch diameter. Only two (2) of the four (4) holes in the finished sample shall have stainless steel grommets designed for 1/4" diameter fasteners installed. Sample shall be produced in PMS 200 blue, white, and black.

C. Finished sample sign must be submitted for review with respect to size, color and compliance to this specification. Sample must be approved by Manager, Signage and Wayfinding, before any sign is fabricated and installed. Failure to submit a sample within the time limit specified will be sufficient cause for rejection.

D. Upon approval of sample sign, Contractor will receive individual artwork to be used to fabricate signs being produced for this project. The artwork will be furnished in Adobe® Illustrator® electronic format.

E. Contractor shall verify accurate receipt of each digital artwork received by returning a

paper proof copy of each to Manager, Signage and Wayfinding, located at 567 W. Lake St., Chicago, IL 60661, Telephone 312-681-3660, before any production runs are made.

F. Upon approval of paper proof, Contractor shall produce and submit a sample of the finished production sign for inspection with respect to size, color, and compliance to this specification; prior to full production of the signs.

G. Provide shop drawings for backer plates and frames; including method of attachment to substrate and spacing of fasteners.

H. Provide product data and specifications for the fasteners and related hardware to be used for each type of sign, backer plate, sign frame, bracket and for each application and/or substrate to be fastened to.

I. Product data and specifications shall indicate the type of fastener, size of fastener, length of fastener, fastener material, zinc coating (if applicable), finish and number of fasteners provided for each application.

1.05 QUALITY ASSURANCE

A. Structural: Design structural support framing, posts and other means of support and attachment components under direct supervision of a Professional Structural Engineer experienced in the design of this work and licensed in Illinois and as required by the Authority.

B. Full-Size Mock-up Testing: Have a specimen representative of the project conditions tested by an independent testing agency for compliance with the specified criteria and as requiredby the Authority.

C. Manufacturer Qualifications: Company specializing in manufacturing aluminum signs of thetype and quantity required for this project for a period of at least seven (7) years.

D. Installer Qualifications: Company experienced in installing aluminum signs of the type and quantity required for this project for a period of at least three years and approved by the manufacturer of the signs.

1.06 DELIVERY, STORAGE AND PROTECTION

A. Delivery: Signs, posts, and accessories shall be delivered to the project site in sufficient time for their scheduled installation.

B. Storage: Store signs, posts and accessories on site protected from the weather and damage.

C. Protection: Signs shall be protected with covering to avoid scratches and other damage during handing, delivery, storage and installation.

1.07 WARRANTY

A. Signs shall be warrantied for a period of ten (10) years after substantial completion. Signs, framing and accessories shall be warrantied from fading, discoloration, cracking, pitting, rusting, delamination, corrosion and other deterioration.

B. Installation of the signs shall be warrantied for a period of one (1) year after substantial completion. Signs shall be warrantied from dislodging, misalignment or

other malfunction.

C. Signs and sign installations that fail within the warranty periods shall be replaced or repaired in entirety at no cost to the Authority and to the satisfaction of the Authority.

1.08 EXTRA MATERIALS

A. Contractor to provide touch-up paint for the signs and deliver same to the Authority as directed.

PART 2 - PRODUCTS

2.01 MATERIAL

A. Signs required shall be listed in the Sign Schedule and the Contract Documents with a description, drawing number(s) and, where available, item number(s).

B. All mounting holes, unless otherwise specified, in the finished enameled signs shall be 5/16 inch plus or minus 1/64" diameter and fitted with brass eyelet grommets equal to Stimpson Company part number A63B or approved equal to prevent cracking of the enamel during themounting application.

C. Enameled holes shall be round and free of irregularities and defects that can affect the eyeletinstallation, cause crazing or chipping of the enamel during or after eyelet

D. installation, or create irreparable misalignment of the eyelet centers within plus or minus 1/16" of the center-to-center distances dimensions specified on the drawing.

E. The base metal for all signs shall be #16 gauge porcelain enameling grade steel conformingto ASTM A 424. The Type shall be determined by the Contractor.

F. Finished signs that are less than 6 inches in length, when resting on the back surface shall be flat within a tolerance of plus or minus 1/32 inch measured diagonally. Finished signs shall be free of sharp edges, burrs, or any other defect that can prove hazardous to personnel or detrimental to the mounting process.

G. All signs shall have full color coverage with no defects on all surfaces and edges such as discoloration, bubbles, pin holes, chipping or surface crazing.

H. All signs will be used outdoors and shall be expected to withstand all weather conditions for the city of Chicago and surrounding suburbs, for a minimum of ten (10) years with minimalfading, cracking and surface crazing.

I. Colors indicated in the descriptions shall be equal to Pantone numbers (747XR Standard).Typical CTA color examples with cross references are as follows:

Color	Pantone #
Safety Red	200
Red	186
Orange	172
Yellow	012
Green	355
Olympic Blue	299
Accessible Blue	300 C
Historic Blue	282 C
Pace Bus Blue	Reflex Blue C

Purple	267
Brown	161
Neutral Gray	425 C
Pink Line Pink	204 C
Black	Process Black C
White	

J. Prior to the application of the porcelain enamel coating, the base metal shall be treated with a suitable metal treatment designed to produce maximum adherence of the porcelain enamel coating. Holes shall be punched or drilled and all holes and edges to be dressed toremove burrs, sharp edges and all irregularities prior to treatment.

K. The vitreous porcelain enamel sign coatings shall consist of one ground coat and one or more cover coats fired at a temperature from 1400 degrees F to 1600 degrees F. Unless otherwise specified the final coat shall be a glossy finish.

L. Following the firing of the background color, additional porcelain enamel colors are to be applied by the silk screen process, or other method approved by the CTA, to accomplish thedesired graphic design.

M. Art work for requested signs shall be provided by the CTA in electronic format.

N. All signs shall have full color coverage with no defects on all surfaces and edges such as discoloration, bubbles, pin holes, chipping or surface crazing.

O. All signs will be used outdoors and shall be expected to withstand all weather conditions for the city of Chicago and surrounding suburbs, for minimum of ten (10) years with minimal fading, cracking and surface crazing.

2.02 MANUFACTURERS

A. Manufacturers that produce porcelain enamel steel signs that may conform to the requirements of this specification section include, but are not limited to, the following:

1. American Porcelain Enamel Company of Dallas
2. Cherokee Porcelain Enamel Corporation
3. Standard Signs, Inc.
4. Winsor Fireform, LLC
5. Approved Equal.

2.03 BACKER PLATES

A. Backer plates to be of steel, same exact size of sign, thickness as shown on the drawings or as required to firmly support the sign, provide attachment to the substrate and as approved by the Authority. Backer plate shall be hot dip galvanized after fabrication including any drilling or cutting. Backer plates should not have sharp edges or corners. Backer plate design subject to the review and approval of CTA signage and Wayfinding Department.

2.04 FASTENERS

A. Provide and install all required attachment devices, washers, bolts and other hardware required for each application. Fasteners and other accessories shall be as specified or asdirected for the application, type of sign, location and substrate.

B. All fasteners, washers, bolts and accessories shall be stainless steel unless noted otherwise.

1. Approved fasteners, washers, bolts, accessories, plates, frames, brackets andother metal that is not stainless steel must be hot dip galvanized.

C. Use expansion anchors, self-tapping screws, pop-rivets, bolts and nuts, etc. as required.

1. Use countersunk screws where exposed or necessary. Exposed fasteners shall betamper resistant.

2.05 IDENTIFICATION

A. Manufacturer of sign shall provide an identification marking permanently embedded on the face of the sign for identification with future warranty considerations. The identification marking shall be placed in the lower right hand corner and shall not exceed an area measuring ½ inch X ½ inch in size. The marking shall contain the following information:

1. CTA design number, CTA Item number, the manufacturer's name and/or logo andthe date of manufacturer.

B. The manufacturer shall also permanently mark the CTA seven digit item number on the backof all signs having CTA Item Numbers, for field identification.

2.06 ENVIRONMENTAL CONDITIONS

A. Signs shall be suitable for unsheltered indoor and outdoor conditions use within temperaturerange of -30 deg F to 120 deg F.

B. All signs will be used outdoors and shall be expected to withstand all weather conditions of the Chicago region with no or minimal fading, cracking, surface crazing, streaking, chalking, peeling, pitting, or delaminating.

PART 3 - EXECUTION

3.01 INSPECTION

A. Prior to installation, all signs shall be inspected by the CTA. All signs must meet the quality parameters of the approved sample. The purpose of this inspection is to verify quality of manufacture and conformance to requirements for the fabrication, color, artwork, etc. of each type of sign. Inspection will be conducted at the Contractor's premises, or at any other mutually agreeable location. The Contractor shall provide the Authority with a minimum ofseven working days' notice prior to inspection.

B. Installer of signs shall verify all locations, sizes, installation and mounting conditions, typeof anchorage required and working conditions in the field.

C. A representative from the Authority may review the existing conditions with the installer prior to installation. The purpose of this inspection is to verify actual locations, method and quality of installation, dimensions, heights, space limitations, and other installation conditions for each sign. The scheduling of this inspection shall be mutually agreed upon by all parties.

D. Contractor to verify the existence of any utilities cables or other existing items or construction that may be in the way of the new signs and this installation. Relocate sign as approved to avoid relocation of utilities or interference with the sign as approved by the Authority.

E. After installation, a final inspection in the field will be conducted by the Authority. The purpose of this inspection is to verify quality of installation, correct location of signs, etc. The Contractor shall provide the CTA with a minimum of seven working days' notice prior to inspection.

3.02 REMOVAL OF EXISTING SIGNS

A. Removal of existing signs

1. If applicable or as otherwise directed, the Contractor shall remove all existing signs of the type that is being replaced or that are nonconforming. All existing signs shall be turned over to the Authority and delivered to a specific location as directed. Also remove all existing accessories not needed for the new signs. Remove all existing signs and accessories with care so as not to damage the signs or existing surfaces.
2. Existing signs to be removed may be pop riveted, bolted, or welded to its substrate. Unless noted to be re-used, existing backer plates, framing, straps, anchors, support posts, etc. used with the existing signs shall be removed. Other items may have to be removed, relocated, or altered to allow for the installation of the new signs.

B. Clean surfaces where existing signs have been removed and clean surfaces that are to receive new signs. Remove any projections or obstructions. Do not reuse existing anchorage devices and other accessories.

C. For any surface where existing signs and their accessories have been removed and the new signs will not cover, touch up the finish and/or paint to match the existing adjacent surfaces.

D. Contractor shall identify any existing historic landmark or monument type signs. These signsshall not be removed unless approved otherwise in writing by the Authority.

3.03 INSTALLATION

A. General: Install signs according to Contract documents or to match existing locations, heights, and mounting details unless indicated or directed otherwise. Variations may be directed by or approved by the Authority's field representative during the pre-installation walk-thru or during the actual installation based on actual field conditions and interference. Use approved mounting methods, mounting accessories, and attachment devices. No glueinstallations are permitted.

B. Installation and anchorage shall be solid and secure. Provide and install all indicated backer plates, frames, support, posts, and other mounting accessories. Provide and install any additional steel framing or other support or accessories required. Where indicated or required, modify existing frame to accept new sign assembly.

1. Sign fastener installation shall be capable of withstanding wind, vibration, abuse and vandalism and as approved by the Authority.

C. Install signs and all mounting accessories level, plumb, and flush with substrates. Sign surfaces shall be free from distortion or other defects in appearance. Mounting heights shall be as shown on drawings, as required and consistent throughout project unless indicatedotherwise or required to avoid interference and approval by the Authority.

D. Provide and install all required attachment devices, brackets, pendants and hardware. Fasteners and other accessories shall be as specified for the application. All fasteners and accessories shall be stainless steel unless noted otherwise. Use expansion

anchors, self-tapping screws, pop-rivets, bolts and nuts, etc. as required. Drill as required. Use countersunk screws where exposed or necessary. Exposed fasteners shall be tamper resistant. Weld where indicated with full, tack, or stitch welds. Glue installations of any kind are not permitted, including as a means to attach the sign to backer plate.

E. Installation of backer plate:

1. Directly to Substrate: Attach backer plate directly to wall, column, light pole, railing, windbreak, etc. by welding or using countersunk screws. Hole locations may be new, existing, or existing to be tapped. Use metal spacers behind the backer pate at each screw location where there are obstructions or minor projections at the surface where indicated on the drawings. Use countersunk expansion anchors when securing backer plate to masonry or concrete.
2. To Metal Frames, Horizontal Supports, Vertical Support Posts or railings: Attach backer plate to a frame made up of metal channels or tubes by welding or using countersunk screws. Attach backer plate to metal channel or tube supports, posts, angles, straps, or hangers by welding or using countersunk screws.

F. Installation of Metal Frames, Supports or Hangers:

1. Weld or bolt metal frames, supports, or support posts to beam, columns, light poles, railing, or windbreak as directed. Use expansion anchors for securing frames, supports, or hangers to masonry or concrete. Drill and grout or imbed supports innew concrete where indicated.

G. Installation of Hangers:

1. Install Flexible hangers where indicated, securing the pivot assembly to the canopy structure and to the sign frame or backer plate as directed.

H. Installation of Plastic and Frame:

1. Unless indicated otherwise, secure plastic frame to built-up welded metal channel frame with stainless steel pop rivets. Provide holes in frame to accept plastic sign frame. Where indicated, install plastic sign frame directly to steel fascia or steel adframe. Install sign in plastic frame.

I. Installation of Signs:

1. Directly to Substrate: Determine that surface is clean and smooth. Secure signs to substrate using stainless steel pop-rivets or drive-rivets (such as at solid walls, masonry, etc.). Spacings as shown on the drawings or as directed by the Authority.
2. To Surface: Surface mounted signs include installations on any flat surface which can be, but are not limited to, walls, canopy support and platform columns, sign frames, sign supports, and stair risers. Fastening hardware shall be ¼-20 tamper-resistant machine screw or TORX T27 with Security Pin or ¼-20 Drive Rivets with ¼-20 self-locking hex head nut (nylon insert) or blind aluminum or stainless steel rivet, as determined by the Authority.
3. To Metal Frame: Welded metal tube, r channel or angle frame with mitered corners same size or slightly larger than sign. Secure sign to frame with pop rivets using approved spacings.
4. To Backer Plate: Metal surface of backer plate shall be clean and smooth with all countersunk screws properly installed. Backer plates shall be same exact size as sign. Secure sign to backer plate using stainless steel pop-rivets or tamper- resistant machine screws as indicated (drill/tap backer plate to accept screws) usingapproved spacings.

5. Pendant Bracket Mounted Sign: Pendant mountings are generally described as those which require two sign faces, back to back, attached to and supported by metal brackets (or similar metal supports), sandwiched between the two sign faces. Brackets shall be configured to provide proper mounting of sign. Fastening hardware and type of installation shall be equivalent to that which is existing.
6. Bracket-Mounted Units: Provide the manufacturer's standard brackets, fittings, and hardware as appropriate for mounting signs that project at right angles from walls and ceilings. Attach brackets and fittings securely to walls or ceilings with concealed fasteners and anchoring devices to comply with manufacturer's directions.
7. Panel Mounted Non-Illuminated signs: Panel mounted signs include installations on any flat or curved surface which can be, but are not limited to, acoustical panels, etc. Fastening hardware shall be 1/4-20 taper resistant machine screws (TORX T27 with Security Pin 1/4-20, T27) with 1/4-20 self-locking head nut (nylon insert) attachedto panel. Glue installations are not permitted.
8. Wall mounted Non-Illuminated signs: Wall mounted signs include installations on any flat surface which can be, but are not limited to, canopy support and platform columns, sign frames, and stair risers. Fastening hardware shall be ¼-20 tamper- resistant machine screw or TORX T27 with security pin or ¼-20 Drive Rivets with ¼-20 self-locking hex head nut (nylon insert) or blind aluminum or stainless steel rivet, as determined by the Authority.
9. Trim signs as required to fit locations only with approval of Authority. Modify existing sign frames, backer plates, supports, etc. as required for new signs.

3.04 FIELD PAINTING

A. The pre-finished backer plates shall have their finish touched up as required where exposedto view after installation of the signs.

B. Galvanized metals cut or drilled in the field shall have its galvanized finish touched up in thefield with approved galvanizing repair paint.

C. Dissimilar metals: To avoid galvanic action, separate dissimilar metals with approved paint.

D. Any mounting accessories such as angles, channels, plates, bent plates, clip angles, tubes, posts, etc. that will be exposed to view after installation of the sign, shall be field painted to match the backer plates. New wood posts and other members shall also be primed and finished to match the backer plates.

E. Care shall be taken to not get paint on the new signs or any other existing surface.

3.05 QUALITY CONTROL

A. All the artwork of signs to be sharply and consistently detailed; with sharp and clear imagesand lettering; easily readable and all colors shall be uniform.

B. The vitreous enameled steel signs shall be free of cracks, scratches, chips, rust, discoloration or any other defects that affect the performance and appearance of the sign.

C. Steel sheet to be of consistent thickness, to be flat, not bent, with sides 90 degrees or parallel to each other and free of distortion. Vitreous Enameled Steel sign and backer plate, if applicable, shall be free of any sharp or rough edges, burrs or other defects.

D. Installation of sign assembly shall be tight and secure. Sign shall be hung at required height, straight and even.

E. Replace defective signs if directed by the Authority. Re-install signs that are crooked, uneven or loose.

3.06 CLEANING AND PROTECTION

A. Signs shall be adequately protected during their delivery and installation to prevent damage by scratches, marring, stains, discoloration, or other causes. The sign faces shall be protected with a protective covering. The signs shall be crated. Damage to any surface during fabrication, handling, shipment, storage, and installation shall be remedied by the Contractor at Contractor's own expense. Replace any damaged signs that cannot be cleaned or repaired.

B. Before delivery to the site, each sign shall be tagged or labeled with the identifying number and installation location as shown in the specifications. Labeling shall be on both the sign andthe protective covering.

C. At completion of the installation, remove the protective coating and clean soiled sign surfaces, and surfaces against which the new sign has been mounted, in accordance with the manufacturer's instructions. Protect units from damage until acceptance by the Authority.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 10 42 50, Vitreous Enameled Steel Signs shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 10 42 50, Vitreous Enameled Steel Signs shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 10 42 60

ILLUMINATED SIGNS

PART 1 - GENERAL

1.01 SUMMARY

A. Drawings and general provisions of the Contract, including General and Special Conditions and other Division 01 Specifications sections, apply to this section.

B. Scope:

1. This section includes the following types of signs:

a. Illuminated informational signs.
b. Illuminated Chicago Transit Authority Station Identifier signs.

2. General: Provide and install signs, mounting accessories, attachment devices, and associated hardware for installation in accordance with requirements of the contract documents. These signs are used at various locations at the transit stations. The number of signs, size of each sign, type of sign, graphics, location for each sign, and type of installation for the signs are indicated on the drawings and/or schedules. The Authority will supply original artwork for the sign faces in Adobe Illustrator electronic format. Remove existing signs as specified herein. Provide additional framing and supports as indicated on the drawings or required. Provide mounting accessories, attachment devices and associated hardware as specified, as shown on the drawings, or as otherwise required.
3. Verify sign locations and installation conditions in the field.
4. See drawings, schedules, and/or verify in the field for standard and special installation details for each sign; type of installation, anchorage, mounting heights, mounting conditions, additional framing and support required, installation accessories required, spacing of anchors, and other details.

C. Related work specified elsewhere:

1. Division 5 – Ornamental Metal.
2. Division 10 – Vitreous Enameled Steel Signs.
3. Division 16 - Electrical.

1.02 REFERENCES

A. Reference Standards: The work is subject to applicable portions of the following standards:

1. "Electric Signs", Standards for Safety, UL Publication 48, Underwriters Laboratories Inc.

1.03 SUBMITTALS

A. General: Submit the following in accordance with Division 1 Section, “Submittals”:

B. Product Data: Include manufacturer's technical data, complete technical specifications and construction details relative to materials, dimensions of individual components, profiles, finishes, and installation details for each type of sign required. Indicate proposed materialsand fabrication of signs.

C. Shop Drawings: Submit shop Drawings to the Authority for review and approval prior to fabrication of illuminated signs. Provide shop drawings for fabrication of each type of sign. Provide shop drawings for each installation condition for each type of sign. Include typicaldetails of materials, fabrication, and graphics. Include plans, elevations, and large- scale sections of sign face, sign frame or housing, typical members and other components. Showanchors, reinforcement, accessories, layout, and installation details.

1. Provide complete sign schedule for illuminated signs, including the following information for each sign:

    a. CTA sign identifier.
    b. Quantity.
    c. Mounting type.
    d. Dimensions
    e. Visual opening
    f. Blank size
    g. Colors
    h. Message
    i. Cross references to the following detail drawings:

        1) Graphic Detail
        2) Elevation Detail
        3) Section Detail
        4) Mounting Detail

    j. CTA Design Number
    k. Remarks
    l. Mounting Height
    m. Signage Plan Drawing Reference

2. Provide drawings for graphics for each sign, including dimensions of sign face, sign blank, visual opening, sign message and sign colors.
3. Provide separate elevation details, section details, and mounting details for each sign.
4. For signs supported by or anchored to permanent construction, provide setting drawings, templates, and directions for installation of anchor bolts and other anchors to be installed.

D. Provide wiring diagrams from the manufacturer for each type of illuminated sign units.Provide specifications for each type of lamp, ballast and other electrical components used.

E. Samples: Submit samples of each sign material or component used showing finishes, colors,surface textures and qualities of manufacturer.

1. Submit full-size sample units, if requested by the Authority. Acceptable units may be installed as part of work.
2. Color samples, 3 each of all paint colors, on specified materials for illuminated signsand station identifier sign. Color samples will be retained by the Authority.
3. Sign face: Provide a sample panel of each sign type, not less than 8-1/2 inches by 11 inches. Include a panel for each color, texture, and pattern required. On each panel include a representative sample of the graphic image process required, showing graphic style, and colors and finishes of letters, numbers, and other graphicdevices.
4. As required by the Authority, provide full size samples for approval of any accessories proposed for the installation and attachment of the signs,

including hangers, straps, frames and other attachment accessories.

F. Submit a material list of all mounting accessories including reinforcing, angles, channels,hangers, straps, frames, etc. Indicate all materials, sizes, thicknesses, shapes, etc.

G. Submit a material list of all attachment devices including anchors, screws, washers, gommets, and rivets indicating material, size, and spacings. Indicate weld types, sizes andlocations.

H. Approval of the shop drawings by the Authority is required prior to issuance of digital artworkfile.

1.04 QUALITY ASSURANCE

A. Submit adequate evidence, prior to awarding of the contract, that the items to be furnishedwill conform completely to the contract documents.

B. Fabricator and Installer: Experienced specialty firms having a minimum of 5 years successful experience and regularly engaged in fabricating and installing work of same types required for this project. Employ only skilled tradesmen who are thoroughly experienced with the materials and equipment to be used in the work.

C. Sign/Support Performance: Provide outdoor sign assemblies designed, tested, and installed to withstand positive and negative wind loading of 40 psf (1.9 kPa) wind pressure loading, in accordance with Chicago Building Code. Signs to be moisture proof.

D. UL and NEMA Compliance: Provide lighting fixtures and electrical components for illuminated signs that are labeled and listed by UL and comply with applicable NEMA standards.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Signs shall be adequately protected during delivery of the work to prevent damage by scratches, stains, discoloration, or other causes. The signs shall be crated. Damage to any surface during fabrication, handling, shipment, storage, and installation shall be remediedby the Contractor at Contractor's own expense.

1.06 PROJECT CONDITIONS

A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication to ensure proper fitting. Show recorded measurements on final shop drawings.

B. Field Conditions: For each station, verify in the field prior to installation the number, location, heights, and installation conditions for each type of sign. Discrepencies shall be reported to the designated representative from the Authority for review and determination. Similarily, report any conflicts to the proper installation of the sign at the location designated. Adjustments in the field will have to be made according to actual field conditions. CTA field representative may also dictate adjustments based on actual field conditions at the time ofinstallation.

C. Contractor to coordinate fabrication and delivery schedule of signs with installation schedule of signs, to avoid delays. Contractor to also coordinate supply of mounting and installation accessories and attachment devices required for installing the signs at

each location, according to the installation schedule.

D. The Authority will provide art work for signs in Adobe Illustrator electronic format.

1.07 WARRANTY

A. Submit a written warranty for the work of this section. All work, including installation, shall be in exact accordance with these specifications and is to be guaranteed for the minimum periodof two years from date of acceptance by Authority, unless noted otherwise.

B. Finishes Warranty: Submit 5-year written warranty, signed by the Fabricator, Contractor and Installer, warranting that the signage finishes will not develop excessive fading or excessive non-uniformity of color or shade, and will not chip, crack, peel, pit, or be subject to pin holes, scratching, or otherwise fail as a result of defective materials or workmanship. Upon notification of such details, within the warranty period, make necessary repairs or replacement at the convenience of the Authority and at no cost to the Authority. Warranty shall cover the finishes of all components of the sign assembly: sign face, sign box, sign frame, and all accessories.

1. "Excessive Fading": A change in appearance which is perceptible and objectionable as determined by the Authority when visually compared with the original color rangestandards.
2. "Excessive Non-Uniformity": Non-uniform fading during the period of the guarantee to the extent that adjacent panels have a color difference greater than the originalacceptable range of color.
3. "Will Not Pit or Otherwise Corrode": No pitting or other type of corrosion, discernible from a distance of 10' (3 m), resulting from the natural elements in the atmosphereat the project sites.

C. Cellulose Acetate Butyrate letters and logo warranty: Manufacturer of Cellulose Acetate Butyrate material shall additionally warrant their product to not fade or break for the life of theinstallation.

D. Inductively Coupled Electrodeless lamp and ballast system for Station Identifier Signs shallalso be warrantied by the manufacturer for five years.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following:

1. Acceptable Manufacturers of Illuminated Informational Signs:

a. Western Remac, Woodridge, Illinois.
b. Doyle Signs, Inc.; Addison, Illinois.
c. Pannier Graphics; Gibsonia, Pa.
d. or approved equal.

2.02 MATERIALS

A. Informational Sign boxes: Enclosure to be stainless steel, 20 ga. Number 4 finish.

B. Station Identifier Sign: Enclosure to be ¼” thick aluminum plate. Flanged leg to be 1/8” thick aluminum angle. Universal mounting bracket from cast aluminum. Solid plate for

one sided installations to be ¼" thick aluminum plate. Sign face bottom frame to be 16 ga. Rolled aluminum plate. All aluminum to have a clear anodized finish.

C. Silk Screens: Photographic screen. Hand cut screens or digital output will not be allowed.

D. Lamp and ballast system for Station Identifier Signs:

1. Inductively Coupled Electrodeless lamp and ballast system. Lamps (2 per doubledface sign) to be Icetron 100/2P/ECO 100 Watts each, 8000 Initial Lumens, rated for 100,000 hours of life. Ballast QT1X100 ICE/UNV – T, starting temperature as lowas 140 degrees F. 120/277 Volts, 50/60 Hz.
2. Lamp and ballast system as specified to be manufactured by the following:

a. Osram Sylvania, Westfield, In.
b. Approved Equal.

2.03 MATERIALS – PLASTIC

A. All plastic shall be UV stabilized. Plastic shall be manufactured of a flame retardant resin that has been tested to comply with U.L. flammability classification 94V-0. Manufacturer to supply certification of conformance plus certification of random flame test sampling during production runs as directed by the Authority.

B. All plastic shall be manufactured of non-yellowing, clear resins.

C. Manufacturer of plastic shall certify that all plastic meets or exceeds the following test standards. If requested, the manufacturer shall provide the results of these tests to the Authority:

1. MIL Spec P7788A surface endurance and scratch resistance, thermal shock,humidity and impact.
2. OSET Lab, Inc. Emmaqua accelerated weathering for a minimum exposure of onemillion Langleys without color fade.
3. Federal Test Method Standard 141, Method 6152; "Accelerated Weathering".
4. United States Postal Service: Acidity, cleaning compounds and fluids.

a. Two plastic sheets shall be immersed in a 0.1 M HCL solution for 30minutes.
b. Two plastic sheets shall be immersed in a 0.1 M MH3 solution for 30minutes.
c. Plastic shall not be appreciably changed as a result of these tests.

2.04 PLASTIC FOR ILLUMINATED INFORMATIONAL SIGNS

A. Plastic for the sign faces of Illuminated Informational Signs to be graphic-embedded Fiberglass Reinforced Plastic (FRP), translucent, .180" thick minimum and .250" maximum. Substitutions will not be permitted.

B. Fiberglass Reinforced Plastic (FRP) shall be non-yellowing, UV stabilized, acrylic-modified polyester resin reinforced with high solubility, chopped strand fiberglass mat so that the index of refraction ensures total clarity of all color, copy and graphics. Glass fibers should not be readily discernable on the sign face and signs shall have a glass content no less than 28%of the total sign weight.

C. Fiberglass Reinforced Plastic (FRP) shall consist of only flame retardant resin that has been tested to comply with U.L. flammability classification 94V-0. Manufacturer to supply certification of conformance plus certification of random flame test sampling

during production runs as directed by the Authority.

D. Downlight acrylic lens to be clear prismatic material with ¼" clear lexan non-glare protective cover, and shall be UV stabilized on both sides.

2.05 PLASTIC FOR ILLUMINATED STATION IDENTIFIER SIGNS

A. Plastic for letters and logo for Station Identifier Signs to be formed of all natural Cellulose Acetate Butyrate (CAB).

B. Colors for Identifier Sign letters, logo, and background shall be the Authority's standard colors.

C. Plastic Identifier Sign to have studs or metal threaded posts secured on rear of the letters and logo for attachment of the plastic sign. Length, spacing, and locations of studs as required by manufacturer for installation and attachment. Show studs on shop drawings submitted to the Authority for review and approval.

D. Plastic as specified for Illuminated Station Identifier Signs to be as manufactured by the following:

1. Gemini, Inc., Cannon Falls, MN.
2. Approved Equal.

2.06 MOUNTING ACCESSORIES

A. For reinforcing, brackets, angles, channels, support posts, steel tube:

1. Steel plate, bent plates, clip angles, shapes, channels, angles, and bars: ASTMA36/A36M, hot dip galvanized G90 (ASTM B 633 Type GS).
2. Cold-rolled steel sheet: ASTM A 653/A 653M, hot dip galvanized G90, commercialquality.
3. Steel Tubing: Cold-Formed Steel Tubing, ASTM A 500 or Hot-Formed Steel Tubing,ASTM A 501, with hot-dip galvanized coating per ASTM A 53.
4. Steel Pipe: ASTM A 53, galvanized, standard weight and extra heavy.
5. Aluminum plate, pipe: ASTM B 221, Alloy 6063-T6.

2.07 ATTACHMENT DEVICES

A. Fasteners: Use concealed fasteners where possible. Fasteners exposed to view shall be of tamper-resistant and anti-vibration design. Fasteners to be of stainless steel unless approved otherwise. See drawings for type, size, spacings, locations for each application. Typically, fasteners to be flat head machine screws. Use fasteners fabricated from metalsthat are not corrosive to the sign material and mounting surface.

B. Anchors and Inserts: Use non-ferrous metal, stainless steel, or hot-dipped galvanized anchors and inserts for corrosion resistance. Use toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts, expansion shields, as required, to beset into concrete or masonry work after drilling.

C. Continuous Hinges: National Lock Co. 56-472, Type 2, or approved equal, stainless steel.

D. Flexible Sign Hangers: Similar to flexible fixture hangers, cushion type, enclosed and gasketed, eight degree swing in all directions, cushions 40 lbs., supports 250 lbs., 3/4" size, as manufactured by Appleton Electric Company or approved equal. Provide 2 1/2" diameter galvanized pipe to cover pipe hanger where shown on the drawings.

E. Threaded Pipe Hangers: 1" in diameter, galvanized with nut and washer (to be tack weldedto frame).

F. Provide brackets, collars, clips, and all other accessories required for installation of signs as approved compatible with the sign and various substrates and as submitted and approved. Fabricate brackets and fittings for bracket-mounted signs from steel to suit sign panel construction and mounting conditions indicated. All metal accessories to be stainless steelor hot-dipped galvanized and factory painted to match the sign frames.

G. Welding Rods and Bare Electrodes: Select according to AWS specifications for the metal alloy to be welded.

2.08 ACCESSORIES

A. Weathertight gasket: Provide continuous .05” rubber gasket at flanges at all locations where sign face assembly meets sign body or/and as shown on drawings or required forweathertight installation.

2.09 PAINT

A. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers.

B. Galvanizing Repair Paint: High zinc dust content paint for touching up galvanized surfaces, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint-20.

C. Paint over galvanized metal:

1. First Coat: Primer over galvanized metal:

a.	Devoe:	8502/8520 Mirrolac.
b.	Fuller:	621-05 Blox-Rust Latex Metal Primer.
c.	Glidden:	5205 Glid-Guard.
d.	Moore:	IronClad Galvanized Metal Latex Primer 155.
e.	PPG:	90-709 Industrial Enamel.
f.	P & L:	Z/F 1003 Supreme Latex Metal Primer.
g.	S-W:	Galvite Paint B50W3.

2. Second and Third Coats: Gloss alkyd enamel:

a.	Devoe:	70XX Mirrolac Alkyd-Urethane Gloss Enamel.
b.	Fuller:	312-XX EPA Compliant Heavy Duty Enamel.
c.	Glidden:	4550 Series Glid-Guard Alkyd Industrial
d.	Moore:	Impervo Enamel 133.
e.	PPG:	6-282 Speedhide Gloss-Oil Enamel.
f.	P & L:	S 4500 Series Tech-Gard Maintenance Gloss Enamel.
g.	S-W:	Industrial Enamel B-54 Series.

3. Color: CTA White or other station color as selected and approved by Authority.

2.10 FABRICATION

A. General:

1. Enlargement or reduction of art shall be done electronically. Original artwork will

beprovided by the Authority in Adobe Illustrator format.

2. Fabricate exposed surfaces uniformly flat and smooth, without distortion, pitting, or other blemishes. Form exposed metal edges to a smooth radius. Grind exposed welds and rough areas to make flush with adjacent smooth surfaces. Provide all sign bodies with tamperproof construction.
3. Sign components shall be designed for easy maintenance and replacement.
4. Sign production shall not begin until shop drawings have been approved by the Authority.
5. Punch, drill, and tap finished members as required for connection to adjoining work.
6. Provide outdoor sign assemblies designed, tested, and installed to withstand positive and negative wind loading of 40 psf (1.9 kPa) wind pressure loading, in accordance with Chicago Building Code.
7. Provide a protective covering to the front of the signs to avoid damage during shipment and installation.
8. Before delivery to the site, each sign shall be tagged or labeled with the identifying number and installation location as shown in the appendix. Labeling shall be on the back of the sign. Any sign scratched, chipped, stained, or otherwise damaged during fabrication, handling, shipment, storage, and installation shall be replaced at Contractor's expense.

B. Illuminated Signs:

1. Closure shall provide sufficient interior space to enclose the means of illumination,its control, and test equipment.
2. Enclosure shall be gasketed, weatherproof, and bug-tight. Illuminated signs shall beUL listed for exterior wet locations.
3. Message compartments in the sign shall be light-tight from all directions, so as to prevent seepage of light between compartments, except the message face. The interior compartments shall be white.
4. Illuminate units in the manner indicated using inductively coupled fluorescent lamp of standard manufacturer, high frequency ballast, insulators and other components. Make provisions for servicing and for concealed connection to the building system.
5. Access to signs for maintenance shall be through a continuously hinged message face door frame held in place by external fasteners. Each hinged door shall have a means of supporting the door in the open position to facilitate maintenance.
6. Electrical Service: Provide to accommodate 120/208 volt, 3 phase, 4 wire, and 120 volt, single phase, as scheduled on drawings. Where 3 phase signs occur, arrangeballasts to evenly distribute the load over all phases.
7. Power Distribution: Provide all internal wiring for ballasts and lamps. Connect to load side of disconnect switch.
8. Voltage Regulation: Provide adequate space within sign enclosure to accommodate transformers for voltage regulation should excessive voltage drop occur.
9. Lamp connected to the ballasts shall remain operating when supply voltage variesplus or minus 10% from normal.
10. Make provisions for concealed connection to the building system. Coordinate the electrical characteristics of signs with those of the power supply provided.
11. Furnish electrical components incorporated in sign construction approved and listed by the Underwriters Laboratories, Inc., and which conform to the Chicago Building Code and the National Electrical Code. Fluorescent lamp holders of high-impact plastic; incandescent lamp holders of porcelain; both with shielded, metal lamp contacts. Fluorescent lamp ballasts shall be CBM approved and shall be of the high power factor type with Class P and internal

capacitor protection, designed for outdoor use to provide reliable starting at temperatures down to -40 degrees Fahrenheit. The maximum temperature limit of the ballast shall not exceed manufacturer instructions. Install ballast below lamp in separate thermally isolated compartment. Provide heat sinking or fan cooling if required.

12. Manufacturers shall be Advance, General Electric, Jefferson, or Universal. Size ballasts properly and having capacity to operate the number and type of lamps under continuous outside duty and each ballast clearly marked or labeled to shown the following:

    a. Manufacturer's name and trademark.
    b. Catalog number.
    c. Input voltage and frequency.
    d. Current rating.
    e. Open-circuit voltage.
    f. Number of lamps to be controlled.
    g. Nominal current per lamp.
    h. Type of lamps and power factor.
    i. Wiring diagram to show correct connections for the various loads.

13. Provide all internal wiring of insulated, stranded copper, appliance wire, not lighter than no. 12 AWG and thermoplastic insulation, of such thickness and composition to provide satisfactory performance under a continuous maximum temperature of 90 degrees C. Color-code wire with white for the ground wire and secondary circuit corresponding to the color of the ballast leads. Provide terminal blocks for interiorpower wiring connections.
14. Provide heavy-duty, single pole, toggle switches for local compartment and lamp control as indicated on drawings; also, provide a disconnect toggle switch inside thesign case of each sign, as required by the Chicago Building Code.
15. Locate ballasts, raceways and other interior components so as to prevent shadows or dark spots on the sign faces. Distribute weight of the ballasts symmetrically to provide a naturally plumb hanging of the signs. Support ballasts and wiring on the bottoms of the sign cases to maintain a minimum clearance of 1/2". Confine ballast lead splices to the ballast junction boxes or contain in the raceways. Strip insulation on wires at connections only as required to properly make connections. Bare conductor overhang at the edge of the base to which it is connected is not allowed. Secure splices and wiring connections to lampholder terminals mechanically and electrically.
16. Fluorescent lamps shall be of high output type and required length and wattage. The maximum length of a lamp shall be less than 8'-0". The lamp color shall be "cool white". Manufacturers shall be General Electric, ITT, Sylvania, or North AmericanPhillips.
17. Each compartment of a multi-compartment illuminated sign shall be separately controlled and wired.
18. Illumination across the face of the sign shall be uniform in brightness when the signis turned on.

C. Mounting Accessories:

1. Provide mounting accessories including reinforcing, brackets, angles, channels, bent plates, faming, etc. as indicated on the drawings, specified, or as otherwise required for the installation of the signs.
2. Plates, steel tubes, steel channels, steel bars, sheet metal, and all other mounting accessories shall be galvanized after fabrication. Touch up galvanizing as required,apply one coat of primer and two coats of finish paint in the shop.

2.11 FINISHES

A. Colors and Surface Textures: For exposed sign material that requires selection of materials with integral or applied colors, surface textures or other characteristics related to appearance, provide color matches indicated, or if not indicated, as selected by the Authorityfrom the manufacturer's standards.

2.12 GRAPHICS

A. All copy and graphics shall be permanently embedded in the plastic. The resulting signs shall have all graphic elements inseparable from the plastic in which they are embedded. Artwork shall become permanent part of plastic sign so it will not delaminate. Laminated products will not be accepted.

B. Lettering for all signs shall be Helvetica Bold. Lettering shall be electronically reproduced via supplied electronic artwork.

C. Legends shall include letters, numbers, arrows, symbols, borders and other applications shown for sign panels.

D. After approval of Shop Drawings, the Authority will supply final artwork in Adobe Illustratorformat.

PART 3 - EXECUTION

3.01 INSPECTION

A. Prior to installation, all signs shall be inspected by the Authority. The purpose of this inspection is to verify quality of manufacture and conformance to requirements for the fabrication, color, artwork, etc. of each type of sign. Inspection will be conducted at the Contractor's premises, or at any other mutually agreeable location, within the City of Chicago. The Contractor shall provide the Authority with a minimum of seven working days'notice prior to inspection.

B. Installer of signs shall verify all locations, sizes, installation and mounting conditions, typeof anchorage required and working conditions in the field.

C. A representative from the Authority may review the existing conditions with the installer prior to installation. The purpose of this inspection is to verify actual locations, method and quality of installation, mounting heights, interference with the installation, and other installation conditions for each sign. The scheduling of this inspection shall be mutually agreed upon byall parties.

D. After installation, a final inspection in the field will be conducted by the Authority. The purpose of this inspection is to verify quality of installation, correct location of signs, etc. The Contractor shall provide the Authority with a minimum of seven working days' notice prior toinspection.

3.02 INSTALLATION

A. General: Install signs to match existing locations, heights, and mounting details unless indicated on the drawings or directed otherwise. Variations may be directed by or approved by the Authority's field representative during a pre-installation walk-thru or during the actual installation based on actual field conditions. Use approved mounting methods, mounting accessories, and attachment devices. No glue installations are

permitted.

B. Installation and anchorage to be solid and secure. Provide and install all indicated backer plates, frames, support, posts, hangers, and other mounting accessories. Provide and install any additional steel or wood framing or other support required. Where indicated or required,modify existing frame to accept new sign assembly.

C. Install signs and all mounting accessories level, plumb, and flush with substrates. Sign surfaces shall be free from distortion or other defects in appearance.

D. Provide and install all required attachment devices, brackets, pendants and hardware. Fasteners and other accessories shall be as specified for the application. Use expansion anchors, self-tapping screws, pop-rivets, bolts and nuts, etc. as required. Drill as required. Use countersunk screws where exposed or necessary. Exposed fasteners to be tamper resistant. Weld where indicated with full, tack, or stitch welds.

E. Installation of Metal Frames, Supports or Hangers:

1. Weld or bolt metal frames, supports, support posts, or hangers directly to the structure, track structure, beam, columns, light poles, railing, canopy fascia, or windbreak as directed. Use expansion anchors for securing frames, supports, or hangers to masonry or concrete.

F. Installation of Pipe Hangers:

1. Install flexible hangers where indicated, securing the pivot assembly to the canopystructure and to the sign frame or backer plate as directed.

3.03 FIELD PAINTING

A. Galvanized metals cut or drilled in the field shall have its galvanized finish touched up in thefield with approved galvanizing repair paint.

B. Dissimilar metals: To avoid galvanic action, separate dissimilar metals with approved paint.

C. Any mounting accessories such as angles, channels, plates, bent plates, clip angles, tubes, posts, etc. that will be exposed to view after installation of the sign, must be field painted to match the pre-finished backer plates. New wood posts and other members shall also be primed and finished to match the backer plates.

D. Care shall be taken to not get paint on the new signs or any other existing surface.

3.04 CLEANING AND PROTECTION

A. Signs shall be adequately protected during their delivery and installation to prevent damage by scratches, marring, stains, discoloration, or other causes. The sign faces shall be protected with a protective covering. The signs shall be crated. Damage to any surface during fabrication, handling, shipment, storage, and installation shall be remedied by the Contractor at Contractor's own expense. Replace any damaged signs that cannot be cleaned or repaired.

B. Before delivery to the site, each sign shall be tagged or labeled with the identifying number and installation location as shown in the specifications. Labeling shall be on both the sign andthe protective covering.

C. At completion of the installation, remove the protective coating and clean soiled sign surfaces, and surfaces against which the new sign has been mounted, in accordance

with the manufacturer's instructions. Protect units from damage until acceptance by the Authority.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 10 42 60, Illuminated Signs shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 10 42 60, Illuminated Signs shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 10 42 70

FIBERGLASS EMBEDDED SIGNS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 01 Specification sections, apply to this section.

1.02 SUMMARY

A. This specification covers the requirements for furnishing and installing fiberglass embedded signs for the Chicago Transit Authority.

B. This specification is intended to be descriptive, not restrictive, and is solely for the purpose of indicating the type and quality of fiberglass embedded signs which would meet the approval of the Authority.

C. Related Sections: The following sections contain requirements that relate to this section:

1. Division 05 Section, “Metal Fabrications”.

1.03 REFERENCES

A. The work is subject to the applicable portions of the following standards:

1. ASTM D 256-06: Standard Test Methods for Determining the Izod Pendulum ImpactResistance of Plastics.
2. ASTM D 543-06: Standard Practices for Evaluating the Resistance of Plastics toChemical Reagents.
3. ASTM D 4329-05: Standard Practice for Flourescent UV Exposure of Plastics.
4. UL 94-2006: Standard for Tests for Flammability of Plastic Materials for Parts inDevices and Appliances.

1.04 SUBMITTALS

A. Contractor is required to submit a sample finished sign no later than thirty (30) days after Contract award. The sample will be fabricated using artwork supplied by the Authority’s Signage and Wayfinding Department. Artwork will be furnished in Adobe® Illustrator® electronic format.

B. Finished sample sign must be submitted for review with respect to size, color and compliance to this specification. Sample must be approved by Manager, Signage and Wayfinding, before any sign is fabricated and installed. Failure to submit a sample within the time limit specified will be sufficient cause for rejection.

C. Upon approval of sample sign, Contractor will receive individual artwork to be used to fabricate signs being produced for this project. The artwork will be furnished in Adobe® Illustrator® electronic format.

D. Contractor shall verify accurate receipt of each digital artwork received by returning a paper proof copy of each to Manager, Signage and Wayfinding, located at 567 W. Lake St., Chicago, IL 60661, Telephone 312-681-3660, before any production runs are made.

E. Upon approval of paper proof, Contractor shall produce and submit a sample of the finished production sign for inspection with respect to size, color, and compliance to this specification; prior to full production of the signs.

F. Contractor shall submit product data for required signs, including complete description of sign and the thickness and color(s) to be used in the sign fabrication.

G. Contractor shall submit a schedule of signs to be provided and installed indicating type of sign, location to be installed, method of installation, artwork, size , item number and otherinformation.

H. Provide shop drawings for backer plates and frames; including method of attachment to substrate and spacing of fasteners.

I. Provide product data and specifications for the fasteners and related hardware to be used for each type of sign, backer plate, sign frame, bracket and for each application and/or substrate to be fastened to.

J. Product data and specifications shall indicate the type of fastener, size of fastener, length of fastener, fastener material, zinc coating (if applicable), finish and number of fasteners provided for each application.

1.05 QUALITY ASSURANCE

A. Structural: Design structural support framing, posts and other means of support and attachment components under direct supervision of a Professional Structural Engineer experienced in the design of this work and licensed in Illinois and as required by the Authority.

B. Full-Size Mock-up Testing: Have a specimen representative of the project conditions tested by an independent testing agency for compliance with the specified criteria and as requiredby the Authority.

C. Manufacturer Qualifications: Company specializing in manufacturing aluminum signs of thetype and quantity required for this project for a period of at least seven (7) years.

D. Installer Qualifications: Company experienced in installing aluminum signs of the type and quantity required for this project for a period of at least three years and approved by the manufacturer of the signs.

E. Contractor shall certify that all signs meet or exceed the following test standards. If requested, the Contractor shall provide the results of these tests within ten (10) calendar days. Signs shall not be appreciably changed as a result of these tests.

1. MIL Spec P7788F surface endurance and scratch resistance, thermal shock,humidity and impact.
2. DSET Lab. Inc. Emmaqua accelerated weathering for a minimum exposure of onemillion Langleys without color fade.
3. Federal Test Method Standard 141, Method 6152; “Accelerated weathering”.
4. United Stated Postal Service Acidity, cleaning compounds and fluids.

    a. Two signs shall be immersed in a 0.1 M HCL solution for 30 minutes.
    b. Two signs shall be immersed in a 0.1 M NH_3 solution for 30 minutes.

F. Signs shall not exhibit swelling, loss of physical strength, fading, delamination of composite materials, cracking, crazing or clouding when subjected to accelerated aging

test per ASTMD 4329, Cycle A using a UVA-340 flourescent lamp for daylight UV.

G. Signs shall not exhibit a change in weight, dimensions or mechanical properties when subjected to chemical reagents in accordance with ASTM D543, Practice B (the wet patchmethod).

H. Sign face shall retain legibility and finished appearance when sprayed with a 10% solution of hydrochloric, nitric or sulfuric acid for one-half hour or when scrubbed by a brush of medium hardness using common commercial cleaning compounds such as ammonia, laundry soaps, detergents, carbon tetrachloride or petroleum base solvents.

I. Sign shall meet UL 94-1 flame test.

1.06 DELIVERY, STORAGE, AND PROTECTION

A. Delivery: Signs, posts, and accessories shall be delivered to the project site in sufficient time for their scheduled installation.

B. Storage: Store signs, posts and accessories on site protected from the weather and damage.

C. Protection: Signs shall be protected with covering to avoid scratches and other damage during handing, delivery, storage and installation.

1.07 WARRANTY

A. Signs will be expected to withstand all exterior weather conditions for the Chicago region for a minimum of ten (10) years after substantial completion. Signs shall not crack or warp. When exposed to elements, sign shall not be subject to fiberbloom. Signs, installation, framing and accessories shall be warrantied from fading,discoloration, cracking, pitting, surface crazing, rusting, delamination, corrosion and other deterioration.

B. Installation of the signs shall be warrantied for a period of one (1) year after substantial completion. Signs shall be warrantied from dislodging, misalignment or other malfunction.

C. Signs and sign installations that fail within the warranty periods shall be replaced or repaired in entirety at no cost to the Authority and to the satisfaction of the Authority.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Signs required shall be listed in the Contract Document with a description, drawing number(s) and, where available, item number(s).

B. All mounting holes, unless otherwise specified, shall be 3/8 inch diameter and fitted with a 5/16 inch inside diameter stainless steel (or other approved material) grommet to prevent cracking of the fiberglass during the mounting application.

C. Signs required shall be listed in the Sign Schedule and the Contract Documents with a description, drawing number(s) and, where available, item number(s).

D. Sign shall be constructed using Fiberglass Reinforced Plastic (FRP) material that meets the requirements specified herein.

E. All copy and graphics shall be permanently embedded in the fiberglass panel. The resulting signs shall be a solid one-piece panel with all graphic elements inseparable from the fiberglass sign so it will not delaminate. Laminated products will not be accepted.

F. Signs shall be manufactured of non-yellowing, R-70 clear resin (or UV stabilized, acrylic- modified polyester resin) reinforced with high solubility, chopped strand fiberglass mat so that the index of refraction ensures total clarity of all color, copy and graphics. Glass fibers should not be readily discernable on the sign face. In addition signs shall have a glass contentno less than 28% of the total sign weight.

G. Signs shall be manufactured of a flame retardant resin, tested and comply with U.L. 94V.

1. Contractor to supply certification of conformance plus certification of random flametest sampling during production runs as directed by the Authority.

H. Signs shall withstand an ambient temperature range of -65 deg F to 120 deg F.

I. Signs shall have the following values: Barcol hardness of 50 (minimum) with the following approximate values: tensile strength of 20,000 psi, compressive strength of 20,000 posi andflexural strength of 30,000 psi.

J. Finished signs shall have minimum Izod notched impact strength of 10 ft-lbsf/in., when testedper ASTM D 256, Method A.

K. Minimum impact of strength shall be 15 ft lbf/in, notched.

L. Sign face shall be opaque or translucent with a semi-gloss or matte finish, as indicated, with a minimum embedment of all graphic elements of 0.031 inches (1/32”). When exposed toelements, sign face shall not be subject to fiberbloom.

M. Sign face shall retain legibility and finished appearance when sprayed with a 10% solution of hydrochloric, nitric, or sulfuric acid for one-half hour or when scrubbed by a brush of medium hardness using common commercial cleaning compounds such as ammonia, laundry soaps, detergents, carbon tetrachloride, or petroleum base solvents.

N. The sign edges shall not be crazed or cracked, and the edge finish shall be smooth, cleanand neat.

O. The finished signs, when resting on the back surface, shall be flat with no visible wavinessor curled corners.

P. All artwork for signage shall be provided by CTA’s Signage and Wayfinding Department in electronic format. Artwork that comes from any other source must not be used under any circumstance.

Q. All signs shall have full color coverage with no defects on all surfaces and edges such as discoloration, bubbles, pin holes, chipping or surface crazing.

R. All signs will be used outdoors and shall be expected to withstand all weather conditions for the city of Chicago and surrounding suburbs, for minimum of ten (10) years with minimal fading, cracking and surface crazing.

2.02 MANUFACTURERS

A. Manufacturers that produce firberglass embedded signs that may conform to the requirements of this specification section include, but are not limited to the following:

1. Aardvark Graphic Solutions, Inc.
2. Envirosigns, Ltd.
3. General Graphics, Inc.
4. Pannier Graphics.
5. Whitco W.S. Sign Design Corporation.
6. Approved Equal.

2.03 BACKER PLATES

A. Backer plates to be of steel, same exact size of sign, thickness as shown on the drawings or as required to firmly support the sign, provide attachment to the substrate and as approved by the Authority. Backer plate shall be hot dip galvanized after fabrication including any drilling or cutting. Backer plates should not have sharp edges or corners. Backer plate design subject to the review and approval of CTA signage and Wayfinding Department.

2.04 FASTENERS

A. Provide and install all required attachment devices, washers, bolts and other hardware required for each application. Fasteners and other accessories shall be as specified or asdirected for the application, type of sign, location and substrate.

B. All fasteners, washers, bolts and accessories shall be stainless steel unless noted otherwise.

1. Approved fasteners, washers, bolts, accessories, plates, frames, brackets andother metal that is not stainless steel must be hot dip galvanized.

C. Use expansion anchors, self-tapping screws, pop-rivets, bolts and nuts, etc. as required. Use countersunk screws where exposed or necessary. Exposed fasteners shall be tamper resistant.

2.05 IDENTIFICATION

A. Manufacturer of sign shall provide an identification marking permanently embedded on the face of the sign for identification with future warranty considerations. The identification marking shall be placed in the lower right hand corner and shall not exceed an area measuring ½ inch X ½ inch in size. The marking shall contain the following information:

1. CTA design number, CTA Item number, the manufacturer’s name and/or logo andthe date of manufacturer.

B. The manufacturer shall also permanently mark the CTA seven digit item number on the backof all signs having CTA Item Numbers, for field identification.

2.06 ENVIRONMENTAL CONDITIONS

A. Signs shall be for unsheltered indoor and outdoor use within a temperature range of -30 degF to 120 deg F.

B. All signs will be used outdoors and shall be expected to withstand all weather conditions of the Chicago region with no or minimal fading, cracking, surface crazing, streaking,

chalking, peeling, pitting, or delaminating.

PART 3 - EXECUTION

3.01 INSPECTION

A. Prior to installation, all signs shall be inspected by the Authority. All signs must meet the quality parameters of the approved sample. The purpose of this inspection is to verify quality of manufacture and conformance to requirements for the fabrication, color, artwork, etc. ofeach type of sign. Inspection will be conducted at the Contractor's premises, or at any othermutually agreeable location. The Contractor shall provide the Authority with a minimum ofseven working days' notice prior to inspection.

B. Installer of signs shall verify all locations, sizes, installation and mounting conditions, typeof anchorage required and working conditions in the field.

C. A representative from the Authority may review the existing conditions with the installer prior to installation. The purpose of this inspection is to verify actual locations, method and quality of installation, dimensions, heights, space limitations, and other installation conditions for each sign. The scheduling of this inspection shall be mutually agreed upon by all parties.

D. Contractor to verify the existence of any utilities cables or other existing items or construction that may be in the way of the new signs and this installation. Relocate sign as approved to avoid relocation of utilities or interference with the sign as approved by the Authority.

E. After installation, a final inspection in the field will be conducted by the Authority. The purpose of this inspection is to verify quality of installation, correct location of signs, etc. The Contractor shall provide the CTA with a minimum of seven working days' notice prior to inspection.

3.02 REMOVAL OF EXISTING SIGNS

A. Removal of existing signs

1. If applicable or as otherwise directed, the Contractor shall remove all existing signs of the type that is being replaced or that are nonconforming. All existing signs shall be turned over to the Authority and delivered to a specific location as directed. Also remove all existing accessories not needed for the new signs. Remove all existing signs and accessories with care so as not to damage the signs or existing surfaces.
2. Existing signs to be removed may be pop riveted, bolted, or welded to its substrate. Unless noted to be re-used, existing backer plates, framing, straps, anchors, support posts, etc. used with the existing signs shall be removed. Other items may have to be removed, relocated, or altered to allow for the installation of the new signs.

B. Clean surfaces where existing signs have been removed and clean surfaces that are to receive new signs. Remove any projections or obstructions. Do not reuse existing anchorage devices and other accessories.

C. For any surface where existing signs and their accessories have been removed and the new signs will not cover, touch up the finish and/or paint to match the existing adjacent surfaces.

D. Contractor shall identify any existing historic landmark or monument type signs. These signsshall not be removed unless approved otherwise in writing by the Authority.

3.03 INSTALLATION

A. General: Install signs according to Contract documents or to match existing locations, heights, and mounting details unless indicated or directed otherwise. Variations may be directed by or approved by the Authority's field representative during the pre-installation walk-thru or during the actual installation based on actual field conditions and interference. Use approved mounting methods, mounting accessories, and attachment devices. No glueinstallations are permitted.

B. Installation and anchorage shall be solid and secure. Provide and install all indicated backer plates, frames, support, posts, and other mounting accessories. Provide and install any additional steel framing or other support or accessories required. Where indicated or required, modify existing frame to accept new sign assembly.

1. Sign fastener installation shall be capable of withstanding wind, vibration, abuse and vandalism and as approved by the Authority.

C. Install signs and all mounting accessories level, plumb, and flush with substrates. Sign surfaces shall be free from distortion or other defects in appearance. Mounting heights shall be as shown on drawings, as required and consistent throughout project unless indicatedotherwise or required to avoid interference and approval by the Authority.

D. Provide and install all required attachment devices, brackets, pendants and hardware. Fasteners and other accessories shall be as specified for the application. All fasteners and accessories shall be stainless steel unless noted otherwise. Use expansion anchors, self-tapping screws, pop-rivets, bolts and nuts, etc. as required. Drill as required. Use countersunk screws where exposed or necessary. Exposed fasteners shall be tamper resistant. Weld where indicated with full, tack, or stitch welds. Glue installations of any kind are not permitted, including as a means to attach the sign to backer plate.

E. Installation of backer plate:

1. Directly to Substrate: Attach backer plate directly to wall, column, light pole, railing, windbreak, etc. by welding or using countersunk screws. Hole locations may be new, existing, or existing to be tapped. Use metal spacers behind the backer pate at each screw location where there are obstructions or minor projections at the surface where indicated on the drawings. Use countersunk expansion anchors when securing backer plate to masonry or concrete.
2. To Metal Frames, Horizontal Supports, Vertical Support Posts or railings: Attach backer plate to a frame made up of metal channels or tubes by welding or using countersunk screws. Attach backer plate to metal channel or tube supports, posts, angles, straps, or hangers by welding or using countersunk screws.

F. Installation of Metal Frames, Supports/Hangers:

1. Weld or bolt metal frames, supports, or support posts to beam, columns, light poles, railing, or windbreak as directed. Use expansion anchors for securing frames, supports, or hangers to masonry or concrete. Drill and grout or imbed supports innew concrete where indicated.

G. Installation of Hangers:

1. Install Flexible hangers where indicated, securing the pivot assembly to the canopy structure and to the sign frame or backer plate as directed.

H. Installation of Signs:

1. Directly to Substrate: Determine that surface is clean and smooth. Secure signs to substrate using stainless steel pop-rivets or drive-rivets (such as at solid walls, masonry, etc.). Spacings as shown on the drawings or as directed by the Authority.
2. To Surface: Surface mounted signs include installations on any flat surface which can be, but are not limited to, walls, canopy support and platform columns, sign frames, sign supports, and stair risers. Fastening hardware shall be ¼-20 tamper-resistant machine screw or TORX T27 with Security Pin or ¼-20 Drive Rivets with ¼-20 self-locking hex head nut (nylon insert) or blind aluminum or stainless steel rivet, as determined by the Authority.
3. To Metal Frame: Welded metal tube, channel or angle frame with mitered corners same size or slightly larger than sign. Secure sign to frame with pop rivets using approved spacings.
4. To Backer Plate: Metal surface of backer plate shall be clean and smooth with all countersunk screws properly installed. Backer plates shall be same exact size as sign. Secure sign to backer plate using stainless steel pop-rivets or tamper- resistant machine screws as indicated (drill/tap backer plate to accept screws) usingapproved spacings.
5. Pendant Bracket Mounted Sign: Pendant mountings are generally described as those which require two sign faces, back to back, attached to and supported by metal brackets (or similar metal supports), sandwiched between the two sign faces. Brackets shall be configured to provide proper mounting of sign. Fastening hardware and type of installation shall be equivalent to that which is existing.
6. Bracket-Mounted Units: Provide the manufacturer's standard brackets, fittings, and hardware as appropriate for mounting signs that project at right angles from walls and ceilings. Attach brackets and fittings securely to walls or ceilings with concealed fasteners and anchoring devices to comply with manufacturer's directions.
7. Panel Mounted Non-Illuminated signs: Panel mounted signs include installations on any flat or curved surface which can be, but are not limited to, acoustical panels, etc. Fastening hardware shall be 1/4-20 taper resistant machine screws (TORX T27 with security pin) with 1/4-20 self-locking head nut (nylon insert) attached to panel. Glueinstallations are not permitted.
8. Wall mounted Non-Illuminated signs: Wall mounted signs include installations on any flat surface which can be, but are not limited to, canopy support and platform columns, sign frames, and stair risers. Fastening hardware shall be ¼-20 tamper- resistant machine screw or TORX T27 with security pin or ¼-20 Drive Rivets with
¼-20 self-locking hex head nut (nylon insert) or blind aluminum or stainless steel rivet, as determined by the Authority.

3.04 FIELD PAINTING

A. The pre-finished backer plates shall have their finish touched up as required where exposedto view after installation of the signs.

B. Galvanized metals cut or drilled in the field shall have its galvanized finish touched up in thefield with approved galvanizing repair paint.

C. Dissimilar metals: To avoid galvanic action, separate dissimilar metals with approved paint.

D. Any mounting accessories such as angles, channels, plates, bent plates, clip angles, tubes,

posts, etc. that will be exposed to view after installation of the sign, shall be field painted to match the backer plates. New wood posts and other members shall also be primed and finished to match the backer plates.

E. Care shall be taken to not get paint on the new signs or any other existing surface.

3.05 QUALITY CONTROL

A. All the artwork of signs to be sharply and consistently detailed; with sharp and clear imagesand lettering; easily readable and all colors shall be uniform.

B. The pre-fabricated signs shall be free of air bubbles, cracks, scratches, chips, delamination or any other defects that affect the performance and appearance of the sign.

C. Fiberglass sheet to be of consistent thickness, to be flat, free of distortion and with sides 90 degrees and parallel to each other. Fiberglass sign and backer plate, if applicable, shall befree of any sharp or rough edges, burrs or other defects.

D. Installation of sign assembly shall be tight and secure. Sign shall be hung at required height, straight and even.

E. Replace defective signs if directed by the Authority. Re-install signs that are crooked, uneven or loose.

3.06 CLEANING AND PROTECTION

A. Signs shall be adequately protected during their delivery and installation to prevent damage by scratches, marring, stains, discoloration, or other causes. The sign faces shall be protected with a protective covering. The signs shall be crated. Damage to any surface during fabrication, handling, shipment, storage, and installation shall be remedied and paid for by the by the Contractor. Replace any damaged signs that cannot be cleaned or repaired.

B. Before delivery to the site, each sign shall be tagged or labeled with the identifying number and installation location as shown in the specifications. Labeling shall be on both the sign andthe protective covering.

C. At completion of the installation, remove the protective coating and clean soiled sign surfaces, and surfaces against which the new sign has been mounted, in accordance with the manufacturer's instructions. Protect units from damage until acceptance by the Authority.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 10 42 70, Fiberglass Embedded Signs shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 10 42 70, Fiberglass Embedded Signs shall be included in the contract

lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 10 42 80

ALUMINUM SIGNS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this section.

1.02 SUMMARY

A. This specification covers the requirements for furnishing and installing aluminum signs for the Chicago Transit Authority. The type, design, size, graphics, locations and other detailsof the signs and their installation as shown on the drawings.

1. The pre-fabricated aluminum signs shall consist of aluminum substrates with mounting holes and pre-printed retroreflective vinyl sign faces applied to one or bothsides.

B. This specification is intended to be descriptive, not restrictive, and is solely for the purpose of indicating the type and quality of fiberglass embedded signs which would meet the approval of the Authority.

C. Related Sections: The following sections contain requirements that relate to this section:

1. Division 05 Section, “Metal Fabrications”.

1.03 REFERENCES

A. The Work is subject to applicable portions of the following standards:

1. ANSI H35.2 - Dimensional Tolerances for Aluminum Mill Products.
2. ASTM B 209 - Standard Specification for Aluminum & Aluminum-Alloy Sheet &Plate.
3. ASTM B 580 - Anodic Oxide Coatings on Aluminum.
4. ASTM D 1730 - Preparation of Aluminum and Aluminum-Alloy Surfaces for Painting.
5. ASTM D 4956 - Specification for Retroreflective Sheeting for Traffic Control.
6. ASTM E 810 - Test Method for Coefficient of Retroreflection of RetroreflectiveSheeting.
7. Illinois Department of Transportation (IDOT) Standard Specification for TrafficControl Items:

   a. Type B Specification.

8. American Association of State Highway and Transportation:

   a. AASHTO Specification M268.

1.04 SUBMITTALS

A. Contractor is required to provide the following for the Authority’s review and approvalaccording to Division One Section, 01 30 00, Submittals.

B. Product Data: Provide product data, specifications, manufacturer's installation instructions, and manufacturer's maintenance recommendations for all products and materials used in the fabrication and installation of the signs of this section.

C. Test Data: Provide certified test data indicating that the materials provided meets the requirements of this specification section and the reference standards listed.

D. Samples: Provide samples of all types of signs, installation materials and other materials provided.

1. Contractor is required to submit a full scale black-and-white paper print-out sample of the proposed signs, along with a 4" x 4" sample of the retroreflective vinyl film, with protective liner, and a 4" x 4" sample of the aluminum sheet that will be used to fabricate the signs. The sample print-out(s) shall be printed using the artwork provided by the Authority. Artwork will be furnished in Adobe® Illustrator® electronic format (EPS files, or an enhanced PDF file).
2. The samples will be forwarded to the Authority's Manager of Signage and Wayfinding Department for review and approval before signs are fabricated and installed.
3. Failure of Contractor to submit the samples and obtain approval before productionshall be sufficient cause for rejection of delivered signs.
4. The samples will be kept by the Authority to compare with the production signs andwill not be available for installation at the project site.

E. Production Quality: Contractor shall submit evidence to the satisfaction of the Authority that representative production material of the type to be used has been used successfully in a substantial traffic signage program in similar climatic conditions for at least seven (7) years.

F. Fabrication Quality: Fabricator shall submit representation indicating his successful experience in producing signs of similar type, quality and quantity for a period of at least seven (7) years.

G. Provide shop drawings for backer plates and frames; including method of attachment to substrate and spacing of fasteners.

H. Provide product data and specifications for the fasteners and related hardware to be used for each type of sign, backer plate, sign frame, bracket and for each application and/or substrate to be fastened to.

I. Product data and specifications shall indicate the type of fastener, size of fastener, length of fastener, fastener material, zinc coating (if applicable), finish and number of fasteners provided for each application.

1.05 QUALITY ASSURANCE

A. Structural: Design structural support framing, posts and other means of support and attachment components under direct supervision of a Profesional Structural Engineer experienced in the design of this work and licensed in Illinois and as required by the Authority.

B. Full-Size Mock-up Testing: Have a specimen representative of project conditions tested by an independent testing agency for compliance with specified criteria and as required by theAuthority.

C. Manufacturer Qualifications: Company specializing in manufacturing aluminum signs of thetype and quantity required for this project for a period of at least seven (7) years.

D. Installer Qualifications: Company experienced in installing aluminum signs of the type and quantity required for this project for a period of at least three years and approved by the manufacturer of the signs.

1.06 DELIVERY, STORAGE AND PROTECTION

A. Delivery: Signs, posts and accessories shall be delivered to the project site in sufficient time for their scheduled installation.

B. Storage: Store signs, posts and accessories on site protected from the weather and damage.

C. Protection: Signs shall be protected with covering to avoid scratches and other damage during handling, delivery, storage and installation.

1.07 WARRANTY

A. Installation of signs shall be warrantied for a period of one (1) year after substantial completion. Signs shall be warrantied from dislodging, misalignment or other malfunction.

B. Signs and sign installations that fail within the warranty periods shall be replaced or repaired in entirety at no cost to the Authority and to the satisfaction of the Authority.

PART 2 - PRODUCTS

2.01 SIGN MATERIALS

A. Signs required shall be listed in the Contract Document with a description, drawing number(s) and, where available, item number(s).

B. All mounting holes, unless other specified, shall be 3/8 inch diameter and fitted with a 5/16 inch inside diameter stainless steel (or other approved material) grommet to prevent damageto the sign during the mounting application.

C. The aluminum signs and materials to be furnished under this specification include the following.

1. Pre-fabricated Signs - Aluminum substrates with mounting holes and pre-printed either on coated white paint base or retroreflective vinyl (e.g. D.O.T. STOP sign, NoParking sign, Do Not Enter sign.)
2. Custom Signs – Aluminum substrate with mounting holes and pre-printed either on coated white paint base or retroreflective vinyl and either an electro-cut vinyl applique or a permanent printed vinyl applied to the surface.
3. Rolls of transparent protective overlay film.
4. Framing members, posts, accessories, fasteners, etc. required for the sign fabrication and installation of the signs.

D. Finished Signs: The finished signs furnished shall be constructed using the following materials:

1. One (1) blank aluminum substrate with required holes.
2. One (1) or Two (2) pre-printed engineering grade retroreflective vinyl sheeting signfaces, one each per side

E. Sign Blank Substrates: The sign blank substrates shall be fabricated from 0.080" thick aluminum sheet, cut and drilled (or punched) to the dimensions as required for installation,and shall meet the following requirements:

1. The blank aluminum substrates shall be fabricated from either 6061-T6 or 052-H38aluminum alloy sheet that complies with ASTM B 209
2. The aluminum sheet used in the fabrication of the blank substrates shall be within the permissible variations for thickness, squareness and flatness as specified in ANSI H35.2.

F. Finished blank substrates shall be flat, and free of distortion, sharp edges, burrs, or any otherdefects.

G. The blank aluminum substrates shall receive a chemical conversion coating that meets therequirements of anyone of the following standards:

1. ASTM B 580, Type C Architectural Class II, natural color (clear or medium grey).
2. ASTM D 1730, Type and Method shall be at Supplier's discretion.

H. The chemical conversion process selected by the Contractor shall leave a surface coating that is fully compatible with the pressure sensitive adhesive used on the back of the retroreflective sheeting.

2.02 MANUFACTURERS

A. Manufacturers that produce aluminum signs that may conform to the requirements of this specification section include, but are not limited to the following:

1. Bowman Displays Digital Imaging, Inc.
2. Approved Equal.

2.03 RETROREFLECTIVE VINYL SIGN FACE

A. The retroreflective vinyl sign faces used in fabrication of the signs shall be cut from flexible white, engineering grade retroreflective sheeting equal in performance to 3M Scotchlite® part no. 3290 (white) which has the following salient characteristics. Alternate acceptable materials are 3M Scotchcal® 6800-010 (white), Oracal™ 5600-010 (white), FDC™ 2402-02 (white) and Avery™ A7801-R (white). Prismatic™, High Intensity™ and Diamond Grade™reflective sheeting is not acceptable.

B. The retroreflective sheeting shall be a typically enclosed lens glass-bead sheeting having a smooth flat outer surface. The sheeting shall be a durable retroreflective sheeting designed for the production of traffic control devices. The sheeting shall have a precoated pressure sensitive adhesive backing, in compliance with ASTM D 4956, Class 1, protected by an easilyremovable liner.

C. The retroreflective vinyl sheeting used in the fabrication of the signs shall meet all the performance requirements specified in ASTM D 4956, for Type I sheeting, or IDOT Standard for Traffic Control Items, Type B specification.

D. Photometric: The sheeting shall meet the minimum coefficients of retroreflection values in ASTM D 4956, Table 4 for Type I sheeting. The values are expressed in candelas per foot candle per square foot (candelas per lux square meter) as measured in accordance with ASTM E 810. The sheeting shall maintain at least 90% of the values shown in Tables 4 with water falling on the surface similar to a rainfall, when measured in accordance with the standard rainfall test of AASHTO M 268.

E. In addition to meeting the ASTM and IDOT requirements specified, the face of the retroreflective sheeting shall have a glossy finish without clearcoat. The material shall notstretch upon removal of the adhesive backing.

F. The sheeting used in sign fabrication, will be considered for qualification only when the material meets the requirements of this specification; and the Contractor provides certified sheeting manufacturer's test data showing that representative production material to be used for sign face fabrication meets the requirements of this specification.

G. The finished signs shall be furnished with the retroreflective vinyl film pre-printed with the artwork.

2.04 COLORED PROCESS INK AND VINYLS

A. The color of the ink to be used in the sign face printing process shall vary based on the application of the sign. If electrocut vinyl is required, use Pantone™ Matching System color swatches for conversion to 3M, Avery or Oracle part numbers to satisfy the colors needed.

B. The inks used in the printing process shall be transparent and shall not reduce the coefficients of retroreflection of the vinyl film more than 70% of the values in ASTM D 4956,Table 4.

C. The inks used in the printing process shall be waterproof and resistant to fading. The inks shall be those recommended by the manufacturer of the retroreflective sheeting for the printing process employed.

D. Colors indicated in the descriptions shall be equal to Pantone numbers (747XR Standard).Typical CTA color examples with cross references are as follows:

Color	Pantone #
Safety Red	200
Red	186
Orange	172
Yellow	012
Green	355
Olympic Blue	299
Accessible Blue	300 C
Historic Blue	282 C
Pace Bus Blue	Reflex Blue C
Purple	267
Brown	161
Neutral Gray	425 C
Pink Line Pink	204 C
Black	Process
Black CWhite	

2.05 SIGN FABRICATION

A. Signs required shall be listed in the Sign Schedule and shown on the Contract Documents with a description, drawing number(s), item number(s), method of installation and location.

B. All mounting holes, unless otherwise specified, in the finished enameled signs shall be 5/16inch plus or minus 1/64” diameter.

C. Finished signs shall be flat within a tolerance of plus or minus 1/32 inch measured diagonally. Finished signs shall be free of sharp edges, burrs, or any other defect that

can prove hazardous to personnel or detrimental to the mounting process.

D. All signs shall have full color coverage with no defects on all surfaces and edges such as discoloration, bubbles, pin holes, chipping or surface crazing.

E. The fabricated signs shall be free of air bubbles, wrinkles, or any other defects that can affect the performance and appearance of the sign or the application of the printed overlay.

F. The fabricated signs shall be trimmed flush around the perimeter edges and holes. Finished holes shall be completely clear of any vinyl film and must accept 5/16" threaded screws after trimming.

G. Trimmed vinyl shall be free of ragged and loose edges, or separation from the aluminum substrate.

H. All signs shall have full color coverage with no defects on all surfaces and edges such as discoloration, bubbles, pin holes, chipping or surface crazing.

I. All signs will be used outdoors and shall be expected to withstand all weather conditions for the city of Chicago and surrounding suburbs, for minimum of ten (10) years with minimal fading, cracking and surface crazing.

2.06 ARTWORK

A. The artwork to be used in the custom printing process of the finished signs will be furnished by the Authority. No other artwork will be acceptable. If using D.O.T. signs, use the Manual on Uniform Traffic Control Devices for Streets and Highways, latest edition, to follow proper guidelines for standard parking enforcement and roadway signage.

B. The printed detail on all sign faces shall be sharp, clear and easily readable, and the colorsshall be uniform.

C. The Contractor will receive from the Authority the art work required to make the sample sign(s) and then, upon approval of the sample(s), all the signs required for this contract. Theartwork will be furnished in Adobe® Illustrator® electronic EPS file format.

D. The Contractor shall verify accurate receipt of each digital artwork received by returning a paper proof copy of each, to the Signage & Wayfinding department c/o Manager of Signage & Wayfinding, located at 567 W. Lake Street, Chicago IL. 60661, before any production runsare made. The paper proof does not have to be in color.

E. Upon approval of paper proof, the Contractor shall produce and submit to the Authority’s Signage & Wayfinding Department the sample of each finished production sign for inspection with respect to size, color, and compliance to this specification.

F. All Pre-Production samples delivered to the Authority, shall be signed for by a Authority employee. Signature shall include delivery time and date.

G. When samples are not delivered directly to a member of the Signage & Wayfinding Department, the Contractor must notify the Signage & Wayfinding Department, that the delivery was made. The following information shall be provided at the time of notification:

1. The location of delivery.
2. The party that signed for the delivery.

3. The date and time of delivery.

H. It shall be the Contractor’s responsibility to obtain a signed receipt for delivery of samples. The Authority will not be responsible for delays in sample approval if the Contractor fails tocomply with the requirements specified in this section.

I. When samples are mailed directly to the Signage & Wayfinding department by posted mail, the Contractor shall notify the Signage & Wayfinding Department the same day that the samples were sent. It shall be the Contractor's responsibility to contact the Signage & Wayfinding Department within three (3) days of mailing, to confirm the samples were received.

J. Upon approval of sample sign(s), the Contractor will receive individual artwork to be used to fabricate signs being produced for this project. The artwork will be furnished in Adobe®Illustrator® electronic format.

K. Contractor shall verify accurate receipt of each digital artwork received by returning a paper proof copy of each to Manager, Signage and Wayfinding, located at 567 W. Lake St., Chicago, IL 60661, Telephone 312-681-3660, before any production runs are made.

2.07 TRANSPARENT PROTECTIVE OVERLAY FILM

A. The protective overlay film furnished shall be a clear, colorless film, which can be used in lieu of clear coating. It shall be durable, solvent resistant and coated with a transparent, pressure sensitive adhesive protected by a removable liner.

B. The transparent protective overlay film shall be designed for UV blocking and to provide a barrier to staining by graffiti and other markings when applied directly to 3M Series 225, transparent printable overlay sheeting having thermally inked graphics applied using the Gerber MAXX2 thermal printing process.

C. Color: When the protective overlay film is applied in accordance with the manufacturer's recommendation over the printable sheeting and thermal ink graphic, the color of the graphic shall conform to the original color requirements of the screen processed color.

D. Photometrics: A composite produced by applying protective overlay film onto the transparent printable sheeting and the reflective sheeting shall conform to the original coefficient throughout the effective life of the reflective sheeting.

E. Field Performance: The expected performance life of the sign face constructed of overlay film, printable overlay, and reflective sheeting shall be equivalent to the expected field performance life of the retroreflective material used.

F. Storage: The overlay film, when stored according to the manufacturer's recommendations,shall be suitable for use for a period of up to one year.

2.08 BACKER PLATES

A. Backer plates to be of steel, same exact size of sign, thickness as shown on the drawings or as required to firmly support the sign, provide attachment to the substrate and as approved by the Authority. Backer plate shall be hot dip galvanized after fabrication including any drilling or cutting. Backer plates should not have sharp edges or corners. Backer plate design subject to the review and approval of CTA signage and Wayfinding

Department.

2.09 FASTENERS

A. Provide and install all required attachment devices, washers, bolts and other hardware required for each application. Fasteners and other accessories shall be as specified or asdirected for the application, type of sign, location and substrate.

B. All fasteners, washers, bolts and accessories shall be stainless steel unless noted otherwise.

1. Approved fasteners, washers, bolts, accessories, plates, frames, brackets and other metal that is not stainless steel must be hot dip galvanized.

C. Use expansion anchors, self-tapping screws, pop-rivets, drive rivets, bolts and nuts, etc. as required. Use countersunk screws where exposed or necessary. Exposed fasteners shall be tamper resistant.

2.10 ENVIRONMETNAL CONDITIONS

A. Signs shall be suitable for unsheltered indoor and outdoor use within a temperature ranfeof -30 deg F to 120 deg F.

B. All signs will be used outdoors and shall be expected to withstand all weather conditions of the Chicago region with no or minimal fading, cracking, surface crazing, streaking, chalking, peeling, pitting, or delaminating.

PART 3 - EXECUTION

3.01 INSPECTION

A. Prior to installation, all signs shall be inspected by the Authority. All signs must meet the quality parameters of the approved sample. The purpose of this inspection is to verify quality of manufacture and conformance to requirements for the fabrication, color, artwork, etc. of each type of sign. Inspection will be conducted at the Contractor's premises, the project site, or at any other mutually agreeable location. The Contractor shall provide the Authority with a minimum of seven working days' notice prior to inspection.

B. Installer of signs shall verify all locations, sizes, installation and mounting conditions, typeof anchorage required and working conditions in the field.

C. A representative from the Authority may review the existing conditions with the installer priorto installation. The purpose of this inspection is to verify actual locations, method and quality of installation, dimensions, heights, space limitations, and other installation conditions for each sign. The scheduling of this inspection shall be mutually agreed upon by all parties.

D. Contractor to verify the existence of any utilities cables or other existing items or

construction that may be in the way of the new signs and this installation. Relocate thesign as approved to avoid relocation of utilities or interference with the sign as approved by the Authority.

E. After installation, a final inspection in the field will be conducted by the Authority. The purpose of this inspection is to verify quality of installation, correct location of signs,

etc. The Contractor shall provide the Authority with a minimum of seven working days' notice prior toinspection.

3.02 REMOVAL OF EXISTING SIGNS

A. Removal of existing signs:

1. If applicable, or as otherwise directed, the Contractor shall remove all existing signs of the type that is being replaced or that are nonconforming. All existing signs shall be turned over to the Authority and delivered to a specific location as directed. Also remove all existing accessories not needed for the new signs. Remove all existing signs and accessories with care so as not to damage the signs or existing surfaces.
2. Existing signs to be removed may be pop riveted, bolted, or welded to its substrate. Unless noted to be re-used, existing backer plates, framing, straps, anchors, support posts, etc. used with the existing signs shall be removed. Other items may have to be removed, relocated, or altered to allow for the installation of the new signs.

B. Clean surfaces where existing signs have been removed and clean surfaces that are to receive new signs. Remove any projections or obstructions. Do not reuse existing anchorage devices and other accessories.

C. For any surface where existing signs and their accessories have been removed and the new signs will not cover, touch up the finish and/or paint to match the existing adjacent surfaces.

D. Contractor shall identify any existing historic landmark or monument type signs. These signsshall not be removed unless approved otherwise in writing by the Authority.

3.03 INSTALLATION

A. General: Install signs according to Contract documents or to match existing locations, heights, and mounting details unless indicated or directed otherwise. Variations may be directed by or approved by the Authority's field representative during the pre-installation walk-thru or during the actual installation based on actual field conditions and interference. Use approved mounting methods, mounting accessories, and attachment devices. No glueinstallations are permitted.

B. Installation and anchorage shall be solid and secure. Provide and install all indicated or required backer plates, frames, support, posts, and other mounting accessories. Provide and install any additional steel framing or other support or accessories required. Where indicated or required, modify existing frame or other support to accept new sign assembly.

1. Sign fastener installation shall be capable of withstanding wind, vibration, abuse and vandalism and as approved by the Authority.

C. Install signs and all mounting accessories level, plumb, and flush with substrates. Sign surfaces shall be free from distortion or other defects in appearance. Mounting heights shall be as shown on drawings, as required and consistent throughout project unless indicatedotherwise or required to avoid interference and approval by the Authority.

D. Provide and install all required attachment devices, brackets, pendants and hardware. Fasteners and other accessories shall be as specified for the application. All fasteners and accessories shall be stainless steel unless noted otherwise. Use expansion anchors, self-tapping screws, pop-rivets, bolts and nuts, etc. as shown or required. Drill

as required. Use countersunk screws where exposed or necessary. Exposed fasteners shall be tamper resistant. Weld where indicated with full, tack, or stitch welds. Glue installations of any kind are not permitted, including as a means to attach the sign to a backer plate.

E. Installation of backer plate:

1. Directly to Substrate: Attach backer plate directly to wall, column, light pole, railing, windbreak, etc. by welding or using countersunk screws. Hole locations may be new, existing, or existing to be tapped. Use metal spacers behind the backer pate at each screw location where there are obstructions or minor projections at the surface where indicated on the drawings. Use countersunk expansion anchors when securing backer plate to masonry or concrete.
2. To Metal Frames, Horizontal Supports, Vertical Support Posts or railings: Attach backer plate to a frame made up of metal channels or tubes by welding or using countersunk screws. Attach backer plate to metal channel or tube supports, posts, angles, straps, or hangers by welding or using countersunk screws.

F. Installation of Metal Frames or Supports:

1. Weld or bolt metal frames, supports, or support posts to beam, columns, light poles, railing, or windbreak as directed. Use expansion anchors for securing frames, supports, or hangers to masonry or concrete. Drill and grout or imbed supports in new concrete where indicated.

G. Installation of Hangers:

1. Install Flexible hangers where indicated, securing the pivot assembly to the canopy structure and to the sign frame or backer plate as directed.

H. Installation of Signs:

1. Directly to Substrate: Determine that surface is clean and smooth. Secure signs to substrate using stainless steel pop-rivets or drive-rivets (such as at solid walls, masonry, etc.). Spacings as shown on the drawings or as directed by the Authority.
2. To Surface: Surface mounted signs include installations on any flat surface which can be, but are not limited to, walls, canopy support and platform columns, sign frames, sign supports, and stair risers. Fastening hardware shall be 1/4-20 tamper-resistant machine screw or TORX T27 with Security Pin or 1/4-20 Drive Rivets with 1/4-20 self-locking hex head nut (nylon insert) or blind aluminum or stainless steel rivet, as determined by the Authority.
3. To Metal Frame: Welded metal tube, channel or angle frame with mitered corners same size or slightly larger than sign. Secure sign to frame with pop rivets using approved spacings.
4. To Backer Plate: Metal surface of backer plate shall be clean and smooth with all countersunk screws properly installed. Backer plates shall be same exact size as sign. Secure sign to backer plate using stainless steel pop-rivets or tamper- resistant machine screws as indicated (drill/tap backer plate to accept screws) usingapproved spacings.
5. Pendant Bracket Mounted Sign: Pendant mountings are generally described as those which require two sign faces, back to back, attached to and supported by metal brackets (or similar metal supports), sandwiched between the two sign faces. Brackets shall be configured to provide proper mounting of sign. Fastening hardware and type of installation shall be equivalent to that which is existing.
6. Bracket-Mounted Units: Provide the manufacturer’s standard brackets, fittings,

and hardware as appropriate for mounting signs that project at right angles from walls and ceilings. Attach brackets and fittings securely to walls or ceilings with concealed fasteners and anchoring devices to comply with manufacturer's directions.

7. Panel Mounted Non-Illuminated signs: Panel mounted signs include installations on any flat or curved surface which can be, but are not limited to, acoustical panels, etc. Fastening hardware shall be 1/4-20 tamper resistant machine screws or TORX T27 with Security Pin or 1/4-20 Drive Rivets with 1/4-20 self-locking hex head nut (nylon insert) or blind aluminum or stainless steel rivet as determined by the Authority, attached to panel. Glue installations are not permitted.
8. Wall mounted Non-Illuminated signs: Wall mounted signs include installations on any flat surface which can be, but are not limited to, canopy support and platform columns, sign frames, and stair risers. Fastening hardware shall be ¼-20 tamper- resistant machine screw or TORX T27 with security pin or ¼-20 Drive Rivets with
¼-20 self-locking hex head nut (nylon insert) or blind aluminum or stainless steel rivet, as determined by the Authority.
9. Trim signs as required to fit locations only with approval of Authority. Modify existing sign frames, backer plates, supports, etc. as required for new signs.

3.04 FIELD PAINTING

A. The pre-finished backer plates, framing members or support members shall have their finishtouched up as required where exposed to view after installation of the signs.

B. Galvanized metals cut or drilled in the field shall have its galvanized finish touched up in thefield with approved galvanizing repair paint.

C. Dissimilar metals: To avoid galvanic action, separate dissimilar metals with approved paint.

D. Any mounting accessories such as angles, channels, plates, bent plates, clip angles, tubes, posts, etc. that will be exposed to view after installation of the sign, shall be field painted to match the backer plates. New wood posts and other members shall also be primed and finished to match the backer plates.

E. Care shall be taken to not get paint on the new signs or any other existing surface.

3.05 QUALITY CONTROL

A. All artwork of signs to be sharply and consistently detailed; with sharp and clear images andlettering; easily readable and all colors shall be uniform.

B. The aluminum signs shall be free of air bubbles, wrinkles, delamination or any other defects that affect the performance and appearance of the sign or the application of the printed overlay.

C. The aluminum signs shall be trimmed flush around the perimeter edges and holes.

Finished holes shall be completely clear of any vinyl film and must accept 5/16" threaded screws after trimming.

D. Trimmed vinyl shall be free of ragged and loose edges, or separation from the aluminum substrate.

E. Aluminum sheet to be of consistent thickness, to be flat, with square corners and free

of distortion. Aluminum sign and backer plate, if applicable, shall be free of any sharp or roughedges, burrs or other defects.

F. Installation of sign assembly shall be tight and secure. Sign shall be hung at required height, straight and even.

G. Replace defective signs if directed by the Authority. Re-install signs that are crooked, uneven or loose.

3.06 TESTING

A. The retroreflective sheeting furnished shall meet the test requirements specified ASTM D 4956 for the following:

1. Coefficient of Retroreflection.
2. Specular Gloss.
3. Daytime Color.
4. Shrinkage.
5. Flexibility.
6. Adhesive.
7. Impact Resistance.
8. Resistance to Accelerated Weathering.

B. In addition to the testing required by ASTM D 4956, the sheeting shall meet the following test requirements.

1. Coefficient of Retroreflection During Rainfall: The coefficient of retroreflection of the sheeting, when totally wet, shall not be less than 90% of the dry values specified in Tables 4 in ASTM D 4956. Wet performance measurements shall be made on newsheeting.
2. The coefficient of retroreflection under simulated rainfall conditions (wet performance) shall be determined using ASTM E 810, with the attune of the waternozzle setup shown in Illustration 5 in Section 12 of this specification.
3. Standard Rainfall Water Test per AASHTO M 268, Section 7.10.0.

    a. Place the test panels on which the sheeting has been applied in an uprightposition 6" below and 4" in front of the water nozzle.
    b. Apply sufficient water pressure so that the upper surface of the spray envelope strikes the top of the specimen. With water falling on the specimen, determine the coefficient of retroreflection at angles of 0.2 degrees observation and -4 degrees entrance only. Where more than one panel of a color is measured, the coefficient of retroreflection during the rainfall shall be the average of all the determinations.

3.07 CLEANING AND PROTECTION

A. Signs shall be adequately protected during their delivery and installation to prevent damage by scratches, marring, stains, discoloration, or other causes. The sign faces shall be protected with a protective covering. The signs shall be crated. Damage to any surface during fabrication, handling, shipment, storage, and installation shall be remedied by the Contractor at Contractor’s own expense. Replace any damaged signs that cannot be cleaned or repaired.

B. Before delivery to the site, each sign shall be tagged or labeled with the identifying number and installation location as shown in the specifications. Labeling shall be on both the sign andthe protective covering.

C. At completion of the installation, remove the protective coating and clean soiled sign surfaces, and surfaces against which the new sign has been mounted, in accordance with the manufacturer's instructions. Protect units from damage until acceptance by the Authority.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 10 42 80, Aluminum Signs shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 10 42 80, Aluminum Signs shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 10 42 90

BRAILLE TACTILE SIGNS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of contract, including General and Special Conditions andDivision 01 Specification sections, apply to this section.

1.02 SUMMARY

A. This specification covers the requirements for furnishing and installing tactile and Braille signs for the Chicago Transit Authority.

B. This specification is intended to be descriptive, not restrictive, and is solely for the purpose of indicating the type and quality of tactile and Braille signs which would meet the approvalof the Authority.

C. The Contractor shall furnish and install new combination tactile and Braille message signs as required. Unless otherwise requested, signs will display identical tactile and Braille messages. Refer to the sign schedule in the contract drawings for a list of signs to be furnished and installed for this project.

D. Related Sections: The following sections contain requirements that relate to this section:

1. Division 05 Section, “Metal Fabrications”.

1.03 REFERENCES

A. Signs shall meet or exceed the requirements of the Department of justice Title II of the Americans with Disabilities Act of 1990 (ADA, 42 U.S.C. 12181) as updated, amended and appended by federal, state and local governments and agencies of jurisdiction. Included inthe act are requirements for color contrast and surface finish.

B. Tactile and Braille characters shall conform to International Code/Council/American National Standards Institute (ICC/ANSI) standard A117.1, Accessible and Usable Buildings and Facilities. A nominal finished character height of 0.031” (0.79 millimeter, mm) is requiredby the standard.

C. Braille characters shall be Grade 2 as determined by National Library Service (NLS), Library of Congress specification #800. The finished characters shall be legible by a Library of Congress certified Grade 2 Braille reader.

D. The version of all standards, codes and specifications referenced herein that are current onthe date of the Invitation to Bid shall apply.

1.04 SUBMITTALS

A. All approvals prior to the award of contract shall be arranged through the Procurement Administrator indicated on the front sheet of the Contract Documents. Approvals subsequent to the award of contract shall be arranged with the Authority’s manager of Signage and Wayfinding. All evaluations, tests, samples and certification shall be at the Potential Bidder’sor Contractor’s expense.

B. Additional approval is required for one or more of the following conditions:

1. New sign products
2. Approved products with a change in manufacturer and manufacturing location.
3. Approved products that have been recomposed or reconstructed by the manufacturer.

C. Approval prior to Award, to the Sign Subcontractor:

1. All submitted documents and samples shall be marked with the Potential Bidder's identification and part number, the Authority item number, and the manufacturer'sname and part number.
2. Pre-award Approval: Pre-award approval by the Authority shall be secured prior to the award of a contract. Pre-award approval shall include an evaluation of the Potential Sign Subcontractor's sample signs by the Authority.
3. Sample signs shall be manufactured per artwork supplied by the Authority's Graphics & Design Department.
4. Submitted sample pre-award signs shall be representative of the Potential Sign Subcontractor's proposed production signs. The Authority will evaluate the samples with respect to the requirements of this specification and the intended service.
5. Submitted pre-award samples may be subjected to field and laboratory evaluations. At discretion of the Authority, evaluations may include, but are not limited to, one or more of the following: disassembly, assembly, installation, simulated service, in-service, nondestructive and destructive tests.
6. Evaluations will be performed based on the availability of the Authority's equipment and personnel.
7. At the satisfactory completion of all tests and evaluations, the Potential Sign Subcontractor's submitted offer will be recognized as an eligible proposal.
8. Pre-award samples shall be submitted no later than thirty (30) days after the date bids for the project are opened. Failure to submit samples within this time limit will be sufficient cause for rejection of the associated bid. Finished sample sign must be submitted for review with respect to size, finish, color, and compliance to this specification. Sample must be approved by Manager, Signage and Wayfinding before any Contract is awarded.

D. Approval after Award, to the Sign Subcontractor:

1. Production approval: Production approval shall be secured prior to the production of each requested sign style. Production approval shall include a verification of the sign artwork by the Authority's Signage and Wayfinding Department.
2. Sign Subcontractor is required to submit a sample finished sign no later than thirty
(30) days after Contract award for the project. The sample will be fabricated using artwork supplied by the Authority's Signage and Wayfinding Department. Artworkwill be furnished in Adobe® Illustrator® electronic format.
3. Upon approval of sample sign, Sign Subcontractor will receive individual artwork to be used to fabricate signs being produced for this project. The artwork will be furnished in Adobe® Illustrator® electronic format.
4. Submitted sample pre-award signs shall be representative of the Sign Subcontractor's proposed production signs. The Authority will evaluate the samples with respect to the requirements of this specification and the intended service.
5. The Sign Subcontractor shall return two (2) full-size, dated Braille-Embossed paper (hardcopy) proof using Grade 2 Translation of each new or revised sign

artwork requested by the Authority. Updates of existing, previously approved sign artworkare included in this requirement.

6. The Sign Subcontractor shall submit Braille translations within proofs should such translation be lacking in the preliminary artwork supplied by the Authority. CTA signdesign numbers do not require Braille translation.
7. Upon acceptance, the Authority will return one paper proof bearing a dated, authorized signature to indicate approval for production.
8. Failure to obtain Authority's production approval prior to sign production shall be sufficient cause for rejection of the associated sign deliveries.
9. Upon approval of paper proof, the Sign Subcontractor shall produce and submit a sample of the finished production sign for inspection with respect to size, color, and compliance to this specification; prior to full production of the signs.

E. Provide shop drawings for backer plates and frames; including method of attachment to substrate and spacing of fasteners.

F. Provide product data and specifications for the fasteners and related hardware to be used for each type of sign, backer plate, sign frame, bracket and for each application and/or substrate to be fastened to.

G. Product data and specifications shall indicate the type of fastener, size of fastener, length of fastener, fastener material, zinc coating (if applicable), finish and number of fasteners provided for each application.

1.05 QUALITY ASSURANCE

A. Structural: Design structural support framing, posts and other means of support and attachment components under direct supervision of a Professional Structural Engineer experienced in the design of this work and licensed in Illinois and as required by the Authority.

B. Full-Size Mock-up Testing: Have a specimen representative of the project conditions tested by an independent testing agency for compliance with the specified criteria and as requiredby the Authority.

C. Manufacturer Qualifications: Company specializing in manufacturing aluminum signs of thetype and quantity required for this project for a period of at least seven (7) years.

D. Installer Qualifications: Company experienced in installing aluminum signs of the type and quantity required for this project for a period of at least three years and approved by the manufacturer of the signs.

1.06 DELIVERY, STORAGE AND PROTECTION

A. Delivery: Signs, posts, and accessories shall be delivered to the project site in sufficient time for their scheduled installation.

B. Storage: Store signs, posts and accessories on site protected from the weather and damage.

C. Protection: Signs shall be protected with covering to avoid scratches and other damage during handing, delivery, storage and installation.

1.07 WARRANTY

A. Unless indicated otherwise, signs shall be warrantied for a period of one (1) year after substantial completion. Signs, installation, framing and accessories shall be warrantied from fading, discoloration, cracking, pitting, rusting, delamination, corrosion and other deterioration.

B. Installation of the signs shall be warrantied for a period of one (1) year after substantial completion. Signs shall be warrantied from dislodging, misalignment or other malfunction.

C. Signs and sign installations that fail within the warranty periods shall be replaced or repaired in entirety at no cost to the Authority and to the satisfaction of the Authority.

PART 2 - PRODUCTS

2.01 MATERIAL

A. Signs required shall be listed in the Sign Schedule and the Contract Documents with a description, drawing number(s) and, where available, item number(s).

B. The base sign shall be constructed of a single, homogenous piece of zinc alloy. By weight, the alloy zinc content shall be 98% or greater. To dissuade theft, materials with high salvagevalue shall not be utilized in the alloy composition.

C. The sign shall display a surface hardness within the range 85 – 105 Rockwell hardness, H scale (HRH) as determined by American Society for Testing and Materials (ASTM) standard E 18, Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials.

D. Signs shall be composed, sized, formatted and styled as specified in the contract release. The Chicago Transit Authority’s Signage and Wayfinding Department shall provide sign artwork in an electronic format consistent with Adobe Illustrator software. Unless otherwiserequested, the latest version of the artwork shall be used.

E. Unless otherwise requested, the sign shall have a nominal thickness of 0.13” (3.3 millimeters, mm).

F. Signs shall be free of sharp edges and protuberances potentially injurious to bare human flesh. The Contractor shall remove all flashing, burrs, and pointed corners.

G. Unless otherwise requested, the tactile letter font shall be Helvetica Medium.

H. All characters shall be well defined. Braille characters shall be distinct mounds that yield smooth feel. Tactile characters shall feature dulled edges. Sharp-edged cylinders shall notbe used for Braille characters nor round-edge relief for tactile.

I. All sign surfaces shall be coated. Unless otherwise specified, the top surfaces of tactile and border relief shall be coated with white catalyzed polyurethane. The background, edges and mounting hole circumferences shall be located with dark gray catalyzed polyurethane, compliant with Pantone Matching System (PMS) color swatch 425. The mounting (rear) surface shall be coated with a moisture impervious, acid-resistant catalyzed epoxy of arbitrary color.

J. Signs shall be finished with a clear, non-yellowing, non-glare matte industrial grade catalyzed polyurethane. The coating shall isolate the sign colored surface coatings from wear, corrosive cleaners, human sweat and body oils.

K. With fully cured coatings, the sign coloration shall comply with the 70% contrast requirementof requirement 2.9.

L. Sign mounting holes shall be located 0.02” or less from the requested true position.

M. The sign shall be suitably flushed and neutralized of all etching acids and process chemicals prior to the application of any coating. Applications shall be in accord with the coating manufacturer’s recommendations.

N. The sign message (front) surface shall be parallel to the mounting surface within 0.04” (1.0mm) or less.

O. Exposed sign surface shall be smooth. The surfaces shall be free of porosity, pits, sinks and blemishes. Welds and casting seams shall be ground flush with adjacent surfaces.

P. Finished signs that are less than 6 inches in length, when resting on the back surface shall be flat within a tolerance of plus or minus 1/32 inch measured diagonally. Finished signs shall be free of sharp edges, burrs, or any other defect that can prove hazardous to personnel or detrimental to the mounting process.

Q. All signs shall have full finish and color coverage with no defects on all surfaces and edgessuch as discoloration, bubbles, pin holes, chipping or surface crazing.

R. All signs shall have full color coverage with no defects on all surfaces and edges such as discoloration, bubbles, pin holes, chipping or surface crazing

S. All signs will be used outdoors and shall be expected to withstand all weather conditions for the city of Chicago and surrounding suburbs, for minimum of ten (10) years with minimal fading, cracking and surface crazing.

2.02 BACKER PLATES

A. Backer plates to be of steel, same exact size of sign, thickness as shown on the drawings or as required to firmly support the sign, provide attachment to the substrate and as approved by the Authority. Backer plate shall be hot dip galvanized after fabrication including any drilling or cutting. Backer plates should not have sharp edges or corners. Backer plate design subject to the review and approval of CTA signage and Wayfinding Department.

2.03 FASTENERS

A. Provide and install all required attachment devices, washers, bolts and other hardware required for each application. Fasteners and other accessories shall be as specified or asdirected for the application, type of sign, location and substrate.

B. All fasteners, washers, bolts and accessories shall be stainless steel unless noted otherwise.

1. Approved fasteners, washers, bolts, accessories, plates, frames, brackets andother metal that is not stainless steel must be hot dip galvanized.

C. Use expansion anchors, self-tapping screws, pop-rivets, bolts and nuts, etc. as required. Use countersunk screws where exposed or necessary. Exposed fasteners shall be

tamper resistant.

2.04 ENVIRONMENTAL CONDITIONS

A. Signs shall be suitable for unsheltered indoor and outdoor use within a temperature rangeof -30 deg F to 120 deg F.

B. All signs will be used outdoors and shall be expected to withstand all weather conditions of the Chicago region, with no or minimal fading, cracking, surface crazing, streaking, chalking, peeling, pitting, or delaminating.

2.05 PACKAGING AND IDENTIFICATION

A. Signs shall be individually packaged. The packaging shall isolate the sign from scratching,staining, scuffing and chipping by adjacent signs.

B. Should the Contractor elect to furnish signs with identification beyond that herein specified, the identification shall be located on the mounting (rear) surface. The identification shall be confined within a region not to exceed 20% of the available surface. The Authority's sign identification is incorporated in the sign exposed artwork.

PART 3 - EXECUTION

3.01 INSPECTION

A. Prior to installation, all signs shall be inspected by the Authority. All signs must meet the quality parameters of the approved sample. The purpose of this inspection is to verify quality of manufacture and conformance to requirements for the fabrication, color, artwork, etc. of each type of sign. Inspection will be conducted at the Contractor's premises, or at any other mutually agreeable location. The Contractor shall provide the Authority with a minimum ofseven working days' notice prior to inspection.

B. Installer of signs shall verify all locations, sizes, installation and mounting conditions, typeof anchorage required and working conditions in the field.

C. A representative from the Authority may review the existing conditions with the installer prior to installation. The purpose of this inspection is to verify actual locations, method and quality of installation, dimensions, heights, space limitations, and other installation conditions for each sign. The scheduling of this inspection shall be mutually agreed upon by all parties.

D. Contractor to verify the existence of any utilities cables or other existing items or construction that may be in the way of the new signs and this installation. Relocate sign as approved to avoid relocation of utilities or interference with the sign as approved by the Authority.

E. After installation, a final inspection in the field will be conducted by the Authority. The purpose of this inspection is to verify quality of installation, correct location of signs, etc. The Contractor shall provide the Authority with a minimum of seven working days' notice prior toinspection.

3.02 REMOVAL OF EXISTING SIGNS

A. Removal of existing signs

1. If applicable or as otherwise directed, the Contractor shall remove all existing signs of the type that is being replaced or that are nonconforming. All existing signs shall be turned over to the Authority and delivered to a specific location as directed. Also remove all existing accessories not needed for the new signs. Remove all existing signs and accessories with care so as not to damage the signs or existing surfaces.
2. Existing signs to be removed may be pop riveted, bolted, or welded to its substrate. Unless noted to be re-used, existing backer plates, framing, straps, anchors, support posts, etc. used with the existing signs shall be removed. Other items may have to be removed, relocated, or altered to allow for the installation of the new signs.

B. Clean surfaces where existing signs have been removed and clean surfaces that are to receive new signs. Remove any projections or obstructions. Do not reuse existing anchorage devices and other accessories.

C. For any surface where existing signs and their accessories have been removed and the new signs will not cover, touch up the finish and/or paint to match the existing adjacent surfaces.

D. Contractor shall identify any existing historic landmark or monument type signs. These signsshall not be removed unless approved otherwise in writing by the Authority.

3.03 INSTALLATION

A. General: Install signs according to Contract documents or to match existing locations, heights, and mounting details unless indicated or directed otherwise. Variations may be directed by or approved by the Authority's field representative during the pre-installation walk-thru or during the actual installation based on actual field conditions and interference. Use approved mounting methods, mounting accessories, and attachment devices. No glueinstallations are permitted.

B. Installation and anchorage shall be solid and secure. Provide and install all indicated backer plates, frames, support, posts, and other mounting accessories. Provide and install any additional steel framing or other support or accessories required. Where indicated or required, modify existing to accept new signs.

1. Sign fastener installation shall be capable of withstanding wind, vibration, abuse and vandalism and as approved by the Authority.

C. Install signs and all mounting accessories level, plumb, and flush with substrates. Sign surfaces shall be free from distortion or other defects in appearance. Mounting heights shall be as shown on drawings, as required by codes and consistent throughout project unless indicated otherwise or required to avoid interference and approval by the Authority.

D. Provide and install all required attachment devices, brackets, supports, and hardware. Fasteners and other accessories shall be as specified for the application. All fasteners and accessories shall be stainless steel unless noted otherwise. Use expansion anchors, self-tapping screws, pop-rivets, bolts and nuts, etc. as required. Drill as required. Use countersunk screws where exposed or necessary. Exposed fasteners shall be tamper resistant. Weld where indicated with full, tack, or stitch welds. Glue installations of any kind are not permitted, including as a means to attach the sign to backer plate.

E. Installation of backer plate:

1. Directly to Substrate: Attach backer plate directly to wall, column, light pole, railing, windbreak, etc. by welding or using countersunk screws. Hole locations may be new, existing, or existing to be tapped. Use metal spacers behind the backer pate at each screw location where there are obstructions or minor projections at the surface where indicated on the drawings. Use countersunk expansion anchors when securing backer plate to masonry or concrete.
2. To Metal Frames, Horizontal Supports, Vertical Support Posts or railings: Attach backer plate to a frame made up of metal channels or tubes by welding or using countersunk screws. Attach backer plate to metal channel or tube supports, posts, angles, straps, or hangers by welding or using countersunk screws.

F. Installation of Metal Frames, Supports or Hangers:

1. Weld or bolt metal frames, supports, or support posts to beam, columns, light poles, railing, or windbreak as directed. Use expansion anchors for securing frames, supports, or hangers to masonry or concrete. Drill and grout or imbed supports innew concrete where indicated.

G. Installation of Pipe Hangers:

1. Install Flexible hangers where indicated, securing the pivot assembly to the canopy structure and to the sign frame or backer plate as directed.

H. Installation of Signs:

1. Directly to Substrate: Determine that surface is clean and smooth. Secure signs to substrate using stainless steel pop-rivets or drive-rivets (such as at solid walls, masonry, etc.). Spacings as shown on the drawings or as directed by the Authority.
2. To Surface: Surface mounted signs include installations on any flat surface which can be, but are not limited to, walls, canopy support and platform columns, sign frames, sign supports, and stair risers. Fastening hardware shall be ¼-20 tamper-resistant machine screw or TORX T27 with Security Pin or ¼-20 Drive Rivets with ¼-20 self-locking hex head nut (nylon insert) or blind aluminum or stainless steel rivet, as determined by the Authority.
3. To Metal Frame: Welded metal tube, channel or angle frame with mitered corners same size or slightly larger than sign. Secure sign to frame with pop rivets using approved spacings.
4. To Backer Plate: Metal surface of backer plate shall be clean and smooth with all countersunk screws properly installed. Backer plates shall be same exact size as sign. Secure sign to backer plate using stainless steel pop-rivets or tamper- resistant machine screws as indicated (drill/tap backer plate to accept screws) usingapproved spacings.
5. Pendant Bracket Mounted Sign: Pendant mountings are generally described as those which require two sign faces, back to back, attached to and supported by metal brackets (or similar metal supports), sandwiched between the two sign faces. Brackets shall be configured to provide proper mounting of sign. Fastening hardware and type of installation shall be equivalent to that which is existing.
6. Bracket-Mounted Units: Provide the manufacturer's standard brackets, fittings, and hardware as appropriate for mounting signs that project at right angles from walls and ceilings. Attach brackets and fittings securely to walls or ceilings with concealed fasteners and anchoring devices to comply with manufacturer's directions.
7. Panel Mounted Non-Illuminated signs: Panel mounted signs include installations on any flat or curved surface which can be, but are not limited to, acoustical panels, etc. Fastening hardware shall be 1/4-20 taper resistant machine screws (Tamper Pruf No 14 head) with 1/4-20 self-locking head nut (nylon insert)

attached to panel. Glueinstallations are not permitted.

8. Wall mounted Non-Illuminated signs: Wall mounted signs include installations on any flat surface which can be, but are not limited to, canopy support and platform columns, sign frames, and stair risers. Fastening hardware shall be ¼-20 tamper- resistant machine screw or TORX T27 with security pin or ¼-20 Drive Rivets with
¼-20 self-locking hex head nut (nylon insert) or blind aluminum or stainless steel rivet, as determined by the Authority.
9. Trim signs as required to fit locations only with approval of Authority. Modify existing sign frames, backer plates, supports, etc. as required for new signs.
10. Provide supports as shown or required for support of tactile and Braille signs. Supports to be stainless steel unless approved otherwise. Supports to be anchored into or to substrates.

3.04 FIELD PAINTING

A. The pre-finished backer plates shall have their finish touched up as required where exposedto view after installation of the signs.

B. Galvanized metals cut or drilled in the field shall have its galvanized finish touched up in thefield with approved galvanizing repair paint.

C. Dissimilar metals: To avoid galvanic action, separate dissimilar metals with approved paint.

D. Any mounting accessories such as angles, channels, plates, bent plates, clip angles, tubes, posts, etc. that will be exposed to view after installation of the sign, shall be field painted to match the backer plates. New wood posts and other members shall also be primed and finished to match the backer plates.

E. Care shall be taken to not get paint on the new signs or any other existing surface.

3.05 QUALITY CONTROL

A. All the images of the braille tactile signs to be sharply and consistently detailed; with sharpand clear images and projections; easily “readable” for the sight impaired.

B. The signs shall be free of cracks, scratches, dents, discoloration or any other defects thataffect the performance or appearance of the sign.

C. Metal sheet to be of consistent thickness, to be flat, free of distortion and with sides at 90 degrees to each other. Braille Tactile sign and backer plate, if applicable, shall be free of anysharp or rough edges, burrs or other defects.

D. Installation of sign assembly shall be tight and secure. Sign shall be hung at required height, straight and even.

E. Replace defective signs if directed by the Authority. Re-install signs that are crooked, uneven or loose.

3.06 CLEANING AND PROTECTION

A. Signs shall be adequately protected during their delivery and installation to prevent damage by scratches, marring, stains, discoloration, or other causes. The sign faces shall be protected with a protective covering. The signs shall be crated. Damage to any surface during fabrication, handling, shipment, storage, and installation shall be remedied by the Contractor at Contractor’s own expense. Replace any damaged signs

that cannot be cleaned or repaired.

B. Before delivery to the site, each sign shall be tagged or labeled with the identifying number and installation location as shown in the specifications. Labeling shall be on both the sign andthe protective covering.

C. At completion of the installation, remove the protective coating and clean soiled sign surfaces, and surfaces against which the new sign has been mounted, in accordance with the manufacturer's instructions. Protect units from damage until acceptance by the Authority.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 10 42 90, Braille Tactile Signs shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 10 42 90, Braille Tactile Signs shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 10 44 16

FIRE EXTINGUISHERS AND CABINETS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS.

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes portable, hand carried fire extinguishers, mounting brackets for fire extinguishers and fire extinguisher cabinets.

1.03 REFERENCES

A. Underwriters Laboratories (UL).

B. AAMA 608.1-77.

C. NFPA 10-90.

D. ASTM A 167-91

E. ASTM C 1048-91.

F. NAAMM Manual – 88.

1.04 PREINSTALLATION CONFERENCE

A. Review methods and procedures related to fire extinguishers and cabinets including, but notlimited to, the following:

1. Schedules and coordination requirements.

1.05 SUBMITTALS

A. Product Data: For each type of extinguisher product. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fireextinguisher, mounting brackets and fire extinguisher cabinets.

1. For each type of cabinet, show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing recessed, semi- recessed, or surface-mounting method and relationships of box and trim tosurrounding construction.

B. Product Schedule: Coordinate final fire extinguisher schedule with fire extinguisher cabinetschedule to ensure proper fit and function.

1. For fire extinguisher cabinets, indicate whether recessed, semi-recessed or surface mounted. Use same designations indicated on Drawings.

C. Shop Drawings: For fire-protection cabinets. Include plans, elevations, sections, details, andattachments to other work.

D. Samples: For fire extinguisher cabinets. For each type of exposed finish required.

E. Samples for Initial Selection: For fire-protection cabinets. For each type of exposed finish required.

F. Samples for Verification: For fire extinguisher cabinets. For each type of exposed finish required, prepared on samples 6 by 6 inches square.

G. Warranty: Sample of special warranty.

H. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.06 QUALITY ASSURANCE

A. Single-Source Responsibility: Obtain extinguishers from one source from a single manufacturer. Obtain brackets and/or cabinets from same manufacturer as extinguisher or verify that the brackets and/or cabinet are suitable, approved and of proper size for the extinguisher provided.

B. Coordination: Verify the size, type and capacity of the extinguishers provided with the Authority's requirements and standards.

C. UL-Listed Products: Fire extinguishers shall be UL listed with UL listing mark for type, rating,and classification of extinguisher.

D. The fire extinguisher submitted for approval must meet the approval of the Authority's Safety Department for durability and operational reliability.

1.07 COORDINATION

A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fitand function.

B. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

C. Coordinate sizes and locations of fire extinguisher cabinets with wall depths.

1.08 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period. Extinguishers shall remain in full operating condition during the warranty period or be repaired or replaced by the manufacturer at no cost to the Authority, upon approval bythe Authority.

1. Failures include, but are not limited to, the following:

a. Failure of hydrostatic test according to NFPA 10.
b. Faulty operation of valves or release levers.
c. Corrosion.

2. Warranty period from the date of final acceptance:

a. For Pump-Type Water Filled Fire Extinguishers: One (1) year.

b. For all other Fire Extinguishers: Six (6) years.
c. Brackets and cabinets shall be warrantied for a period of at least one yearagainst malfunction, corrosion and deterioration of the finish.

1.09 SEQUENCING

A. Apply decals or vinyl lettering on field painted fire protection cabinets after painting is complete.

PART 2 - PRODUCTS

2.01 FIRE EXTINGUISHERS

A. General: Provide fire extinguishers of each type listed for each location shown on the drawings or as required by the Authority, from manufacturer's standards, that comply withauthorities having jurisdiction.

B. Performance:

1. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA"Portable Fire Extinguishers."
2. Fire Extinguishers: Listed and labeled for type, rating, and classification by anindependent testing agency acceptable to authorities having jurisdiction.

a. Provide fire extinguishers approved, listed, and labeled by FM Global.

3. The extinguishers shall operate satisfactorily within the temperature range of 120degrees and -40degrees F.
4. Extinguishers shall not require a periodic recharge and not be required to be re-charged until used.

2.02 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet and/or mountingbracket indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by oneof the following:

a. Amerex Corporation.
b. Ansul Incorporated; Tyco International.
c. Badger Fire Protection.
d. Buckeye Fire Equipment Company.
e. Fire End & Croker Corporation.
f. Guardian Fire Equipment, Inc.
g. JL Industries, Inc.; a division of the Activar Construction Products Group.
h. Kidde Residential and Commercial Division.
i. Larsens Manufacturing Company.
j. Miller-Peerless, Ri-Del Manufacturing, Inc.
k. MOON American.
l. Nystrom, Inc.
m. Pem All Fire Extinguisher Corp.; Pem Systems, Inc.
n. Potter Roemer LLC.
o. Approved equal.

2. Valves: Manufacturer's standard.

3. Handles and Levers: Manufacturer's standard.
4. Instruction Labels: Include pictorial marking system complying with NFPA Appendix B, and bar coding for documenting fire-extinguisher location, inspections, maintenance, and recharging.

B. Pump-Type Water Filled Fire Extinguisher: Provide 2.5 Gallon, UL-rated containing approved antifreeze solution good for temperatures as low as minus 25 degrees Fahrenheit in a copper tank of minimum thickness of 22 gauge. The outside of the tank shall be painted with red enamel and the tank shall have a carrying handle and a footrest.

1. The double-action pump shall be constructed of copper and brass parts and be fastened by means of a non-ferrous casting, which is also part of a locking device to secure the pump in a closed position. Provide a gasket between the casting and the tank to prevent water leakage. The pump plunger shall have a spade type-type cast brass handle, which shall serve to carry the extinguisher. The out-put of the pump shall be such that eight complete strokes shall pump approximately 16 ounces of water.
2. The discharge hose shall be equipped with a nonferrous nozzle. A three-ply rubber hose shall be 33.5 inches long and capable of passing a 400 psi hydraulic test for five minutes. The hose shall be protected against kinking at its attaching end by a coil spring surrounding said hose, and secured to the pump casting. The tank shall be equipped with a small socket, soldered or brazed to the tank for insertion of hosenozzle when not in use.

C. Multipurpose Dry Chemical Type: Provide UL-rated 20A – 120BC, 20-lb. nominal capacity, in enameled steel container. Extinguishing agent shall be monoammonium phosphate- base dry chemical that shall meet or exceed the minimum requirements of Underwriters Laboratories, Inc. and Factory Mutual Laboratories for the type of dry chemical.

D. Carbon Dioxide Type: Provide UL-rated 5-BC, 10-lb nominal capacity, in manufacturer's standard enameled metal container.

E. Fire Extinguishers Fabrication:

1. Provide hand held cartridge type fire extinguishers as required by codes set in cabinets. Extinguishers shall be A-B-C- class, meeting U.L. rating 2A-10BC, containing 5.5 lbs. of dry chemical in a seamless aluminum body.
2. Provide all necessary attachments and pressures gauges as required for Underwriters' Label and rating.
3. Operation of the hand held extinguisher shall be operated by a lever which punctures a cartridge disc, allowing carbon dioxide gas contained therein to escape into the dry chemical container and expel the dry chemical when the hose nozzle is opened. The puncturing mechanism of the extinguisher shall be protected against accidental operation by suitable means for all methods of puncturing.
4. Extinguisher assembly shall consist of the chemical chamber or container, carrying handle, cartridge receiver, carbon dioxide cartridge, puncturing mechanism, hoseand shut off nozzle.

    a. The shell of the chemical chamber shall be made of steel. The outer surface of the chemical chamber shall be zinc-coated, bonderized or copper-plated. The interior of the chemical chamber shall be treated to resist corrosion.
    b. The hose shall be non-kinking, ½” I.D. x 31-1/2” long.
    c. The shut-off nozzle (discharge nozzle) shall have a spring-loaded lever-operated valve. All parts of the nozzle and valve shall be made of

corrosion resistant materials. The operation of the valve shall be such as to prevent any pressure leaks or moisture absorption, which might tend to cake the dry chemical. The discharge from the nozzle shall be in an expanding round stream. The hose shall be non-kinking, ½" I.D. x 31-1/2" long.

d. The dry chemical chamber shall have a fill opening measuring approximately 2 inches in diameter or more to assure easy and rapid filling with dry chemical. The design of the extinguishers shall allow for ease of re-assembly.

e. Extinguishers shall be furnished with a fill cap indicator that will show when the extinguisher has been used. The device shall be a tamperproof stem that "pops-up" when the extinguisher is actuated and the stem shall remain in this position until it is reset at the time of the recharging.

F. Markings

1. All extinguishers shall be die-stamped with the words "PROPERTY OF CTA" with letters 3/8" high stamped around the barrel of the extinguisher approximately 3/8"up from the bottom edge of the extinguisher.
2. All extinguishers shall have a metal label affixed indicating that it is approved by theUnderwriters Laboratories and Factory Mutual Laboratories.
3. Operating instructions for the portable extinguishers shall be positioned to face outward when the extinguisher is mounted on a wall, in accordance with U.L. Standard 299. Recharging instructions shall be positioned on the side opposite theoperating instructions.

2.03 MOUNTING BRACKETS

A. Brackets: Designed to prevent accidentally dislodging extinguisher, of sizes required for type and capacity of extinguisher indicated, in plated finish.

1. Provide brackets for extinguishers that are not located or mounted in cabinets.

B. Mounting Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or [red] [black] baked-enamel finish.

1. Manufacturers: Subject to compliance with requirements, provide products by oneof the following:

a. Amerex Corporation.
b. Ansul Incorporated; Tyco International.
c. Badger Fire Protection.
d. Buckeye Fire Equipment Company.
e. Guardian Fire Equipment, Inc.
f. JL Industries, Inc.; a division of the Activar Construction Products Group.
g. Larsens Manufacturing Company.
h. Nystrom, Inc.
i. Potter Roemer LLC.
j. Strike First Corporation of America.
k. Approved equal.

C. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Authority.

1. Identify bracket-mounted fire extinguishers with the words "FIRE

EXTINGUISHER" in red letter decals applied to mounting surface.

2.04 FIRE EXTINGUISHER CABINETS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. American Specialties, Inc.
2. Fire-End & Croker Corporation.
3. GMR International Equipment Corporation.
4. Guardian Fire Equipment, Inc.
5. JL Industries, Inc.; a division of the Activar Construction Products Group.
6. Kidde Residential and Commercial Division.
7. Larsens Manufacturing Company.
8. Modern Metal Products, Division of Technico Inc.
9. MOON American.
10. Nystrom, Inc.
11. Potter Roemer LLC.
12. Strike First Corporation of America.
13. Approved equal.

B. Construction: Manufacturer’s standard box, with trim, frame, door and hardware to suit cabinet type, trim style, and door style indicated. Weld joints and grind smooth. Miter and weld perimeter door frames.

1. Fire-Rated Cabinets: Construct fire-rated cabinet boxes with double walls fabricated from 0.043-inch- thick cold-rolled steel sheet lined with minimum 5/8-inch- thick fire-barrier material. Provide factory-drilled mounting holes.

C. Fire-Rated Cabinets: UL listed with UL listing mark with fire-resistance rating of wall where installed.

D. Cabinet Material: Stainless steel sheet unless noted otherwise.

1. Shelf: Same metal and finish as cabinet.

E. Cabinet Type: Suitable for containing the fire extinguisher.

1. Recessed Cabinet:

a. Trimless with Concealed Flange: Surface of surrounding wall finishes flush with exterior finished surface of cabinet frame and door, without overlapping trim attached to cabinet. Provide recessed flange, of same material as box, attached to box to act as plaster stop or drywall bead.
b. Trimless with Hidden Flange: Flange of same metal and finish as box overlaps surrounding wall finish and is concealed from view by an overlapping door.
c. Exposed Flat Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall returnat outer edge (backbend).
d. Semi-recessed Cabinet: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wallreturn at outer edge (backbend).

2. Surface-Mounted Cabinet: Cabinet box fully exposed and mounted directly on wall with no trim.

F. Trim Style: Fabricate trim in one piece with corners mitered, welded, and ground smooth.

1. Exposed Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).

    a. Square-edge trim with 2 ½ inch backbend depth.
    b. Trim Metal: Of same metal and finish as door.

G. Door Material and Construction: Manufacturer's standard door construction, of material indicated, coordinated with cabinet types and trim styles selected.

1. Stainless Steel: Manufacturer's standard flush, hollow stainless steel door construction.
2. Door Glazing: Clear float glass complying with ASTM C 1036, Type I, Class I, Quality q3.

H. Identify fire extinguisher in cabinet with FIRE EXTINGUISHER lettering applied to door. Provide lettering to comply with authorities having jurisdiction for letter size, style, color, spacing and location.

1. Application Process: Etched.

I. Identify bracket-mounted extinguishers with FIRE EXTINGUISHER in red letter decals applied to wall surface. Use letter size, style and location as selected by the Authority.

J. Door Style: Manufacturer's standard design with center glass panel with frame, unless shown otherwise.

1. Break Glass Panel: Float glass, 1/8 inch thick, with inside latch and lock.

K. Door Hardware: Provide manufacturer's standard door-operating hardware of proper type for cabinet type, trim style and door material and style indicated. Provide either lever handle with cam-action latch, or exposed or concealed door pull and friction latch. Provide concealed or continuous-type hinge permitting door to open 180 degrees.

L. Materials:

1. Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304.

2. Finish: ASTM A480/A480M No. 4 directional satin finish.

M. Accessories:

1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to security fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.

2.05 FABRICATION

A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door,and hardware to suit cabinet type, trim style, and door style indicated.

1. Weld joints and grind smooth.
2. Provide factory-drilled mounting holes.
3. Prepare doors and frames to receive locks.
4. Install door locks at factory.

B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materialsindicated and coordinated with cabinet types and trim styles.

1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.

2. Fabricate door frames of one-piece construction with edges flanged.
3. Miter and weld perimeter door frames.

C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and groundsmooth.

2.06 FINISHES FOR CABINETS, GENERAL

A. Comply with NAAMM “Metal Finishes Manual” for recommendations relative to applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying temporary strippable protective covering prior to shipping.

C. Finish fire-protection cabinets after assembly.

D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine walls and partitions for thickness and framing for cabinets to verify mounting priorto installation.

B. Examine rough-in for cabinets to verify locations prior to cabinet installation.

C. Examine fire extinguishers for proper charging and tagging.

1. Remove and replace damaged, defective, or undercharged fire extinguishers.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION - GENERAL

A. Follow manufacturer's printed instructions for installation of fire-protection cabinets and fireextinguishers.

B. Fasten and secure mounting brackets and fire-protection cabinets to structure square andplumb at locations indicated.

C. Identification: Apply decals or vinyl lettering at locations indicated.

3.03 INSTALLATION – FIRE EXTINGUISHER CABINETS

A. Install Fire Extinguisher Cabinets: Install fire-protection cabinets in locations and at mounting heights indicated below and at heights acceptable to authorities having jurisdiction.

1. Fire Extinguisher Cabinets: 54 inches above finished floor to top of cabinet.

B. Unless otherwise indicated, provide recessed fire extinguisher cabinets. If wall thickness is inadequate for recessed cabinets, provide semi-recessed fire extinguisher cabinets.

C. Provide inside latch and lock for break-glass panels.

D. Fasten mounting brackets to inside surface of fire extinguisher cabinets, square and plumb.

3.04 INSTALLATION – FIRE EXTINGUISHERS AND MOUNTING BRACKETS

A. Install Fire Extinguishers and Mounting Brackets: Mount fire extinguishers and brackets in locations and at mounting height indicated below and at heights acceptable to authorities having jurisdiction.

1. Mounting Brackets and Fire Extinguishers: 54 inches above finished floor to top offire extinguisher.

3.05 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire extinguisher cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust fire extinguisher cabinet doors to operate easily without binding. Verify that integrallocking devices operate properly.

C. On completion of fire extinguisher cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes, or replace fire extinguisher cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnishedby fire extinguisher cabinet and mounting bracket manufacturers.

E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

3.06 WARRANTY, MAINTANCE AND OPERATING INSTRUCTIONS

A. Provide the Authority with fully executed copies of the warranty and copies of maintenance and operating instructions for each type of extinguisher, bracket and cabinet installed.

MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 10 44 16, Fire Extinguishers and Cabinets shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 10 44 16, Fire Extinguishers and Cabinets shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 10 45 40

ROTOGATES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of contract, including General and Special Conditions andDivision 01 Specification sections, apply to this section.

1.02 SUMMARY

A. Provide rotogates as required by the Contract Documents. The stainless steel rotogate assembly consists of a manually operated rotating gate with framed barrier, ceiling plate, and canopy structure. Rotogates may be single type or double type, as shown on the drawings.

B. Related Work Specified Elsewhere:

1. Metal Fabrications, Section 05 50 00.
2. Barriers, High Barriers, Gates, Section 05 50 10.

C. The rotogates shall be of heavy duty type and shall be designed and manufactured to withstand high volume use and unsupervised traffic flow.

D. The single rotogates shall be used for single direction travel only. The double rotogates shall have two rotating sections used for dual direction travel, independent of the other. Rotation direction (clockwise or counterclockwise) is dependent on the particular application and will be determined in the field during installation (rotogates shall be delivered non-directional). The rotogates shall be designed so that direction of rotation cannot be reversed by force.

1.03 QUALITY ASSURANCE

A. Field Measurements: If possible, take field measurements prior to preparation of shop drawings and fabrication. Do not delay job progress; when taking field measurements beforefabrication might delay work, allow for adjustments during installation.

B. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

C. Qualifications: No work, shop drawings or materials shall be bought or ordered until the manufacturer of the rotogates has been approved by the Authority. The manufacturer/contractor shall comply with the following:

1. The manufacturer shall have at least ten (10) continuous years experience in the manufacture of the type of work under this contract.
2. The manufacturer's plant shall be open to the Authority’s representative for the Authority’s inspection. Complete fabrication methods and procedures shall be demonstrated to the Authority upon request.
3. The manufacturer shall demonstrate that their plant is adequate to handle fabrication and installation within the construction period.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's product specifications and installation instructions forproducts and processes used, including finishes.

B. Shop Drawings: Prior to fabrication, the rotogate manufacturer shall submit shop drawings to the Project Manager for approval. Shop drawings shall indicate all dimensions, details, installation details, elevations, plans, sections, all components, material list, assembly, etc. of each type of rotogate. Include plans, elevations and details of fittings, connections, and anchorages to other work. Shop drawings shall indicate actual field verified dimensions and conditions. The manufacturer shall make any changes specified in line with the requirements. Approval of shop drawings shall not release the manufacturer from furnishing the equipment in full compliance with these requirements.

C. Provide any required templates for anchor and bolt installation by others.

D. As-built Drawings, Parts Lists, and Instructions: The contractor and manufacturer shall furnish three sets of as-built drawings, maintenance instructions, circuit diagrams, and parts lists at the time of delivery of equipment. Drawings shall enable identification of all parts and subassemblies for ease in future ordering of repair parts.

E. Samples: Provide samples of stainless steel in finish specified.

F. Certification: Provision of rotogates, including fabrication and installation, shall be in strict compliance with all safety and code requirements of federal, state, and local government agencies having jurisdiction. Contractor shall submit written certification of all required compliance prior to fabricating and installing.

G. Manufacturer shall also certify that he has reviewed the proposed locations and applications of the rotogates and that his rotogate would function properly in those locations and underthose conditions.

H. Manufacturer shall also certify that replacement parts for the rotogate will be available for purchase by the Authority after the expiration of the warranty period.

1.05 WARRANTY

A. Rotogates shall be warrantied for a period of one year after final acceptance for defects in materials, workmanship, and installation and be repaired or replaced to the satisfaction of the Authority and at no cost to the Authority. Rotogates that fail to operate smoothly and asdesigned shall similarly be replaced within the warranty period.

1.06 DELIVERY & STORAGE

A. Delivery, Storage and Handling: Material shall be delivered to the project in sealed containers bearing manufacturer's name and material identification. Materials shall be stored in strict accordance with the manufacturer's printed directions.

B. Protection: Protect materials against damage from mechanical abuse, plaster, salts, acids, staining, and other foreign matter by an approved means during transportation, storage and erection and until completion of construction work. All unsatisfactory materials shall be removed from the premises, and all damaged materials replaced with new materials.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include but are not limited to the following:

1. BCBM, LLC. 3023 N. Clark St., Chicago, Il 60657 312-550-8616.
2. Boon Edam, Inc., 402 McKinney Pkwy., Lillington, NC 27546 910-814-3800.
3. Approved Equal.

2.02 MATERIALS

A. General: Furnish complete rotogate assemblies each with a three wing section consisting of assembled rotor section, arms, assembled barrier section, cage section, floor and ceiling plates. Unless noted otherwise, all rotogate components shall be manufactured from ANSINo. 304 Stainless Steel.

1. The rotogates shall be so designed and constructed so as to permit convenience passage of persons freely in one direction of rotation and prevent passage in the opposite direction. The double rotogate shall have two separate gates. The direction of travel through the rotogate shall be reversible without requiring additional parts.
2. The overall height of all rotogates shall be 7'-0". The diameter of a non-accessible single rotogate shall be 5'-6" unless shown otherwise on the drawings. Accessible rotogates, where shown, to be 8'-0" in diameter. The overall width of a dual rotogate assembly shall be 8’-0” with a depth of 5’-0”. The total height of all rotogate cagesshall be 6'-7" or as shown on the drawings.
3. The rotor post to consist of a single vertical member, to which three (3) sets of arms are individually and fully welded, spaced 120 degrees apart on centerline. Each arm shall consist of a single stainless steel section, equally spaced. The maximum vertical space between the horizontal rotor arms for each section shall be 5". The rotor arms shall be minimum 1-1/2" diameter tubing with minimum .083" thick wall, internally supported and then welded to the rotor post, with the ends of the arms spun welded closed over to a spherical configuration, ground and polished smooth. Each arm shall be brushed to No. 4 finish.

    a. Alternate Construction (to be submitted for approval by CTA): In lieu of a single vertical member, the rotor post can also consist of three (3) vertical members, each with their own set of arms welded, and spaced 120 degreesapart on centerline.

4. Rotor and Barrier Vertical Members shall be stainless steel 2 inch square posts with 0.12” thick walls.
5. The barrier comb sections shall consist of minimum 1-1/2" diameter (to match arms) stainless steel tubing, minimum .083” thick wall, spaced equally and offset with the rotor arms, welded to the support post, with the ends of the arms spun welded closed over to a spherical configuration ground and polished smooth and finished to match the rotor arms. The maximum vertical space between the horizontal barrier arms shall be 5” to match the rotor arms. The configuration shall be such that a person should not tend to be caught between the rotor arm section and the barrier section.
6. The single rotogate’s shield assembly or cage is to be constructed with 3 vertical stainless steel “U” channels attached to the floor and ceiling plates and spaced equally and set to match the circumference of the rotogate; with 1 ½” horizontal stainless steel bands of minimum .38" stainless steel, spaced equally, curved to form the circumference of the rotogate, and bolted to the vertical

channels. Finish to match the rotor arms. The maximum vertical distance between the bands shall not exceed 5". Alternate barrier materials are a stainless steel plate bolted to the horizontal bars and vertical channels from approximately 4” from the floor to a height of 4’-0” and supported by a minimum of three horizontal bars; a full stainless plate bolted to the horizontal bars and vertical channels; or tempered glass in a stainless steel frame; as indicated on the drawings.

7. The twin rotogate shall have two shield assemblies each constructed with 3 vertical stainless steel “U” channels attached to the floor and ceiling plates and spaced equally and set to match the circumference of the rotogate; with 1 ½” horizontal stainless steel bands of minimum .38" stainless steel, spaced equally, curved to form the circumference of the rotogate, and bolted to the vertical channels. Finish to match the rotor arms. The maximum vertical distance between the bands shall not exceed 5". Alternate barrier materials are a stainless steel plate bolted to the horizontal bars and vertical channels from approximately 4” from the floor to a height of 4’-0” and supported by a minimum of three horizontal bars; a full stainless plate bolted to the horizontal bars and vertical channels; or tempered glass in a stainless steel frame; as indicated on the drawings.
8. Heel guards on the bottom arms of rotor shall be stainless steel “U” shaped channels, minimum 0.072” thick, surrounding the lower arms and bolted to the bottom set of arms, extending to within ½” of the floor. The holes for the bolts (1/4” bolts minimum) shall be slotted to allow for adjustment of the heel guard after installation, allowing for at least ¾” adjustments.
9. The full round ceiling plate shall be fabricated of stainless steel, minimum 11 attached to internal supports of structural steel channel and the mechanism housing. The internal steel support system, which contains the rotogate controls shall not beopen to view. The exterior section shall be brushed to a No. 4 finish and span theentire shield and barrier assembly. Ceiling canopy to be provided with weldedstiffeners and structural reinforcements consisting of minimum 0.375” steel angles.
10. The center post shall be mounted to the floor with a serviceable base plate. The bottom bearings for the rotors shall be of the friction type to minimize spinning and corrosion. A mechanical clutch mechanism to be used to restrict traffic flow to exit only; using a machined clutch body and hardened 1" thick ratchet assembly. Over-running clutch design, drill rod steel rollers, hardened inner clutch ring and keyway. Hardened steel star gear, steel bearings and 2” thick flame-cut and hardened steel housing. Mechanical clutch shall be located at the top of the ceiling plate to allow for maintenance, repair and changing of clutch rotation. Operation of rotogate shall be silent and resistant to “free-wheeling”.
11. The rotor bearings shall be of a friction type constructed of only either iron and/or steel. Bearing housing shall be equipped with a oil cup or hole/cutout for lubrication for the bottom bearing and an accessible grease hole for the top mechanism. Thetop access hole shall be of a self-sealing type.
12. Rotogate to be of heavy duty design and operation, with heavy duty operating mechanism.
13. As required and/or shown on the drawings, The ceiling of the rotogate shall have a facia extending upward. Facia shall extend the full perimeter of the ceiling, be of one piece metal, welded as required, reinforced as required, and be of 16 ga. stainless steel, minimum, finish to match other stainless steel. Height of facia as shown on the drawings or as required by field verified dimensions.
14. When installed at unprotected exterior locations, the rotogate shall be designed and fabricated to withstand the elements and operate properly under all conditions. The rotogate shall have adequate protection from moisture

infiltration of its mechanismand all moving parts.

B. Protection from Dissimilar Materials: Stainless steel shall be protected from direct contactwith dissimilar materials as follows:

1. Dissimilar metals shall be painted with a heavy brush coat of zinc chromate paint.
2. Stainless steel surfaces in contact with mortar, concrete, or other masonry materialshall be given one heavy brush coat of alkali-resistant bituminous paint.

C. Stainless Steel: All exposed materials used for the manufacture of the rotogate shall be stainless steel. All stainless steel shall be ANSI Type 304 with No. 4 brushed finish unlessotherwise indicated.

2.03 FABRICATION

A. Field Measurements: Before proceeding with fabrication, the supplier/installer shall verify all dimensions and take such measurements as are required for proper fabrication and erectionof the work.

B. Standards:

1. Work under this section shall be executed by a qualified manufacturer. All exposed work shall be professionally finished in materials and workmanship. Field work shall be done by skilled mechanics. Angles and lines shall be straight and true; surfaces shall be smooth and free from all waves and buckles. Do all cutting and drilling necessary for fitting work in place and erect all work in place in a firm, rigid and workmanlike manner.
2. Shop assembled members shall be bolted or welded as indicated. No field riveting will be permitted except for installation of the rotogate assembly; bolted field connections may be reinforced by welding. All welds shall be ground smooth andflush with adjacent surfaces.
3. Where welding occurs, it shall be by the electric arc process in accordance with American Welding Society's Code of Arc and Gas Welding in Building Construction.
4. All welding shall be executed by operators who have been qualified previously by tests as prescribed by the American Welding Society's "Standard Qualification Procedure" to perform the work required.
5. No flame cutting of steel will be permitted in the field. Members flame-cut in the shop shall be finished to an acceptable appearance equal to a sheared finish. Holes shall not be flame-cut in either shop or field. No cutting of structural shapes shall be donein the field without the consent of the Authority.

C. Assembly:

1. Materials shall be properly marked and match-marked where field assembly is required. The sequence of shipment shall be such as to expedite erection and minimize the field handling of materials.
2. Use care in handling and erection to insure that steel shall not be twisted bent, or otherwise damaged, and should any difficulty be encountered, it shall be immediately reported to the Authority.
3. Connections at angles, miters and junctions which cannot be forged or welded shall be made with blind screws from the back or other concealed fastenings. Furnish and install all additional clips, angles, braces, framing and supports

required for anchoring this work to the masonry or structural frame of building or for supporting other work as shown. Provide proper expansion joints in continuous metal work where required, as approved by the Engineer. Exposed work shall be finished smooth and even, with close joints and connections.

2.04 PROTECTION FROM THE ELEMENTS

A. Provide whatever additional materials or systems necessary to protect the mechanisms of the rotogates and assure continuous proper operation at all times when rotogates are indicated to be installed exposed and without protection from the elements; including rain,snow, ice and cold temperatures.

2.05 IDENTIFICATION

A. A corrosion resistant nameplate shall be permanently affixed to the rotogate. The nameplate shall display the manufacturer's name, model number and date of manufacture.

2.6 PROTECTION OF STAINLESS STEEL FINISH

A. Provide a transparent polymer film covering for shop fabrication and protection during erection. Film shall be applied with a roller coating and thermal setting technique which when erected in place can be stripped from the finished surface.

PART 3 - EXECUTION

3.01 INSPECTION

A. Contractor shall examine the areas and conditions under which rotogates are to be installed and remedy any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Provide all required support necessary for the installation of the rotogate, including any required framing or blocking required below the floor or above the ceiling necessary to secure the rotogate to. Provide and install any additional stainless steel bars or barriers required toenclose the space and support the rotogate.

3.03 INSTALLATION

A. Install rotogate in accordance with manufacturer's directions and under the supervision of a factory representative. Equipment shall be installed plumb, square, in proper alignment and securely anchored in the building construction.

3.04 ERECTION

A. Furnish erection equipment, tools and anchorage items for proper installation of the work.

B. Erect and assemble work in place in proper sequence with the installation of related equipment.

C. Use approved anchoring devices, screws and bolts, in finish to match rotogate.

3.05 TESTS AND INSPECTION

A. The Contractor shall make any repairs, adjustments, replacements and tests that are necessary to provide satisfactory operation in full compliance with these requirements. If required, during the installation and test period, the Contractor shall furnish the services ofa competent engineer to perform tests.

B. Any omission to disapprove the work at the time of inspection, or during the warranty period,shall not relieve the Contractor of any of Contractor's obligations.

C. The Contractor shall replace any part or parts which fail within the warranty period unless failure is due to negligence or damage beyond normal. Such parts, assemblies, or subassemblies shall be replaced within a period of 30 working days from time of notification. Labor for replacement of such parts and assemblies and subassemblies shall be supplied by the Contractor, and the Contractor shall furnish all material and pay shipping expensesboth from and to the property.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 10 45 40, Rotogates shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 10 45 40, Rotogates shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 10 74 00
STATION PLATFORM GAP FILLER AND ENCLOSURE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions and Division 01 Specification Sections, apply to work of this Section.

1.02 SUMMARY

A. The work under this Section shall include furnishing all labor, materials, tools and equipment necessary for the fabrication, delivery and installation of gap fillers and gap filler enclosures; and all materials necessary for the installation of the gap fillers and gap filler enclosures onstation platforms.

B. Provide number of gap fillers and enclosures as shown on drawings. Gap fillers and enclosures as shown on drawings. Gap filler enclosures to be as located on the platformsas shown on the drawings.

1.03 SUBMITTALS

A. Samples: Submit pre-production samples of gap filler and gap filler enclosure materials and finished samples: specified in this section for approval by the Authority. Provide stainless steel sheet sample indicating pattern, texture, and finish.

B. Product data: Provide manufacturer's technical data, specifications and installation instructions for gap fillers and gap filler enclosures, including materials, accessories, finishes, graphics, etc.

C. Shop drawings: Shop drawings to indicate all dimensions to indicate all dimensions, details, attachment devices, for fabrication of gap filler and gap filler enclosure. Provide connection shop drawings to different materials as applicable to each type of platform construction. Show anchorage and accessory items. Provide templates for anchors and bolts required forinstallation.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Firm experienced in successfully producing fabrications similar to that indicated for this Project, with sufficient production capacity to produce the requirednumber of units.

B. All welds to comply with latest AWG Standards for Stainless Steel welding.

1.05 GUARANTEE

A. The Contractor shall furnish a one (1) year written guarantee that all assemblies furnished under this section shall be free from defects. The manufacturer shall make good without expense to the Authority, any materials that are defective.

PART 2 - PRODUCTS

2.01 PLATFORM GAP FILLERS

A. Material:

1. The gap filler shall be fabricated as indicated on the Drawings.
2. Gap filler shall be 49-3/4" wide (+1/8", -0") between retaining bracket forks.
3. Weight of assembled gap filler shall not exceed 40 pounds.
4. Gap filler shall be constructed of 1/4" thick fiberglass reinforced plastic and structural core AL 600. FRP laminate skins shall be fabricated from premium vinylester resin and unidirectional M8610 continuous fiberglass mat. Fire retardant agents shall be added to enable the FRP to meet flammability and flame spread requirements.
5. Caster mounts shall be molded into the basic structure.
6. Stabilizing bars shall be stainless steel.
7. Wheel/Fork Combo Colson Series 1 Catalog no. 1-2210-1-3-43 available from Industrial Wheel and Tool Co, Oak Park, Il.

B. Testing:

1. FRP shall meet flammability and flame spread requirements. Original data sheets on FRP are not acceptable. A pre-production sample shall be submitted for testingprior to production run to either:

   a. Underwriters Laboratories, Inc. 333 Pfingsten Road Northbrook, IL 60062708)272-8800
   b. Wiss, Janney, Elstner Assoc., Inc. 330 Pfingsten Road Northbrook, IL60062 708)272-7400
   c. Warnock Hersey, Inc. 8431 Murphy Drive Middleton, WI 53562 608)836-4400

PROPERTY	TEST METHOD	TEST VALUE
Flammability	ASTM E 162	(radiant panel IS 35 max. test) (additional provision is that there shallbe no flaming drippings)
Flame spread	ASTM E 84	(tunnel test) FSI 25 max.

   d. A certificate of previous testing approval may be submitted instead ofretesting.

C. Fabrication:

1. Gap filler shall support a load of 600 pounds with a safety factor of at least three based upon the ultimate strength of the material. Gap filler shall be dimensionally and structurally equivalent to approved sample currently at CTA. A preproduction sample shall be submitted for engineering evaluation prior to production run. Testshould take place in the "normally used" position.
2. Maximum 1/8" gap (bowing) permissible at either end of laminate when placed onflat surface.
3. 3" draft angle permissible for mold removal except where noted.
4. Washers must sit flush on inner surface.
5. Wheel mounting surface must be flat and level.

D. Finishes:

1. All laminated surfaces shall be smooth and abrasion free, causing no injury to unprotected hands or personnels' clothing.
2. Gap filler exterior coating shall be isophtalic polyester gel-coat with UV-9, safety yellow color. The final product shall be colored and stenciled per CTA

requirementsto be supplied by CTA.

3. Gap filler ramp surface shall be anti-skid.
4. The gap filler shall conform to Federal Register V56, the wheel chair logo, by beingproperly identified with the international symbol of accessibility.

2.02 PLATFORM GAP FILLER ENCLOSURES

A. Material:

1. The gap filler enclosure shall be fabricated as indicated on the Drawings.
2. Gap filler enclosure shall be constructed of 16 gauge Type 304 Stainless Steel with a Satin finish both sides and a 5-wl pattern as manufactured by Rigidized Metals Corp., 685 Ohio Street, Buffalo, N.Y. 14203 or a equal product submitted to and approved by the Authority.
3. Gap filler enclosure shall have a continuous 18 gauge stainless steel piano hinge with a 1/8" diameter stainless steel pin, continuous style, 1-1/2" flat width, equal toCTA lot no. 1903001 on access doors.
4. R.H. Locks, lot no. 4130015 shall be provided by the CTA for installation by the Contractor.
5. Top of gap filler enclosure shall be stainless steel and sloped to each side with a center peak along the long dimension. Sides of gap filler enclosure shall be stainlesssteel with cross bend for rigidity.
6. Continuous angles, two (one per side) 3" x 2 1/2" x 3/16" thick stainless steel, with stainless steel riveted connection to gap filler enclosure, shall be provided for attachment of gap filler enclosure.
7. Pairs of stainless steel angles shall be secured to the platform and a column or a post installed for that purpose. Install using stainless steel screws or connectors. Verify locations and types and installations; verify conditions in the field.
8. The post, if required, shall be a stainless steel hollow structural tube with welded top. Tube shall be 4" x 4" x 3/16" thick material, height to match top of gap enclosure. Tube to be continuously welded to a 10" x 10" x 2" stainless steel base plate bolted to the concrete platform with 4 bolts. Provide grout for leveling and providing flushsurface for recessed installations.

B. Fabrication:

1. Gap filler enclosure shall be dimensionally and structurally equivalent to approved sample currently at CTA. A pre-production sample shall be submitted for engineering evaluation prior to production run.
2. Structure shall be spot or tack welded.
3. All sharp edges and corners shall be removed.
4. CTA supplied locks shall require modification by vendor as indicated on the Drawings. Outer door assembly shall lock positively when closed with minimum force.

C. Finishes:

1. All sheet metal shall be free of distortion, drag edges, sharp corners, burrs and weldslag or splatter.
2. All lock surfaces coming into contact with stainless steel shall be painted with blackprimer.

PART 3 - EXECUTION

3.01 PREPARATION

A. Coordinate and furnish gap fillers and gap filler enclosure instructions, and directions

for installation of proper anchorages including, platform concrete anchors to be embedded inconcrete slab and wood platform anchors.

3.02 INSTALLATION

A. Furnish and install gap fillers and enclosures as indicated and located on the Drawings and in accordance with the station location condition. Install gap filler enclosures adjacent to structural supports.

B. The gap filler, gap filler enclosure and required installation hardware shall be packaged together as a complete gap filler assembly for each location.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 10 74 00, Station Platform Gap Filler and Enclosure shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 10 74 00, Station Platform Gap Filler and Enclosure shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 10 74 13
STATION CLOCK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this section.

1.02 SUMMARY

A. Section includes providing and installing the Station Clock, including all labor and materials for a complete installation.

B. Work Included: Work under this section consists of furnishing all labor and materials necessary for and incidental to the execution and completion of the Station Clock, including, but not limited to the custom stainless steel enclosure, domed polycarbonate lenses, stainless steel bezel rings and weather seals, illuminated clock faces (dials), clock hands, stainless steel internal structure, all required hardware and fasteners, internal clock mechanisms, LED lighting and transformer. The work also includes the remote installed clock controller unit placed within a RoHs compliant fiberglass fan cooled and heated enclosure. Work also includes the stainless-steel rods and connections to the base structure for suspension and support of the Station Clock.

C. Related Sections: The following sections contain requirements that relate to and shall be incorporated into the work of this section:

1. Section 01 43 41, “Special Mockups”.
2. Section 05 50 00, “Metal Fabrications”.

1.03 REFERENCES

A. Standards provided by the following professional organizations are referred to in this section for technical requirements:

1. ADA: American with Disabilities Act
2. ANSI: American National Standards Institute
3. ASTM: American Society for Testing and Materials
4. AWS: American Welding Society
5. OSHA: Occupational Safety and Health Administration

1.04 DELEGATED DESIGN

A. Delegated Design: The internal structural steel (armature) and connections / fastenings, support of the clock mechanism, clock face, clock bezel and domed lenses, stainless steel clock enclosure, and the clock suspension / rigging to the main roof structure, shall be designed by the Station Clock Contractor's engineer, licensed to practice in the State of Illinois.

B. The Station Clock and its connections to the main structure shall be designed to sustain structural loadings and stresses, including but not limited to, exposure to wind,

deflection of the main supporting structure, and from vibration caused by train movement.

1.05 SUBMITTALS

A. General: Submit each item in this Article according to the General and Special Conditions and Division 01 Specification Sections.

B. Product Data: For each type of product used in the work.

C. Shop Drawings: Furnish shop drawings showing sizes and detailing fabrication and erection of each component thereof as shown on the Drawings and as required to complete the work. Include plans, elevations, sections, profiles, and details of the work and their connections to the station roof structure. Indicate heights, sizes and spacings of components. Show fasteners, joinery and accessory items. Indicate materials and finishes of each item in the work. Include wiring diagrams. Where applicable, indicate field verified dimensions on shop drawings.

1. Include setting drawings, templates, and directions for installation of anchor connection points to structure and adjacent work.
2. Indicate field verified dimensions on shop drawings.
3. Indicate on shop drawings location of all components and all details and dimensions. Provide cuts for all accessories, fasteners and hardware.
4. Indicate adjacent work of other trades as incidental and required for coordination purposes. Include notation of coordination requirements.

D. Calculations: Provide structural calculations for the Station Clock. Provide loads and connection information for coordination with the main structure from which it is to be suspended. Include list of codes, loads, and other factors used in performing these services..

C. Samples: Furnish samples of specified finishes, and any additional samples representative of materials and finished products as may be requested by Authority. Provide 12 inch x 12 inch samples of stainless steel representative of the final finish for review and approval prior to fabrication of mockup.

E. Certificates: Furnish welder certificates signed by Contractor certifying that welders comply with requirements specified under "Quality Assurance" article.

F. Qualification Data: For firms and persons specified in "Quality Assurance" article to demonstrate their capabilities and experience. Include list of completed projects with project name, addresses, names of Architects and Owners, and other information specified.

G. Closeout Submittals: Furnish maintenance and service data including maintenance manuals for all equipment. Provide cleaning instructions for stainless steel clock enclosure.

1.06 QUALITY ASSURANCE

A. Contractor Qualifications: Contractor shall provide services including design, engineering, fabrication and installation for scope of Work specified in this section. General C ontractor shall contract this Work directly from one of the listed acceptable Contractors. Contracting through an intermediary is not acceptable. Contractor shall be

experienced in successfully producing custom clocks and clock enclosures, including coordination and integration of clock mechanisms and controls, and who has a minimum of 10 years of experience.

B. Contractor Qualifications: Contractor shall provide in-house services including design, engineering, fabrication and installation for scope of Work specified in this section. General Contractor shall contract this Work directly from one of the listed acceptable Contractors. Contracting through an intermediary is not acceptable. Contractor shall be experienced in successfully producing custom clock enclosures of similar complexity to that indicated for this Project, including coordination and integration of clock mechanisms and controls, and who has a minimum of 10 years of experience in the manufacture of custom clocks and clock enclosures.

C. Bidding: Only listed acceptable Contractors, or other companies demonstrating equivalence in every aspect of these Contract Documents, shall be allowed to bid the Work. The Contractor bidding for the work must submit proposed details, preliminary engineering analysis confirming proposed systems and structural members and all loading reactions to the structure supporting the work of this section.

D. Equivalence Requirements: To be considered for acceptance, Contractors not listed under Article 2.02 A, shall provide proof of relevant equal experience no later than ten (10) days prior to bid. Provide a list of a minimum of four (4) projects completed within the last five (5) years, using the specified systems or equivalent. For each project, provide photographs to illustrate detail characteristics and complexity of installations.

E. Commissioner’s determination to allow approved equal Contractors to bid shall be final. All approvals shall be made in writing and evidence shall be provided via addenda prior to bid.

F. Contractor shall comply with the Federal Transit Administration’s Buy America requirements. Refer to Book 1 for additional details.

G. Installer Qualifications: Arrange for installation, testing and calibration of the Station Clock by the same Contractor providing the clock.

H. Regulatory Requirements: Comply with applicable requirements of all governing codes, ordinances and regulations.

I. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel" and AWS D1.3 "Structural Welding Code--Sheet Steel", or when applicable, comparable AWS standards for 316 stainless steel.

1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

J. Pre-Installation Conference: Conduct conference at Project site to comply with requirements of Division 01 Section "Project Meetings".

K. Mockup: Clock fabricator shall produce full scale mockup of the extents shown on the drawings to verify full assembly process and final appearance of the clock enclosure, clock dome lens, clock face, and clock hands. Refer to Section 01 43 41, Special Mockups.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store fabricated components and materials in clean, dry locations, away from uncured concrete and masonry. Cover with waterproof paper, tarpaulin or polyethylene sheeting in a manner that permits air circulation within covering.

B. Include temporary protective film on exposed finished surfaces and lenses. Handle components to a minimum; exercise care to avoid damaging metal and plastic finishes.

C. Workers shall handle all components with clean new gloves, to prevent the transfer of hand soiling and fingerprints to the Station Clock.

1.08 PROJECT CONDITIONS

A. Field Measurements: Check actual locations of structure, walls and other construction to which metal fabrications shall fit, by accurate field measurements before fabrication; show recorded measurements on final shop drawings.

B. Where field measurements cannot be made without delaying the Work, Specialty Station Clock Contractor or General Contractor shall guarantee dimensions and proceed with fabrication of products without field measurements.

1.09 COORDINATION

A. General Contractor to coordinate the work of this section with the work by other contractors as shown on the drawings and specified elsewhere.

B. General Contractor to coordinate the work of this section relating to the connection to the main structure by the structural steel Contractor. Furnish setting drawings, templates, and directions for installing anchorages.

C. General Contractor to coordinate the work of this section with the Electrical Contractor providing the power and cabling for a complete power supply to the clock controller and the clock movements, and to the LED backlighting system.

1.10 WARRANTY

A. General Warranty: Submit a one (3) year written warranty, beginning from date of substantial completion, and executed by the Contractor agreeing to repair or replace metal fabrication components that develop defects in materials or workmanship within the specified warranty period. Defects include, structural failures, deterioration of metals, metal finishes, improper installation, and other conditions beyond normal weathering and use.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Station Clock Contractors: Manufacturer/Fabricator/Installer shall be one of the following listed companies, or an approved equal company specializing in manufacturing custom timekeeping systems and custom clock enclosures, with a minimum of 10 continuous years of documented experience:

1. Americaclock, Inc, Maryland Heights, MO

2. Electric Time Company, Medfield MA
3. National Time & Signal, Wixom, MI
4. The Verdin Company, Cincinnati, OH
5. Approved equal as defined under Article 1.06 D and E.

2.02 STAINLESS STEEL

A. Stainless Steel: Provide austenitic stainless steel in form and 316/316L grade complying with the following requirements:

1. Stainless Steel Plate, Sheet, and Strips: ASTM A240/A240M and A480/A480M.
2. Bars, Rods and Shapes: ASTM A 276, Type 316L.
3. Stainless Steel Pipes: ASTM A312 TP316.
4. Stainless Steel Welded Tubing: ASTM A511/A511M.

2.03 FASTENERS

A. Always provide Type 316 stainless steel fasteners for all use. Select fasteners for the type, grade, and class required and for type of loading and installation condition shown or as specified by the manufacturer.

1. Conceal all fasteners except those required for captive retained fasteners at access doors.
2. Provide Phillips flat-head machine screws for exposed fasteners, unless otherwise indicated.

B. Stainless Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, nuts and where indicated, flat washers; ASTM F 593 for bolts and ASTM F 594 for nuts, Alloy Group 1.

C. Plain Washers: Round, Type 316 Stainless Steel.

D. Lock Washers: Type 316 Stainless Steel.

2.04 CLOCK AND ACCESSORIES

A. Clock Movement:

1. Provide self-starting electric clock movement with a 24V AC, 24 W motor with a permanently self-lubricated gear train, rotor bearings and stainless steel shafts.
2. Provide one, centrally mounted clock movement motor driving four axial output shafts to each of the four clock dial hour and minute gear sets.
3. Machine all gears, shafts and bearings from stainless steel.
4. Mount all gears, shafts and motors in a stainless steel assembly.
5. Enclose movement in an IP52 rated enclosure.
6. Clock hands to be properly counter balanced.

B. Clock Heater:

1. Clock minimum operating temperature range -30 F to +140 F. Provide thermostatically controlled 12 V DC, 80 W heating pad devices to comply with minimum temperature range. Electrical contractor shall provide separate circuit, transformer and wiring to the internal heating device.
2. Provide power and lightning surge protection.

C. Remote Clock Controller:

1. Provide remote located controller compatible with clock movement motor with automatic setting from the controller.
2. Clocks shall automatically adjust for Daylight Saving Time per the Daylight-Saving time settings in the system controller.
3. Setting to be achieved by fast set advancement.
4. Controller to be mounted within a RoHS compliant fiberglass, fan cooled and heated NEMA enclosure. Fan cooling and heating requirement is waived if the controller is installed in a conditioned, weather- protected space.
5. Controller is to automatically maintain time calibration, including after power interruptions, by means of either GPS or NTP, with the final method to be coordinated with the CTA.
6. Electrical contractor to provide power circuit and wiring to the controller.
7. Provide power and lightning surge protection.
8. Electrical contractor to provide two 2/c #18 STP wiring between the controller and the clock drive motor and heater.
9. Route STP wiring along light tray and attached to clock suspension rigging cables/rods. The cable insulation and attachments to be grey color that minimizes visibility of wiring. Color samples to be submitted for approval.
10. Electrical contractor to provide CAT6E communication wiring from HUB switch to the controller.

D. Dial LED Backlighting:

1. Clock translucent dials to be backlit by LED lighting, arrayed and mounted so as to provide even illumination at all clock tick marks and across each clock face, and without casting shadows upon the dial.
2. Provide four (4) 24-V, 60W LED power supply drivers, to be UL listed with minimum IP67 rating.
3. LED power supply drivers to be mounted within the light tray as shown on Drawings.
4. Electrical contractor shall provide four 2/c-#12 shielded twisted pair (STP) wiring to the clock to serve each LED power supply within the clock enclosure.
5. Route STP wiring along light tray and attached to clock suspension rigging cables/rods. The cable insulation and attachments to be grey color that minimizes visibility of wiring. Color samples to be submitted for approval.
6. Provide 120V AC LED power supply from lighting panel 20A circuit breaker to LED power supply drivers located in light tray and lightning surge protection. Electrical contractor to provide 3 #12AWG from power panel to LED power supply drivers and splice cables using terminal blocks located in light tray.

2.05 FABRICATION, GENERAL

A. Exterior enclosure of the clock housing to be fabricated of custom compound-curved Type 316/316L stainless steel plates with fully welded, ground smooth joints. Minimum 11-gauge thick stainless steel plate enclosure.

1. Enclosure to be polished through a 7-step process to produce a seamless continuous form, without any indication of forming process distortions, panel joints, welds, and shall be free of any discoloration in the materials.
2. After polishing the final finish is to be achieved through application of a UV resistant clear coat.

B. All components of the custom Station Clock enclosure shall be IP67 rated to prevent dust or water ingress. Fabricate joints in a manner to exclude water. Provide weep holes where water may accumulate. Gap between the clock enclosure and the bezels and domed polycarbonate lenses must be watertight and gasketed. Stainless steel fasteners shall be captive to prevent loss of fasteners.

C. Servicing of failed clock movement and LED lighting systems shall be facilitated by removal of clock face dial from the exterior of the clock enclosure after removal of the lens and bezel.

D. Fabricate the internal structural framework from Type 316/316L stainless steel.

E. The Station Clock and its connection to the main structure shall be designed to sustain structural loadings and stresses, including but not limited to, exposure to wind, deflection of the main supporting structure by any cause, and from vibration caused by train movement.

F. Allow for thermal movement in the design, fabrication, and installation of installed metal assemblies to prevent buckling, opening up of joints, and overstressing of welds and fasteners.

G. Cut, drill, shear and punch metals cleanly and accurately. Remove burrs and ease exposed edges.

H. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

I. Remove sharp or rough areas on exposed surfaces.

J. Weld stainless steel enclosure seams continuously to comply with AWS specifications and the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness or distortion or discoloration shows after finishing and contour of welded surface matches those adjacent. Grind, sand, and polish exposed welds flush and smooth to match and blend with adjoining surfaces.

K. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use concealed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous. Cope or miter corner joints.

L. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.

M. Provide necessary rebates, lugs and brackets for assembly of units. Use concealed fasteners wherever possible.

N. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

2.06 WELDING

A. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for the metal alloy to be welded. Provide type and alloy of filler metal and electrodes as specified by producer of metal to be welded, complying with applicable AWS specifications, and as required for color match, strength and compatibility in the fabricated items.

B. All structural welds shall be 3/16 inch fillet all around continuous welds unless noted or required otherwise. Ground smooth and flush all welds unless noted otherwise.

PART 3 - EXECUTION

3.01 PREPARATION

A. Field verify all dimensions and conditions for the installation of the Station Clock and associated systems. Coordinate with approved shop drawings.

3.02 INSTALLATION, GENERAL

A. Station Clock shall be designed and installed such that clock faces align truly with the station structure as shown in the drawings.

B. Field Welding is not allowed.

C. Do not mark or abrade finishes which cannot be completely restored in the field. Return items with such finishes to the shop for required alterations, followed by complete refinishing or provide new units as required.

D. Corrosion Protection: Coat concealed surfaces that will come into contact with dissimilar metals with a suitable coating to prevent galvanic action.

3.03 ADJUSTING AND CLEANING

A. After installation of Station Clock follow manufacturer’s instructions on final testing, adjusting and calibration.

B. Cleaning: Follow manufacturer’s instructions on cleaning of polycarbonates and stainless steel.

C. At a period of 1 year after initial installation, arrange for the manufacturer to inspect and make any adjustments as necessary.

3.04 PROTECTION

A. Protect finishes of metalwork from damage during construction period by use of temporary protective coverings approved by fabricators. Retain protective coverings intact and remove simultaneously from similarly finished items to preclude non-uniform

oxidation and discoloration. Remove protective covering at time of substantial completion.

B. For pre-finished surfaces, restore protective coverings which have been damaged during shipment or installation of the work. Remove protective coverings only when there is no possibility of damage from other work yet to be performed at the same location.

C. Restore finishes damaged during installation and construction period so that no evidence remains of corrective work when reviewed by architect from a distance of five (5) feet. Return to the shop any items which cannot be refinished in the field; make required alterations and refinish entire unit, or provide new units as required.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 10 74 13, Station Clock shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 10 74 13, Station Clock shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 10 80 00

TOILET ROOM ACCESSORIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes toilet room accessory items as scheduled, including the following:

1. Toilet Tissue Dispensers.
2. Toilet Seat Cover Dispenser.
3. Waste Receptacle.
4. Grab Bars.
5. Sanitary Napkin Disposal.
6. Mirror.
7. Double-Prong Robe Hook.
8. Mop and Broom Holder/Utility Shelf
9. Warm-air dryers.
10. Under-lavatory Guards.
11. Shelf for Water Heater.

B. Related Sections include the following:

1. Division 26 Sections, electrical, for warm air dryer.

1.03 SUBMITTALS

A. General: Submit the following according to conditions of contract and Division 01 Specifications Sections:

1. Product data for each toilet room accessory item specified, including construction details relative to materials, dimensions, gauges, profiles, mounting methods, specified options, and finishes.
2. Samples of each toilet room accessory item to verify design, operation, and finish requirements. Acceptable full-size samples will be returned and may be used in theWork.
3. Schedule indicating types, quantities, sizes, and installation locations (by room), mounting heights, for each toilet room accessory item to be provided for the project.
4. Setting drawings where cutouts are required in other work, including templates, substrate preparation instructions, and directions for preparing cutouts and installing anchorage devices.
5. Maintenance instructions including replaceable parts and service specifications.

1.04 REFERENCES

A. ASTM A153 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

B. ASTM A653 - Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Lock-

FormingQuality.

C. A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.

D. ASTM B456 – Standard Specification for Magnetic Particle Examination of Large Crankshaft Forgings.

E. ASTM C1036 – Standard Specification for Flat Glass.

F. ASTM F446 - Consumer Safety Specification for Grab Bars and Accessories Installed in the Bathing Area.

1.05 QUALITY ASSURANCE

A. Inserts and Anchorages: Furnish accessory manufacturers' standard inserts and anchoring devices that shall be set in concrete or built into masonry. Coordinate delivery with other workto avoid delay.

B. Single-Source Responsibility: Provide products of same manufacturer for each type of accessory unit and for units exposed to view in same areas, unless otherwise acceptable to Authority.

C. Electrical Components: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.06 PROJECT CONDITIONS

A. Coordination: Coordinate accessory locations, installation, and sequencing with other work to avoid interference with and ensure proper installation, operation, adjustment, cleaning, and servicing of toilet accessory items.

B. Deliver inserts and anchoring devices set into masonry as required to prevent delaying theWork.

1.07 WARRANTY

A. Mirrors: Submit a written warranty executed by mirror manufacturer, agreeing to replace any mirrors that develop visible silver spoilage defects within a warranty period of fifteen (15) years from date of Final Acceptance.

B. Electric Hand Dryer: Submit a written warranty executed by the dryer manufacturer, agreeing to replace the dryer if it malfunctions or develops defects within a warranty period of five (5)years from date of Final Acceptance.

C. Other Accessories, Materials and Work: Submit a written warranty executed by the various manufacturers and the Contractor, agreeing to replace any accessories, materials or work that becomes defective, inoperative, dislodged, loose, or its finish becomes defective due to defective materials or workmanship within a warranty period of one (1) year from date ofFinal Acceptance.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide toilet room accessories by one of the following:

1. A & J Washroom Accessories.
2. American Specialties, Inc.
3. Bobrick Washroom Equipment, Inc.
4. Bradley Corporation.
5. General Accessory Manufacturing Co.
6. McKinney/Parker.

2.02 MATERIALS, GENERAL

A. Stainless Steel: ASTM A 666, Type 304, with satin No. 4 finish, 0.034-inch (22-gauge)minimum thickness.

B. Brass: Leaded and unleaded, flat products, ASTM B 19; rods, shapes, forgings, and flatproducts with finished edges, ASTM B 16; Castings, ASTM B 30.

C. Sheet Steel: Cold-rolled, commercial quality ASTM A 1008, 0.04-inch (20-gage) minimum.Surface preparation and metal pretreatment as required for applied finish.

D. Galvanized Steel Sheet: ASTM A 653, with G60 hot-dip zinc coating.

E. Galvanized Steel Mounting Devices: ASTM A 153, hot-dip galvanized after fabrication.

F. Chromium Plating: Nickel and chromium electro-deposited on base metal, ASTM B 456,Type SC 2.

G. Baked Enamel Finish: Factory-applied, gloss white, baked acrylic enamel coating.

H. Mirror Glass: Nominal 0.23-inch thick, conforming to ASTM C 1503, Type I, Class 1, Quality q2, and with silvering, electro-plated copper coating, and protective organic coating.

I. Fasteners: Screws, bolts, and other devices of same material as accessory unit, stainlesssteel, or of galvanized steel where concealed.

2.03 TOILET TISSUE DISPENSERS

A. Toilet Tissue Dispenser: American Specialties Model No. 0040 or equal; for two jumbo rolls. Surface mounted with concealed anchorage #304, stainless steel, satin finish, 22 gauge one-piece, seamless construction. Unit shall be equipped with 18 gauge hood hinged to shell. Spindle shall be chrome plated plastic with a heavy duty internal spring. Door shall be of 18 gauge stainless steel one piece seamless construction with integral rigidizing ribs and shall be provided with two tissue level viewing slots. Door shall be hung on heavy duty stainless steel pivot hinges and shall be held closed by a keyed tumbler lock. When one roll is depleted, other roll shall be selected by shifting over panel lever at bottom of unit. Approximate size of unit to be 21 inches by 6 inches.

2.04 TOILET SEAT COVER DISPENSERS

A. Toilet Seat Cover Dispenser: Bobrick Model No. B-221 or equal. Surface mounted with concealed anchorage #304, stainless steel, satin finish, 22 gauge one-piece, seamless construction. Approximate size of unit to be 15 3/4 inches wide by 11 inches high by 2”

deep.Dispenses 250 single or half-fold toilet seat covers. Keyed access panel.

2.05 GRAB BARS

A. Stainless Steel Type: Provide Type 304 Stainless Steel grab bars with wall thickness not less than 0.05 inch (18 gauge) and as follows:

1. Mounting: Concealed, manufacturer's standard flanges and anchorages.
2. Clearance: 1-1/2-inch clearance between wall surface and inside face of bar.
3. Gripping Surfaces: Smooth, satin finish.
4. Heavy-Duty Size: Outside diameter of 1-1/2 inches.

B. Grab bars to be firmly secured to structure of wall to sustain loads and pulling forces withmanufacturer’s approved or provided mounting kits and fasteners.

C. Concealed Mounting Flanges: Provide Stainless Steel, Type 304, 1/8” thick plate; end flanges 2” X 3 1/8” with two holes for attachment to wall. Intermediate flanges 2 5/8” X 3 1/8”wide X 3 1/8” diameter.

D. Snap Flange Covers: Provide Type 304, 22 gauge (0.8mm) Stainless Steel with satin finish 3 ¼” diameter X ½” deep. Each cover snaps over mounting flange to conceal mounting screws.

2.06 SANITARY NAPKIN DISPOSAL

A. General: Fabricate sanitary napkin disposal cabinet of satin finish stainless steel, type 304, not less than 0.034-inch (22-gauge) thick, all-welded construction with seamless exposed walls. Provide door of seamless satin stainless steel, minimum 0.05-inch (18-gauge) thick, with 9/16 inch 90 degree returned edges for maximum rigidity. The door or disposal panel to be secured to the cabinet with a concealed, full-length stainless piano hinge. Door to be equipped with tumbler lockset. Disposal panel to have for identification an international graphic symbol identifying napkin disposal.

1. Mounting: Semi-recessed type, with stainless steel collar to extend unit from nominal 4-inch-thick wall cavity.
2. Disposal receptacle shall have a capacity of 1.2 gallons.

2.07 MIRROR UNITS

A. Glass Mirror with Stainless Steel Angle Frame: Mirror shall have a one-piece, type 304 stainless steel angle frame, ¾” x ¾”, not less than 0.04 inch (20 gauge), with continuous integral stiffener on all sides and beveled front to hold frame tightly against mirror, corners shall be mitered with hairline joints, heliarc welded, ground, and polished smooth; all exposed surfaces shall have satin finish. All edges shall be protected by plastic filler strips and the back shall be protected by full-size, shock-absorbing, water- resistant, nonabrasive, 3/16” thick polyethylene padding. Galvanized steel back shall be not less than 0.034 inch (22 gauge) and full mirror size. Back shall have integral one- piece, galvanized steel, horizontal hanging brackets located at top and bottom for mounting on concealed rectangular wall hanger and to prevent the mirror from pulling away from the wall and for a rigid, tamperproof and theft-proof installation. Spring action locking devices secure mirror to concealed wall hanger. There shall be no exposed screws or bolts. Mirror shall be of ¼” polished tempered glass. Mirror shall be removable from wall hanger for re-glazing mirror.

B. Mirror shall be 24” x 36”.

2.08 ROBE HOOK

A. Surface Mounted Double-Prong Robe Hook: Heavy-duty satin finished type 304 stainless steel double-prong robe hook. Flange and support arm shall be 22 gauge and equipped with a concealed, 18 gauge mounting bracket that is secured to a concealed, 19 gauge wall plate with a stainless steel setscrew. Cap shall be 14 gage welded to the support arm.

2.09 WASTE RECEPTACLE

A. Semi-Recessed Receptacle Unit: Stainless steel unit fabricated of type 304, 22 gauge, stainless steel with no. 4 satin finish. Hemmed edges for safety. Waste receptacle provided with hooks to hang reusable, heavy duty vinyl liner, minimum 12 gallon capacity, secured in place with tumbler lock. Face trim to be 1" wide formed from one piece with no miters, welding or open seams and have ¼" square return to wall. Structural assembly of all components shall be of welded construction. Unit to be recessed 4" and extend beyond the wall 4". Approximate overall size including trim to be 17" wide X 30" high. Mount unit in wall recess using no. 10 self tapping screws through concealed mounting holes provided. Semi-Recessed Receptacle Unit shall be as manufactured by American Specialties, Inc., Yonkers, New York or an approved equal.

B. Surface Mounted Receptacle Unit: Stainless steel unit fabricated of type 304, 20 gauge, stainless steel with no. 4 satin finish. Hemmed top edge with return to inside. Waste receptacle provided with hooks to hang reusable, heavy duty vinyl liner, minimum 12.8 gallon capacity. Structural assembly of receptacle shall be of continuous and seamless welded construction. Unit shall have gently radiused front vertical edges and may have a bowed front face. There shall be no exposed fastening devices or spot welded seams. Approximate overall size to be 15" wide X 24" high X 9" deep maximum. Receptacle shall be screw mounted to the wall through keyhole slots with concealed heavy duty type 304 stainless steel reinforcement straps and concealed theft resistant locking screws. Surface Mounted Receptacle Unit shall be as manufactured by American Specialties, Inc., Yonkers, New York or an approved equal.

C. Surface Mounted Corner Receptacle Unit: Stainless steel unit fabricated of type 304, 22 gauge, stainless steel with no. 4 satin finish. Hemmed top edge with return to inside. Waste receptacle provided with hooks to hang reusable, heavy duty vinyl liner, 16 gallon capacity. Structural assembly of receptacle shall be of continuous and seamless welded construction. There shall be no exposed fastening devices or spot welded seams. Approximate overall size to be 15" wide along each wall X 24" high X 4" extending out from the wall maximum. Receptacle shall be screw mounted to the wall through keyhole slots on back of unit with concealed theft resistant locking screws. Surface Mounted Corner Receptacle Unit shall be as manufactured by American Specialties, Inc., Yonkers, New York or an approved equal.

D. Free Standing Trash Receptacle Unit: Two piece (trash bin with removable swing top) heavy gauge stainless steel with exposed surfaces in satin finish. Swing door on top to be counter balanced for ease of operation. Receptacle to be equipped with vinyl wall bumper strip and rubber feet. Trash receptacle to have 21 gallon capacity. Unit approximately 15" square at top, the bin is approximately 30" high and 38" with the swing top in place. The swing top lifts off for maintenance. Free Standing Trash Receptacle with swing top shall be as manufactured by Bradley, Model No. 377-36 or an approved equal.

2.10 MOP AND BROOM HOLDER/UTILITY SHELF

A. Mop and Broom Holder/Utility Shelf: Combination unit with 0.05-inch (18-gauge), Type

304, stainless steel shelf with 1/2-inch returns, 0.062-inch (16-gauge) support brackets for wall mounting. Provide 0.062-inch (16-gauge) stainless steel hooks for wiping rags on front of shelf, together with spring-loaded, rubber hat, cam-type mop/broom holders; 1/4-inch-diameter stainless steel drying rod suspended beneath shelf. Provide unit 36 inches long, 6 inches deep and complete with four mop/broom holders and three hooks.

B. Provide two triangular brackets, same material as shelf, welded to shelf underside, to support the shelf.

2.11 HAND DRYERS

A. Surface mounted. Hand dryer control assembly activated by an infrared optical sensor located next to the air outlet and shall operate as long as hands are under the air outlet with a 35-second lockout feature when hands are removed.

B. Cover, including nozzle, to be one piece 18 gauge brushed stainless steel with seamless exposed surfaces. Cover to be heavy-duty, rib-reinforced, die-cast zinc alloy. All parts to be rust proof. Cover to be secured to base with tamper-resistant screws, bolts and latch.

C. Size of unit shall be approximately 12” wide X 12” high X 6” deep projecting from wall.

D. All internal hand dryer parts shall be coated according to Underwriters’ Laboratories, Inc. requirements. Entire mechanism shall be internally grounded.

E. Electric Requirements: 110/120 V., 12.5 A., 1500 W, 60 Hertz.

F. Motor to be instant starting, brushless, 5/8 hp, 20,000 rpm, with self lubricating bearings, providing air velocity of 16,000 LFM (linear feet per minute) at the air outlet and 14,000 LFMat the hands 4 inches below the air outlet.

G. Heating element (900 W) to be protected by an automatic resetting thermostat, which shall open whenever air flow is cut off and shall close when flow of air is resumed, and produce an air temperature of 130 deg – 145 deg F at 72 deg F ambient room temperature at the hands 4 inches below the outlet.

H. Warm-air dryer to be model number Xlerator XL-SB with brushed stainless steel housing as manufactured by Excel Dryer, Inc. or a similar model by one of the following manufacturers:

1. A & J Washroom Accessories, Inc.
2. American Specialties, Inc.
3. Bobrick Washroom Equipment, Inc.
4. Bradley Corporation.
5. Excel Dryer Corporation.
6. General Accessory Manufacturing Co.
7. World Dryer Corporation.
8. Approved Equal.

I. Decibel rating for hand dryer shall be 90 decibels or less. The Xlerator brand hand dryer must be equipped with their optional 1.1 noise reduction nozzle to meet the decibel requirement.

2.12 UNDERLAVATORY GUARDS

A. Insulating pipe covering for supply and drain piping assemblies, that prevent direct

contact with and burns from piping, and allow service access without removing coverings.

B. Material for underlavatory guards to be antimicrobial, molded-plastic, color white.

C. Manufacturers:

1. Plumberex Specialty Products, Inc.
2. TCI Products.
3. Truebro, Inc.
4. Approved Equal.

2.13 URINAL SCREENS

A. Wall-hung Urinal Screens: Panels shall be 12” x 42” and not less than 1" thick made of two sheets of 20 gauge .032 stainless steel, type 304 and satin no. 4 finish and assembled over and pressure laminated to core material. The two face plates of the panel shall have formed edges sealed with a continuous interlocking molding strip, mitered, welded and finished at corners. Exposed welds to be ground smooth. Exposed surfaces to be free of pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections.

1. Urinal screen panels shall have integral full-height flanges for wall attachment.
2. Core material shall be Manufacturer’s standard sound deadening honeycomb ofresin impregnated kraft paper in thickness required to provide finish thickness.

B. Brackets: Full height (continuous) type: Manufacturer’s Standard design; stainless steel.

C. Manufacturers:

1. Flush Metal Partition Corp.
2. Bradley Corporation; Mills Partitions.
3. Accurate Partitions Corp.
4. Approved Equal.

2.14 SHELF FOR WATER HEATER

A. Wall mounted water heater platform engineered to support water heaters up to 20 gallons. Size to be approximately 21 inches by 21 inches. Constructed of galvanized steel with arm supports and mounting accessories for masonry wall. Platform to perform as a drip pan with raised edges and water tight corners. Platform to have one inch drain fitting for drainage. Verify that platform accommodates the size and weight of the actual water heater.

1. Water heater platform to be model 40-SWHP-WM as manufactured by HoldriteQuickStand or approved equal.

2.15 ACCESSORIES

A. Hardware and accessories: Manufacturer’s standard design, heavy-duty hardware and accessories.

B. Anchorages and Fasteners: Manufacturer’s standard exposed fasteners of stainless steel with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications.

2.16 FABRICATION

A. General: Only a maximum 1-1/2-inch-diameter, unobtrusive stamped manufacturer logo, as approved by Authority, is permitted on exposed face of toilet or bath accessory units. On either interior surface not exposed to view or back surface, provide additional identification by either a printed, waterproof label or a stamped nameplate, indicating manufacturer's name and product model number.

B. General: No names or labels are permitted on exposed faces of toilet and bath accessory units. On either interior surface not exposed to view or on back surface, provide identification of each accessory item either by a printed, waterproof label or a stamped nameplate indicating manufacturer's name and product model number.

C. Surface-Mounted Toilet Room Accessories, General: Except where otherwise indicated, fabricate units with tight seams and joints, exposed edges rolled. Hang doors or access panels with continuous stainless steel piano hinge. Provide concealed anchorage wherever possible.

D. Recessed Toilet Room Accessories, General: Except where otherwise indicated, fabricate units of all-welded construction, without mitered corners. Hang doors or access panels with full-length, stainless steel piano hinge. Provide anchorage that is fully concealed when unitis closed.

E. Keys: Provide universal keys for access to toilet room accessory units requiring internal access for servicing, re-supply, etc. Provide minimum of six keys to Authority's representative.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install toilet room accessory units according to manufacturers' instructions, using fasteners appropriate to substrate as specified by unit manufacturer. Install units plumb and level, firmly anchored in locations and at heights indicated. Secure solidly to structural substrate.

1. Mounting height for hand dryers to be 37” from floor to bottom of dryer.
2. Mounting height for trash receptacles:

    a. Semi-recessed receptacle unit: Top of unit 43” above floor.
    b. Surface mounted receptacle unit: Top of receptacle maximum 40” abovefloor.

B. Secure mirrors to walls in concealed, tamperproof manner with special hangers, toggle bolts, or screws. Set units plumb, level, and square at locations indicated, according to manufacturer's instructions for type of substrate involved.

C. Install grab bars firmly with concealed anchorage and manufacturer’s approved or supplied mounting kits and fasteners to structural wall, structural blocking or structural framing to withstand a load of at least 250 lbf in any direction, complying with ASTM F446. Install grabbars according to manufacturer’s directions and recommendations.

D. All toilet room accessories shall be secured to solid substrate, not into hollow spaces. Provide wall reinforcing as required for solid anchorage of all accessories.

E. Provide electrical supply and connection for electric hand dryer as required and accordingto code.

F. Secure water heater shelf to wall with masonry expansion anchors designed to adequatelysupport the weight of the wall heater, shelf and accessories.

3.02 ADJUSTING AND CLEANING

A. Adjust toilet room accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.

B. Clean and polish all exposed surfaces strictly according to manufacturer's recommendations after removing temporary labels and protective coatings.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 10 80 00, Toilet Room Accessories shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 10 80 00, Toilet Room Accessories shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 10 81 00

PIGEON CONTROL SYSTEM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions and Division 01 Specification sections, apply to this section.

1.02 SUMMARY

A. Provide labor, materials and equipment to install pigeon control system to the surface of the platform canopy, track structure, station structures and other areas as indicated in the Drawings. The bird wire shall stop pigeons, seagulls, and larger birds from landing and roosting on the building structures.

1.03 SUBMITTALS

A. Product Data: Submit all descriptive information from the manufacturer including catalogs, installation instructions and other descriptive material for all components of the pigeon control system, including adhesives and other materials to adhere the system.

B. Warranty: Provide a copy of the Warranty on material and Installation.

C. Samples: Provide samples of each component of the system and each type of hardware, including proposed fastening materials.

D. Shop Drawings: Provide a plan indicating locations for installation of the pigeon control system and detail system components and their relationship and attachment to the structure.

E. Provide statement by official indicating that they are a certified installation company.

F. Provide a mock- up of the pigeon control system for review of the actual system, in the actual finish, and including relationship to the substrate and method of attachment. Include a corner condition and any special conditions. Approval of a mock-up to set the standard for the work.If approved, mock-up may be used in the work.

1.04 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protectivecovering for storage and identified with labels describing the contents.

1. Provide a minimum of ten (10) percent of the quantity of each of the materials to beinstalled for the pigeon control system project.

1.05 QUALITY ASSURANCE

A. Single Source Responsibility: Furnish products from one manufacturer for entire project.

B. Obtain all technical information from the manufacturer.

C. Manufacturer to be experienced in the design and manufacture of pigeon control

systems similar to that specified herein and similar to the scope of this project for a period of five (5) years minimum. The system to be proven to be effective in providing bird control in similar installations. Manufacturer to provide references including names, addresses, contact information and descriptions of similar successful pigeon control projects.

D. Utilize Installers authorized by the manufacturer to properly install their products and who areknowledgeable in pigeon control product installations.

E. Installer must visit the site to gather all information of existing site conditions.

1.06 PRODUCT HANDLING

A. Protect materials from damage before, during and after the installation.

1.07 PROJECT CONDITIONS

A. Coordination: Furnish all anchoring devices or adhesive required to secure system to and around existing building structure. Coordinate installation with existing conditions and within on-site tolerances.

B. Visit site and field measure prior to fabrication and delivery of materials.

C. Design Requirements: Measure carefully the width of the surface and determine the appropriate mounting system as determined by site conditions and mounting surface.

1.08 WARRANTY

A. Product to carry a minimum five (5) year warranty from the date of substantial completionagainst defects in workmanship and deterioration including U.V. breakdown.

B. Installation to be guaranteed for two (2) years from the date of substantial completion.

PART 2 - PRODUCTS

2.01 BASIS OF DESIGN

A. Bird-B-Gone Bird Wire 2000 – Modular Post and Wire System.

1. Adhesive: Model Adhesive E 6100 as supplied by Bird-B-Gone.

B. Approved equal pigeon control system.

2.02 MATERIAL

A. Wire: 0.45mm 1 x 7 stainless steel wire, U.V. stabilized clear nylon coated to 0.7mm finished diameter.

B. Crimps: Nickel-plated copper.

C. Metal Hardware: 316-grade stainless steel.

D. Plastic Hardware: High impact U.V. stabilized thermoplastic.

E. Number of Rows: As determined by the manufacturer and based on project conditions.

F. Mounting System: As determined by the manufacturer and based on project conditions.

G. Fasteners: Stainless steel.

1. To isolate dissimilar metals and avoid galvanic reaction when fasteners are in contact with incompatible substrate metal, provide neoprene washers or membranebetween the fasteners and incompatible metal.

H. Adhesive: As supplied by manufacturer of pigeon control system.

2.03 MOUNTING SYSTEMS

A. Mounting system to be as recommended by the manufacturer for the particular substrate,using materials supplied by the manufacturer, and as approved by the CTA:

1. Use stick-on bases with an outdoor construction adhesive when approved by CTA.Adhesive should be allowed to dry overnight:

a. Adhesive to be supplied by the manufacturer of the pigeon control system and be capable of permanently securing the wire stands to the substrates and capable of withstanding extreme hot and cold temperatures, rain, snow, ice, wind and vibration. The adhesive to be effective when adhered to painted surfaces as well as non-painted surfaces.

2. Bases to be mechanically secured to the substrate:

a. Pigeon control system secured mechanically must not compromise the performance of the substrate including roofs, copings for parapet walls andother construction.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine the installation area and note any detrimental or hazardous work conditions. NotifyCTA of the detrimental work conditions.

B. Do not proceed with the installation until conditions are corrected.

3.02 SURFACE PREPARATION

A. Surface should be thoroughly cleaned, dry and free of bird droppings, nesting materials, rust,loose, flaking or peeling paint; oil, grease, dust, dirt or other debris or contaminants.

1. When pigeon control systems are adhered to substrates with stick-on bases or adhesive, the surfaces must be dry, clean and prepared as recommended by the manufacturer of the system and the adhesive. Verify that painted surfaces are compatible with the adhesive.

B. Remove or repair articles that may damage product after installation, including overhanging foliage, brush and loose parts on the structure.

3.03 INSTALLATION

A. Install the pigeon control system as recommended by the manufacturer, using recommended and approved installation methods.

B. Pigeon control system should be installed as shown on the drawings, at locations shown onthe drawings and covering the entire depth of the surface, not just the perimeter.

1. Follow contours and angles closely.
2. Space materials in accordance with manufacturer's recommendations.
3. Install pigeon control system components straight and even, Secure firmly tosubstrate.

3.04 INSPECTION

A. Visually inspect for any signs of poor installation, including failing adhesive, loose screws and fasteners or un-removed debris.

B. Immediately correct and repair defective materials or installation as approved by CDOT and at no cost to CDOT.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 10 81 00, Pigeon Control System shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 10 81 00, Pigeon Control System shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 11 81 29

FACILITY FALL PROTECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Design and provide a complete roof Fall Protection Equipment (FPE) Horizontal Cable Lifeline System in the locations shown on the drawings.

B. Provide a system that allows two users to walk uninterrupted.

C. Related Sections:

1. Section 05 10 30, Structural Steel.
2. Section 07 52 60, Modified Bituminous Sheet Roofing – Heat Welded,
3. Section 07 62 00, Sheet Metal Flashing and Trim.

1.03 REFERENCES

A. OSHA 2 9 CRP - Occupational Safety and Health Administration Fall Protection Systems and Practices.

B. ANSI A10.14 - Requirements for Safety Belts, Harnesses, Lanyards, and Lifelines for Construction and Industrial Use.

C. ANSI Z359.1 - Safety Requirements for Personal Fall Arrest Systems, Subsystems, and Components

1.04 COORDINATION

A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.

B. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

C. Coordinate size and location of required structural steel sections for fabrication with Section05 10 30, Structural Steel.

1.05 SUBMITTALS

A. Shop Drawings: Design layouts of all items of equipment shall be presented to the Authorityfor approval prior to fabrication.

1. Provide plans, elevations, and details showing location of all components of FPE system, anchorage to structure, anchorage connections, profiles of parts and roofflashing details.

B. Qualification Data: For Installer and manufacturer.

C. Field quality-control test reports.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for specified system.

E. Product Data: Submit manufacturer's product data, including installation instructions. This Product Data will not be accepted as a substitute for sealed calculations and drawings.

F. Engineering Data: Provide data and structural calculations showing loading imposed on the canopy and roof structure, end loads and intermediate loads on the system, deflection, number of users, and total span.

1. Provide engineering calculations and drawings prepared and sealed by a Structural Engineer licensed in the State of Illinois.
2. Provide certification from provider and installer of fall protection system stating that the system meets all structural, building code and OSHA requirements for the specific application.

G. Operations and Maintenance Manual:

1. Operation and Maintenance Data: For fall protection equipment system to include in emergency, operation, and maintenance manuals. Refer to Section 01 70 00 “Contract Closeout."
2. Provide parts catalog listing all replaceable parts, including parts identification numbers and ordering instructions.
3. Provide operating instruction with illustrations of all operable parts and "step-by- step" explanation for safe operation of system.
4. Provide maintenance requirements for all equipment including a lubrication chart indicating all equipment lubrication points, frequency of lubrication required, and the type of lubricant required.
5. Provide a rescue plan.
6. Provide a neatly bound inspection log for the purpose of the owner to permanentlyrecord daily, periodic and bi-annual inspections of the FPE.

H. The Authority shall review the submittals for general conformance with the specification requirements and their impact on the overall structural design. The FPE system provider shall retain full responsibility for ensuring that the system conforms to all applicable safetyrequirements and to coordinate with the designer of record.

I. Warranty: Special warranty specified in this Section.

J. Training Video: Provide the video from the manufacturer’s training session for the fall protection system installed at the facility.

1.06 QUALITY ASSURANCE

A. Provide a FPE system designed, engineered, manufactured, and installed by a single source whose main concern and business is solely involved with FPE systems.

B. Submit evidence in the form of photographs, brochures, and other materials that the FPE contractor has been actively engaged in this business for no less than 5 years and that theFPE contractor has installed at least 3 FPE systems of similar applications.

C. Comply with the following standard:

1. Safety Factors: Per governing design standard. See reference section.

D. Preinstallation Conference: Conduct conference at Project site. Review methods and procedures related to fall protection system.

1.07 WARRANTY

A. Special Warranty: Manufacturer's and Installer's standard form in which manufacturer and installer agrees to repair or replace components of the fall protection system that fail in materials or workmanship within specified warranty period.

1. System Warranty Period: Ten (10) years from date of Substantial Completion.

B. Warranty on High Performance Finish: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes do not comply with requirements or that fail in materials or workmanship within specified warranty period. Warranty includes fading, cracking, chipping, peeling, pitting or other deterioration other than normal weathering.

1. Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: Twenty (20) years from date of final acceptance.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited the following:

1. HY-SAFE Technology.
2. Capital Safety.
3. Summit Anchor Company, Inc.
4. Evan Corporation.
5. Pro-Bel Group.
6. Diversified Fall Protection, Inc.
7. Approved equal.

2.02 HORIZONTAL CABLE FALL PROTECTION SYSTEM

A. Safety and Lifeline Tiebacks: Safety tiebacks shall be fabricated from ASTM A 36 structural steel and shall be hot-dip galvanized and finished with a High-Performance Coating after fabrication. Supply and install safety tiebacks in locations shown on the drawings.

B. General: Provide system designed to allow users to walk uninterrupted the entire length of the canopy and roof without having to disconnect from the system to pass through any intermediate support points. Design system to support at least two people at the same time in case of fall and to prevent users from free falling more than 6 feet. Design system for handsfree operations once the user attaches to the system.

C. Fall Protection System:

1. General: Construct the entire horizontal lifeline system of Type 316 stainless steel,including safety cable.
2. Cable: Provide horizontal lifeline of continuous safety cable or cable with swaged splices that allow uninterrupted travel. Design horizontal lifeline for use in conjunction with either self-extracting lifelines or lanyards certified to meet ANSI performance requirements.
3. End terminal hardware: At ends, provide line tension device and tension indicatorand shock absorber.
4. Intermediate support brackets: Attach horizontal lifeline to canopy structure end brackets at both ends and intermediate brackets as shown on the drawings. Design intermediate brackets to allow user to pass without unhooking cable and to dissipate a portion of the energy generated during a fall.
5. Fasteners: Provide stainless steel anchors and fasteners of proper size and attachment to adequately support the intended load with minimum design to support a load on the system of two times the maximum design load without failure.
6. Cable runner: Provide two stainless steel pass-through shuttles with automatic runner bypass capable of connecting and disconnecting at any point on the cable.
7. Harness: Provide two Class III full-body harnesses with D-ring, self-retracting lifelines, and shock absorbing lanyards.
8. Data plate: Provide non-corrosive data plates at all entry points clearly stating Maximum Service Capacity and Number of Users.

2.03 FACTORY FINISHES

A. Finish: Manufacturer's standard finish applied to factory-assembled and tested before shipping. Structural steel components must be hot-dip galvanized.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for, installation tolerances, and other conditions affecting performance of work.

1. For the record, prepare written report, endorsed by Installer, listing conditionsdetrimental to performance of work.
2. Verify site dimensions.
3. Verify compatibility with and suitability of substrates, including compatibility withexisting finishes or primers.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

A. Install equipment in accordance with the contract drawings. All equipment shall be installedunder the supervision of the equipment manufacturer.

B. Coordinate installation with work of related trades.

C. Embedded Inserts: Install safety and lifeline tiebacks in patterns conforming to the approved shop drawings. Use templates as required to ensure that all dimensions and elevations are maintained. Notify the Authority immediately to resolve any interferences

of locations.

D. Install anchorages and fasteners in accordance with manufacturer's instructions to obtain the allowable working loads listed on the engineering data and in accordance withspecifications.

E. Install system under the direction of manufacturer's authorized, trained personnel.

F. Anchor Plates: Install anchors plumb on the structural frame.

G. Do not load or stress system until the completion of proper installation of all materials andfasteners occurs.

3.03 FIELD QUALITY CONTROL

A. Testing Services: Testing and inspecting of completed installations of fall protection equipment system shall take place in successive stages, in areas of extent and using methods approved by the manufacturer. Technical representative from manufacturer shall witness the installation to maintain warranty. Do not proceed with application of davits, tiebacks and laydown sleeves for the next area until test results for previously completed applications of the work show compliance with requirements.

B. Remove and replace applications of components where test results indicate that it does notcomply with specified requirements.

C. Additional testing and inspecting, at Contractor's expense, is required to be performed to determine if replaced or additional work is compliant with specified requirements.

3.04 TRAINING

A. Engage a factory-authorized service representative to train CTA's maintenance personnel to adjust, operate, and maintain the system. Minimum 1 day training required for each maintenance shift. Provide a video recording of training session for CTA's future use.

3.05 REPAIR AND CLEANING

A. Clean area at installation of components.

B. Remove all excess materials from job and dispose of properly.

C. Contractor to verify that the roof areas, facias and other areas of the structures have not been compromised or damaged during the installation of the fall protection equipment system. Any damage must be repaired at the Contractor expense and to the Authority’s satisfaction. Repairs to match the existing. Repair any damaged finishes to match existing. The installation of the system shall not create any leaks at the roofs or void any warranties.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 11 81 29, Facility Fall Protection shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 11 81 29, Facility Fall Protection shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 12 67 20

WINDBREAKS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Condi ions and other Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Provide all labor, materials, and equipment necessary for the fabrication and installation of windbreaks as shown on the drawings and installed at the locations shown on the drawings.

B. Windbreaks include structural steel framing, **s**kylight canopy where shown, laminated glass and perforated sheet metal windbreak panels, station sign, support beams and all requiredaccessories.

C. Related Sections: The following sections contain requirements that relate to this section.

1. Division 5 Section “Structural Steel”.
2. Division 8 Section “Glass and Glazing”.
3. Division 9 Section “Painting”.
4. Division 12 Section “Station Benches”.

1.03 REFERENCES

A. Structural Steel shall comply with ASTM A36.

1.04 PERFORMANCE REQUIREMENTS

A. Provide and install windbreaks capable of withstanding the effects of loads and stresses from live loads, wind loads and thermal movements without evidencing permanent deformation of assembly, components or fasteners and anchors. Loads shall be considered cumulativeand acting in any direction.

1. Live Load: 500 lb. Horizontal.
2. Wind Load: 30 psf.
3. Thermal Movement: Provide windbreaks that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperature by preventing buckling, opening of joints, over-stressing of components, and other detrimental effects. Base engineering calculations on surface temperatures of materials due to both sol**a**r heat gain and nighttime-sky heat loss.

    a. Temperature Range: 120 deg F ambient; 180 deg F.

4. Vibration: Installation of windbreaks to withstand vibration from trains and traffic.

1.05 SUBMITTALS

A. General: Submit each item in this Article acc**o**rding to the General and Special Conditions and Division One Specification Sections.

B. Product data for products used for the windbreaks including metals, glazing, and all accessories, and including all finishes.

C. Shop Drawings: Submit shop drawings for approval for windbreaks immediately after award of contract indicating dimensions, details, construction, materials, and finishes. Shop drawings to indicate all field verified conditions and dimensions for attachment and locationof windbreaks.

D. Submit samples for verification purposes of actual products to be used in their specified finishes, including metal shapes, glazing for canopy, glazing and perforated metal panel, and accessories. Samples to be 12 inches long of 12 inches by 12 inches as applicable. Provide samples of sealants and gaskets used for glazing roof and wall panels.

E. Structural calculations: Submit a comprehensive analysis of design loads, including live loads, snow drift loads, wind loads, and thermal movement. Design calculations shall identify the moment and shear forces transferred to the structure or support through the installationconnections.

1. Structural Calculations to be stamped and signed by the qualified professionalengineer responsible for their preparation.

F. Welding Calculations: Manufacturer to submit calculations demonstrating that fillet welds produced with the Pulsed Gas Metal Arc Welding (WMAW/MIG) process with withstand aminimum of 526 pounds of force in shear.

1. Weld Strength Calculations to be stamped and signed by a professional engineerspecializing in the application of welding technology.

G. Welder certificates signed by Contractor certifying that welders comply with requirements specified under "Quality Assurance" article.

H. Qualification data for firms and persons specified in "Quality Assurance" article to demonstrate their capabilities and experience. Include list of completed projects with project name, addresses, names of Architects and Owners, and other information specified.

1.06 QUALITY ASSURANCE

A. Qualifications: Demonstrate to Authority’s satisfaction that fabricator and installer has the experience in the actual design, fabrication, and installation of windbreaks according to thedrawings and these specifications.

B. Design Compliance: Design windbreaks complying with all requirements of the Chicago Building Code including, but not limited to, structural load design, materials safety, prefabrication, and testing. Provide and submit data to verify that requirements have beensatisfied for the following loads:

1. Wind Pressure: 30 pounds per square foot of wall area for wind form any direction.
2. Roof Live Load: 30 pounds per square foot of roof area normal to surface (includingsnow load).
3. Roof Concentrated Load: 200 pounds concentrated load occupying an area of twoand one-half square feet so placed to produce maximum stress on roof framing.

C. Design Criteria: Provide pre-engineered windbreaks, designed by the manufacturer,

incorporating all features required to provide complete windbreaks that are vandal resistant, water-tight, maintenance free, structurally sound, and weather resistant. Windbreak design to be in accordance with the Drawings and all other requirements, codes, and specifications.

D. Provide each type of laminated glass and fiberglass reinforced glazing and primary sealant/gasket from a single manufacturer with not less than five (5) years of successful experience in the production of materials similar to those required.

E. Professional Engineer Qualifications: A professional engineer who is licensed to practice in the State of Illinois and who is experienced in providing engineering services of kind indicated. Engineering services are defined as those performed for installations of exterior pylon signs that are similar to those indicated for this Project in material, design, and e tent.

F. Fabricator Qualifications: Firm experienced in successfully producing metal fabrications similar to that indicated for this Project, with sufficient production capacity to produce required units without causing delay in the Work.

G. Installer Qualifications: Arrange for installation of metal fabrications specified in this sectionby same firm that fabricated them.

H. Regulatory Requirements: Comply with applicable requirements of all governing codes, ordinances and regulations.

I. Qualify welding processes and welding operators in accordance with AWS D1.1 "Structural Welding Code Steel," D1.3 "Structural Welding Code Sheet Steel", and D1.2 "Structural Welding Code Aluminum." Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

J. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code Steel" and AWS D1.3 "Structural Welding Code Sheet Steel", or when applicable, comparable AWS standards for 304 stainless steel.

1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

K. Pre-Installation Conference: Conduct conference at Project site to comply with requirementsof Division 01 Section "Project Meetings".

L. Galvanize Coating Applicator’s Qualifications: Company specializing in hot dip galvanizing after fabrication and following the procedures of “Quality Assurance Manual” of the American Galvanizers Association.

1.07 PROJECT CONDITIONS

A. Field Measurements and Details: Check actual locations for windbreaks for dimensions and installations conditions. Show recorded measurements and details on final shop drawings.

B. Coordinate and cooperate with the Authority for installation of all sleeves and anchorage for windbreaks and railing. All schedules shall be maintained in order to ensure the orderly sequence of the work as directed by the Authority.

1.08 SEQUENCING AND SCHEDULING

A. Coordinate installation of anchorages for windbreaks. Furnish setting drawings, templates, and directions for installing anchorages, including support beams. Deliver such items to project site in time for installation.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Store fabricated components and materials in clean, dry locations until required for installation. Cover and protect metal and glazing surface dirt and damage during delivery,storage and installation of windbreak components.

B. Fabricated windbreaks to be adequately protected during delivery and installation to prevent damage by scratches, stains, discoloration, and other causes. Damage to any surface during fabrication, handling, shipment, storage, and installation to be remedied by the Contractorat the Contractor's own expense.

1.10 COORDINATION

A. Coordinate installation of anchorages for windbreaks. Furnish setting drawings, templates,and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts,plates, angles, and items with integral anchors, that are to be embedded in concrete or attached to framing. Deliver such items to project site in time for installation.

1.11 WARRANTY

A. General Warranty: Submit a one (1) year written warranty, beginning from date of substantial completion, and executed by the Contractor, manufacturer and the installer agreeing to repair or replace metal fabrication components that develop defects in materials or workmanship within the specified warranty period. Defects include, structural failures, deterioration of metals, metal finishes, improper installation, and other conditions beyond normal weathering and use.

B. Provide warranties on all glazing materials form defects in material and workmanship including breakage, delamination, discoloring, coating failure, increased haze, excessive yellowing, loss of light transmission, air pockets, moisture infiltration, and other imperfections; as follows:

1. Laminated glass panels: 10 years.
2. Skylight system: 20 years.

C. Provide, without charge to the CTA, replacement materials and installation and/or repairs as approved by the Authority, as required during the warranty periods.

PART 2 - PRODUCTS

2.01 FERROUS METALS

A. Metal Surfaces, General: For metal fabrications exposed to view upon completion of the Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials whose exposed surfaces exhibit pitting, seam marks, roller marks, rolled trade names, roughness, statins, discolorations, and for steel sheet, oil canning and variations in flatness exceed those permitted by reference standardsfor stretcher-leveled sheet.

B. Steel Plates, Shapes, and Bars: ASTM A 36.

C. Steel Tubing: Product type (manufacturing method) and as follows:

1. Cold-Formed Steel Tubing: ASTM A 500, Grade A, unless otherwise indicated orrequired for design loading.
2. Hot-Formed Steel Tubing: ASTM A 501.

a. For exterior installations and where indicated, provide tubing with hot dipgalvanized coating per ASTM A 53.

D. Uncoated Steel Sheet: Commercial quality, product type (method of manufacture) as follows:

1. Cold-Rolled Steel Sheet: ASTM A366.
2. Hot-Rolled Steel Sheet: ASTM A 569.

E. Galvanized Steel Sheet: Quality as follows:

1. Commercial quality: ASTM A 653, G90 coating designation unless otherwise indicated.

F. Steel Pipe: ASTM A 53; finish, type, and weight class as follows:

1. Provide galvanized finish for exterior installations and where indicated.

G. Brackets, Flanges, and Anchors: Cast or formed metal of the same type material and finishas supported rails, unless otherwise indicated.

2.02 STAINLESS STEEL

A. Stainless Steel: Provide austenitic stainless steel in form and grade indicated complying with the following requirements:

1. Tubing: ASTM A 554, Grades MT 301, MT 302, or MT 304, as standard with manufacturer.
2. Pipe: ASTM A 312, Grade TP 304.
3. Plate and Sheet: ASTM A 167, Type 301, 302 or 304.
4. Sheet, Strip, Plate, and Flat Bars: ASTM A666 Type 304 or Type 316, as indicatedon the drawings.
5. Bars and Shapes: ASTM A 276, Type 304.
6. Rolled Floor Plate: ASTM A 793.
7. Bar Stock: ASTM A 276.
8. Castings: ASTM A 743, Grade CF 8 or CF 20.
9. Rolled-Stainless-Steel Floor Plate: ASTM A 793.

2.03 FASTENERS

A. General: Provide fasteners of same basic metal and alloy as fastened metal, unless otherwise indicated. Do not use metals which are corrosive or otherwise incompatible with metals joined. Provide Type 300 series stainless steel fasteners for all exterior use. Select fasteners for the type, grade, and class required, and for type of loading and installation condition shown or as specified by the manufacturer.

1. Provide concealed fasteners for interconnection of metal components and for their attachment to other work except where exposed fasteners are unavoidable or arethe standard fastening method.
2. Provide Phillips flat-head tamper-proof machine screws for exposed fasteners, unless otherwise indicated.

B. Bolts and Nuts: Regular hexagon head type, ASTM A 307, Grade A (ASTM F 568, PropertyClass 4.6), with hex nuts, ASTM A 563, and where indicated, flat washers.

C. Lag Bolts: ANSI B18.2.1 (ANSI B18.2.3.8 M).

D. Machine Screws: ANSI B 18.6.3 (ANSI B 18.6.7 M).

E. Plain Washers: Round, carbon steel, ANSI B 18.22.1 (ANSI B 18.22 M).

F. Lock Washers: Helical, spring type, carbon steel, ANSI B 18.21.1.

G. Expansion Anchors: Anchor bolt and sleeve assemblies of type as required for installation condition shown; and of material indicated below with capability to sustain, without failure, a load equal to 6 time the load imposed when installed in unit masonry and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

1. Material: Group 1 alloy 304 or 316 stainless-steel bolts and nuts complying with ASTM F 593 and ASTM F 594.
2. Drilled-In Expansion Anchors: Expansion anchors complying with FS FF-325, Group VIII (anchors, expansion), Type I (internally threaded tubular expansion anchor); and machine bolts complying with FS FF-575, Grade 5.

2.04 WELDING

A. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for the metal alloy to be welded. Provide type and alloy of filler metal and electrodes as specified by producer of metal to be welded, complying with applicable AWS specifications, and as required for finish match, strength, and compatibility in the fabricated items.

B. Welding shall be in accordance with appropriate specifications of American Welding Society and must be done with electrodes and methods specified by manufacturers of alloys being welded. Type, size, and spacing of welds shall be as shown on shop drawings. Welds behind finished surfaces to be done so as to minimize distortion and discoloration of finished side. Weld splatter and welding oxides on finished surfaces shall be removed by descaling or grinding. Unless otherwise shown or specified, weld beads on exposed polished surfaces to be ground and polished **s**mooth to match and blend with finish on adjacent parent metal.

C. All structural steel welds to be 3/16” fillet all around unless noted otherwise.

2.05 GALVANIZING AND PAINT

A. Hot-dip galvanize ferrous metal items as indi**c**ated to comply with ASTM A 123, for galvanizing both fabricated and un-fabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strips. Comply with ASTM A 153 forgalvanizing steel and iron hardware.

B. Galvanize framing, supports, and miscellaneous assemblies for windbreak after fabrication to greatest extent possible. Galvanize members after welding, drilling, and cutting. Galvanize steel sheet after perforations are made.

C. Galvanizing Repair Paint: High zinc dust content paint for regalvanizing welds in galvanized steel, with dry film containing not **l**ess than 94 percent zinc dust by weight, complying with DOD-P-21035 or SSPC-Paint-20.

D. Shop Primer for Ferrous Metal: Primer to be recommended for application over galvanizing and be manufacturer's or fabricator's standard, fast curing, lead free, universal modified alkyd primer selected for good resistance to normal atmospheric corrosion, for compatibility with finish paint systems indicated, and for capability to provide a sound foundation for field or shop applied topcoats despite prolonged exposure complying with performance requirements of FS TT P 645.

E. Bituminous Paint: Cold applied asphalt mastic complying with ASTM D 1187 and containing no asbestos fibers.

F. Zinc Chromate Primer: FS TT P 645.

2.06 STAINLESS STEEL FINISHES

A. Finish designations prefixed by AISI conform with the system established by the AmericanIron and Steel Institute for designating finishes for stainless steel sheet.

B. Satin Finish: AISI No.4 polished, directional texture to match approved sample. Direction oftexture shall be parallel to the long dimension of the member or surface.

2.07 FABRICATION, GENERAL

A. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.

B. Form exposed work true to line and level with accurate angles, curves and surfaces and straight sharp edges. Form to required shapes and sizes. Finish exposed surfaces to smooth, sharp, well-defined lines and arises.

C. Allow for thermal movement in the design, fabrication, and installation of installed metal assemblies to prevent buckling, opening up of joints, and overstressing of welds and fasteners.

D. Cut, drill, shear and punch metals cleanly and accurately. Remove burrs.

E. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

F. Remove sharp or rough areas on exposed surfaces.

G. Weld corners and seams continuously to comply with AWS specifications and the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent. Grind exposed welds flush and smooth to match and blend with adjoining surfaces.

H. Form exposed connections with hairline joints, flush and smooth, using concealed

fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat head (countersunk) screws or bolts. Locate joints where least conspicuous. Cope or mitercorner joints.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.

J. Provide necessary rebates, lugs and brackets for assembly of units. Use concealed fasteners wherever possible.

K. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

L. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware, screws, and similar items.

M. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weepholes where water may accumulate.

N. Provide separation between dissimilar materials, if required.

2.08 FABRICATION

A. General: Fabricate units to sizes, shapes, and profiles of structural tubing and plates as indicated and required to receive adjacent other construction and members. Fabricate from structural steel shapes using fully welded construction. Fabricate in shop to greatest extent possible. Joints to be mitered. Fabricate and secure framing by welding or anchoring as approved and to withstand all applicable loadings and stresses.

1. Provide uniform profiles with mitered corners to provide tight joints.

B. Joints to be continuously welded with smooth exposed edges. Use concealed field splices wherever possible. Provide cutouts, fittings, and anchorage as required for coordination of assembly and installation with other work. Anchorages to be concealed unless approved otherwise.

C. Provide galvanized or stainless steel tube stops for glazing; welded to frame at one side as indicated, removable at opposite side with countersunk stainless steel machine screws uniformly spaced at not more than 10 inches on center.

D. Provide brackets, anchors, and framing at platform to support windbreaks with deflection limited to L/360. Attach windbreak brackets and framing to structure with bolted connections.

E. See drawings for sizes, design, and details for windbreak. See drawings for galvanized or stainless steel, size and shape for materials for framing, base, glazing stops, plates, bench, anchors, brackets, etc., as applicable, for windbreak. See drawings for type of infill panels, glazing and thickness of glazing.

2.09 WINDBREAKS

A. Fabricate and install windbreakers and canopies as shown on the drawings and approved shop drawings. See drawings for design, sizes, and details for windbreak and canopy. See Drawings for locations and installation details for windbreaks and

canopies.

B. To attach sign and glazing panels, weld a continuous bar to all vertical posts and support bars and to all horizontal rails. Galvanized steel anchorage bar to have mitered corners, welded and ground smooth. Touch up weld with galvanizing touch up paint. Anchorage bar to have holes pre-drilled (before galvanizing) at 10” centers and/or as shown on drawings.

2.10 WINDBREAK PANELS

A. Refer to Section 08 80 00, “Glass and Glazing” for glazing requirements.

B. Sign panels to consist of galvanized steel backer plate 1/4” thick with graphic sign secured tobacker plate at both sides. Galvanize backer plate after holes are drilled. Attach backer plate and signs to continuous anchorage bar with stainless steel bolts all sides.

2.11 CANOPY GLAZING

A. Refer to Section 08 80 00, “Glass and Glazing” for glazing requirements.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General: Locate windbreaks, and windbreak canopy assemblies including all accessories where shown or scheduled.

1. Verify floor surfaces and conditions.
2. Install assemblies level, plumb and at the height indicated with surfaces free from distortion or other defects in appearance. Provide shims as required for level andplumb installation.
3. Provide for secure installation to substrate. Windbreaks and windbreak canopy assemblies to be secured to counteract all design and applied lateral and wind forces. Attachment to be designed to withstand vandalism and possible vibration.

3.02 INSTALLATION OF WINDBREAK ASSEMBLY TO PLATFORM

A. Unless shown otherwise, provide galvanized W8 support steel beam bolted to wood platform joists, including 1/2” stiffener near and far side. See drawings and verify in field.

B. Unless shown otherwise, 4”x4“x1/4” windbreak columns to have a 10”x8”x1/2” galvanized steel base plate continually welded. Touch up weld with galvanizing paint. Base plate to have 4 holes pre-drilled (before galvanizing) for 3/4” in diameter bolts. Bolt windbreak assembly at base plate to support beam with 3/4” diameter stainless steel bolts.

3.03 ADJUSTING AND CLEANING

A. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 requirements for touch-up of field painted surfaces. Apply by brush or spray to provide a minimum dry film thickness of mils

B. For galvanized surfaces clean welds, bolted connections and abraded areas and apply

galvanizing repair paint to comply with ASTM A 780.

C. Clean stainless steel with soap and water; rinse with clear water.

D. Immediately after erection, clean field welds, bolted connections and abraded areas of shop paint and paint exposed areas with the same material as used for shop painting. Apply bybrush or spray to provide a minimum 3.0 mil dry film thickness.

3.04 PROTECTION

A. Protect finishes of metalwork from damage during construction period by use of temporary protective coverings approved by fabricators. Remove protective covering at time of substantial completion.

B. For pre-finished surfaces or stainless steel, restore protective coverings which have been damaged during shipment or installation of the work. Remove protective coverings only when there is no possibility of damage from other work yet to be performed at the same location. Retain protective coverings intact and remove simultaneously from similarly finished items to preclude non-uniform oxidation and discoloration.

C. Restore finishes damaged during installation and construction period so that no evidence remains of corrective work. Return items which cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units as required.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 12 67 20, “Windbreaks” shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 12 67 20, “Windbreaks” shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 12 67 23

STATION WOOD SLAT BENCHES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions and Division 01 Specification Sections, apply to work of this Section.

1.02 SUMMARY

A. This Section includes providing all material, labor, equipment and accessories to provide andinstall the following wood slat benches:

1. Benches installed on station platforms.
2. Materials necessary for installation of benches.

1.03 SUBMITTALS

A. Samples: Submit samples of products with materials and finishes specified in this section for approval.

B. Product Data: Submit manufacturer's technical data, specifications and installation instructions for benches.

C. Shop Drawings: Submit shop drawings for the fabrication of the benches indicating all dimensions and details of construction. Submit shop drawings detailing connections to different materials as applicable in each station. Show anchorage and accessory items.

D. Manufacturer’s Qualifications: Submit evidence of manufacturer’s experience and ability toproduce the benches of sufficient quantity.

E. Finishes: Provide product data, specifications and color, finish and gloss samples of all primers, paints, sealers and varnishes to be used on the bench components for the Authority’s selection and approval.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Firm experienced in successfully producing fabrications similar to that indicated for this Project, with sufficient production capacity to produce the requirednumber of units.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Benches shall be delivered with proper protection to prevent damage during shipping andhandling.

B. Deliver benches to the site as one complete piece with no assembly required on site. Includeall accessories and attachment devices.

1.06 GUARANTEE

A. The Contractor shall furnish a one (1) year written guarantee that all benches under this section shall be free from defects for one year from the date of final acceptance. The Contractor shall make good without expense to the Authority, within the guarantee period,any materials that are defective or that show excessive weathering or wear.

PART 2 - PRODUCTS

2.01 BENCH CONSTRUCTION

A. Bench Wood Slats:

1. Refer to Drawings for dimensions. All wood slats used in the benches shall be Clear or Better Teak or IPE (South American Teak), free-of-heart-center and kiln-dried to a moisture content of 15% or less.
2. Wood slats shall be finished with two (2) coats of clear sealer. The first coat shall be allowed to dry and then be buffed. A second finished coat is then applied. Wood slat sealer shall be Benjamin Moore, Olympic, or Cabot clear sealer or approved equalby the Authority.

B. Bench Metal Frames:

1. Refer to Drawings for dimensions.
2. Bench frames shall be configured in accordance with the approved shop drawingswithout excessive heat distortion.

C. Metal Finish:

1. Bench Frame Finish: Frames shall be mechanically etched by shot-blasting to a near white finish and chemically cleaned using a multi-stage phosphate system prior tothe finishing process.
2. All metal shall be hot dip galvanized after fabrication.
3. After galvanizing, all components shall then be treated as required and electrostatically powder coated with a thermosetting TGIG polyester powder top coat to a minimum thickness of 8-10 mils in accordance with paint manufacturers recommendations.
4. Color shall be Federal Standard No. 595B, Station White, Gloss No. 27722 unlessselected otherwise by the Authority.
5. Bench Divider Finish: Dividers shall be Grade 316 stainless steel, brushed #4 finish.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Set benches in place and anchor to station platforms and station floor at locations indicatedby the Authority and in accordance with manufacturer’s written instructions.

1. Benches shall be installed straight, even and level.

3.02 INSPECTION

A. Benches shall be inspected after they are installed. They should be secure to their substrate. There should be no splinters, checks, cuts, or other damage to the wood. The finish to the wood should be dry, even and smooth. There should be no chips or scratches to the finishon the metal.

B. Benches that are damaged or not installed properly should be repaired or replaced at no costto the Authority and to the Authority's satisfaction.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 12 67 23, Station Wood Slat Benches shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 12 67 23, Station Wood Slat Benches shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 12 87 11

PLATFORM SANDBOXES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes:

1. Sandboxes of fiberglass gel coated wood installed on concrete and wood platforms for the purpose of storing sand to be used to improve safety during snow and ice conditions.

B. Related work specified elsewhere:

1. Section 12 87 00, Bicycle Racks.
2. Section 12 87 20, Station Trash Receptacles.

1.03 REFERENCES

A. ASTM A276 - Standard Specification for Stainless Steel Bars and Shapes.

B. ASTM A666 – Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer’s technical data, specifications, fabrication details andinstallation instructions for sandbox materials including:

1. Plywood Core.
2. Gel Coat.
3. Stainless Steel hardware.

B. Shop Drawings: Shop drawings showing sizes of sandboxes. Shop drawings to detail fabrication of the sandboxes including erection of each fabrication. Include plans, elevations, sections, profiles, and details of the fabrications, their connections, joinery, installation of hardware, and operation. Indicate heights, sizes and spacing of components. Show joineryof components, hardware, and trim and all accessory items.

C. Indicate method of anchorage to the platform including type and spacing of anchors.

D. Provide structural capacities for the sandbox fabrication.

E. Samples: Submit samples of products with materials and finishes specified in this section for approval.

F. Color Samples: Provide color samples of standard colors for the fiberglass gel coat for theAuthority’s selection.

G. Mockup: fabricate one sandbox for the Authority's inspection and approval prior to the fabrication of any additional sandboxes.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Firm experienced in successfully producing fabrications similar to that indicated for this Project, with sufficient production capacity to produce the requirednumber of units.

B. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code Steel" and AWS D1.3 "Structural Welding Code Sheet Steel", or when applicable, comparable AWS standards for 316 stainless steel.

1. Certify that each welder has satisfactory passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Sandboxes shall be delivered with proper protection to prevent damage during shipping andhandling.

B. Platform sandboxes shall be fabricated and finished in the shop, with their accessories, and shall be delivered to the site as a complete assembly.

1.07 WARRANTY

A. Sandboxes shall have a one year from substantial completion warranty against defects in material and workmanship including delamination, corrosion, deflection, deterioration of finish, or other malfunction and be replaced or repaired to the Authority's satisfaction and atno cost to the Authority.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Subject to the requirements, manufacturers of products of this section include:

1. Transit Systems, Incorp.
2. Approved equal.

2.02 MATERIALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces, unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materialswithout seam marks, roller marks, rolled trade names, or blemishes.

1. Steel Plates, Shapes, and Bars: ASTM A 36. Galvanize as indicated on drawings.
2. Stainless Steel Sheet, Strip, Plate, and Flat Bars: ASTM A666 Type 316.
3. Stainless Steel Bars and Shapes: ASTM A276, Type 316.

B. Metal components and trim to be of sufficient thickness to maintain its profile, remain straight, be of sufficient strength to withstand the imposed loads and withstand the elements and corrosion.

C. Framing members and fabrication of the sandboxes shall be sufficient to withstand the loads of maximum weight of being fully loaded with sand and the possibility of patrons standing and/or sitting on the sandboxes.

D. Hardware: Provide hardware, miscellaneous metal and accessories as shown on drawingsand required.

1. Continuous stainless steel piano hinge with offset one leaf, screw holes 6” maximumcenters.
2. Chain, half ring, and eyes, stainless steel.
3. Hasp, stainless steel heavy duty 6 inches.
4. Staple, Stainless steel
5. Lid Support Brace: Stanley 446 HD Folding Leg Brace, stainless steel, 1 per side oflid, 16 5/8” length 1 ¼” width.
6. Stainless steel radius edge, 12 gauge.
7. Stainless steel trim angle, 2” x 7/8” x 3/16”.
8. Stainless steel screws, pop rivet, nylon locknut, and other fasteners.
9. Stainless steel carriage bolts (for wood platforms) or expansion anchors (for concrete platforms) to secure sandbox units to platform. Bolts to fasten components to be of material being fastened, stainless steel where exposed. Screws to secure trim, hardware, and other components to be stainless steel and tamper-resistant.

E. Wood Products:

1. Provide wood specified and shown on drawings to receive fiberglass finish.
2. Core to be flame, smoke and toxity (FST) compliant.
3. Shims: Pressure treated wood.

F. Gel coat encapsulating fiberglass for molded fiberglass sandwich construction.

2.03 FABRICATION – GENERAL

A. Fabricate sandboxes as designed on the drawings, complete with all items indicated to produce the finished product including fasteners to attach to substrate as required. Coordinates hasp size and spacing requirements with the Authority’s padlock requirements.

B. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.

C. Form exposed work true to line and level with accurate angles, curves and surfaces and straight sharp edges. Form to required shapes and sizes. Finish exposed surfaces to smooth, sharp, well-defined lines and arrises.

D. Shear and punch metals cleanly and accurately. Remove burrs.

E. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

F. Remove sharp or rough areas on exposed surfaces.

G. Weld metal corners and seems continuously to comply with AWS specifications and the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded suface matches those adjacent. Grind exposed welds flush and smooth to match and blend with adjoiningsurfaces.

H. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillip flat-head (countersunk) screws or bolts. Locate joints where least conspicuous. Cope or miter corner joints.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.

J. Cut, reinforce, drill and tap as indicated to receive finish hardware, screws, and similar items.

K. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weepholes where water may accumulate.

L. All components and trim to be mechanically fastened. Do not use glue for attachment of anycomponents or trim.

2.04 FABRICATION

A. Fabricate sandboxes to meet requirements and dimensions shown on the drawings and specified herein. Sandboxes to have a capacity of one cubic yard of sand.

B. Fabricate the sandbox to provide a rigid one-piece construction including the fixed portionof the lid.

C. Apply fiberglass gel coat system in color indicated to all exposed surfaces of wood so no wood is exposed.

D. Provide twelve (12) 3/8” diameter drain holes on bottom of sandbox and seal with gel coat.

E. Remove sharp or rough areas on exposed surfaces.

F. Install all required hardware.

G. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.

H. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weepholes where water may accumulate.

2.05 FASTENERS

A. General: Provide fasteners of same basic metal and alloy as fastened metal, unless otherwise indicated. Do not use metals that are corrosive or otherwise incompatible with metals joined. Provide Type 300 series stainless steel fasteners for exterior use. Select fasteners for the type, grade, and class required and for type pf loading and installation condition shown.

B. Provide tamperproof attachment fasteners as indicated on the design drawings or as approved in the shop drawings as required to attach to station platform substrate.

2.06 STAINLESS STEEL FINISHES

A. Finish designations prefixed by AISI conform with the system established by the AmericanIron and Steel Institute for designating finishing for stainless steel sheet.

B. Satin Finish: AISI No. 4 polished, directional texture to match approved sample. Direction of texture shall be parallel to the long dimension of the member or surface.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Set sandboxes in place and anchor to station platforms at locations indicated or as directed by the Authority.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 12 87 11, Platform Sandboxes shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of 12 87 11, Platform Sandboxes shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

Section 12 93 00

SITE FURNISHINGS

1.1 GENERAL

1.2 WORK INCLUDES

A. Base Bid:
   a. General Contractor
      a. Bike Rack
      b. Crash Bollard
      c. Bollard
      d. Precast Planter

1.3 Related WORK:

A. Division 03 Section “Cast-In-Place Concrete” for foundations and benches

B. Division 05 Section “Metal Fabrications”

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications:
   a. Minimum 10 years experience in the manufacture of site furnishings and amenities.
   b. Provide reference list of at least ten major transportation authorities, municipalities, universities, or other high-use public environments currently using site furnishings and amenities fabricated by the manufacturer.

1.5 SUBMITTALS

A. Product Data: For each product indicated.
   a. Manufacturer’s standard product literature.
   b. Shop drawings.
   c. Installation instructions.
   d. Maintenance instructions.
   e. FSC Certification for all wood surfaces

B. Samples: Submit manufacturer’s samples of materials, finishes, and colors.

C. Shop Drawings: Submit drawings for bike racks and site locations. Include on drawing confirmation from General Contractor there are no as-built condition layout conflicts.

1.6 CLOSEOUT SUBMITTALS

A. Submit the following.
   a. Maintenance Data for each furnishing and material specified:
      a. Maintenance Manual: Assemble into binder.

1.7 ADMINISTRATIVE REQUIREMENTS

A. Pre-installation Meetings:
   a. Pre-Installation Conferences: Contractor to conduct meetings at site with installer and all other trades involved prior to fabrication and start of Work. Familiarize installer with conditions at site and related Work.

1.8 DELIVERY, STORAGE AND HANDLING

A. Handle products in accordance with manufacturer's instructions.

B. Store products in manufacturer's original packaging until ready for installation.

C. Protect products from impacts and abrasion during storage.

1.9 WARRANTY

A. Provide manufacturer's standard warranty.
   a. Warranty terms: one year from date of invoice against defects in materials and workmanship.
   b. Include in Landscape Binder

2. PRODUCTS

2.1 BICYCLE RACK

A. Bicycle Rack - The bicycle rack must be fabricated from square Domestic (U.S. manufactured) Steel tubing, in accordance with ASTM A500 Grade B, 2" X 2" in size with 0.25" wall mechanical and structural mild steel tubing. The tubing must be bent in a one piece width as shown on the contract documents. The bicycle racks must not be welded in sections. Only the base plate must be welded to the steel tubing by using stainless steel A.C.D.C. 309L 16 or 17 electrode rod for welding.

B. Color of the coating must be Black.

C. The coating must be applied only after the bicycle rack has been fabricated.

D. The final product will be rejected if the coating cracks, ripples in the curved areas or is otherwise damaged due to the fabrication and/or shipping.

E. Fastener-Expansion anchor to be stainless steel mushroom head spike, ½" x 4", as manufactured by Rawlplug Co., Inc. (New Rochelle, N.Y. 10802, tel. 914/235-6300) or as suggested.

F. Base plates - Base plates must be fabricated from Domestic (U.S. manufactured) Stainless Steel, 3/8" thick, in accordance with ASTM-T-304.

G. Coating of Bicycle Rack

H. Steel:
   a. Shot blast to near white steel.
   b. Iron phosphate pre-treatment.

I. Primer:
   a. Thermosetting epoxy powder coating (similar to Corvel Zinc Gray 13-7004).
   b. Electrostatic application, cure schedule approximately 6 minutes at 250 degrees.
   c. Thickness 1.8 - 10 mils.

J. Topcoat:
   a. Triglycidyl Isocyanurate (TGIC) Polyester powder coating.
   b. Electrostatic application cured in oven for approximately 20 minutes at 250 degrees.
   c. Total coatings: 8-10 mils.
   d. Finish color to be gloss black.

K. MOUNTING
   a. Mounting: Surface Mount. Provide Corrosion resistant anchor bolts, mounting plate and hardware, including tamper-resistant screws.

2.2 CRASH BOLLARD

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the work include, but are not limited the following:
   a. 1. Secure Usa
   b. 2. Calpipe Security
   c. 3. Nasatka Security

B. Product
   a. Type: Fixed, M30 (K4) Certification.
   b. Dimensions: Diameter As shown on Drawings, and as required by manufacturer to meet performance requirements. 36” high above sidewalk grade
   c. Sleeve Finish: Stainless Steel, Type 316, #4 Finish.

2.3 BOLLARD

A. MANUFACTURER

a. Landscape Forms, Inc., 7800 E. Michigan Ave, Kalamazoo, Michigan 49048. Phone: (800) 521-2546. Fax (269) 381-3455. Website www.landscapeforms.com

B. MODEL

a. "Stop" Bollards
   a. Style: Standard

b. Size:
   a. Interior Pipe
      1.) Outer Diameter Size: 4.50 inches
      2.) Wall Thickness: 0.237 inches
      3.) Height : 28.25 inches
   c. Cover Casting
      a. Diameter at base: 6.875 inches.
      b. Width and Depth at top: 6.875 x 5.92 inches
      c. Height: 34.17 inches.
   d. Mounting:
      a. Permanently embedded.

C. MATERIALS

a. Bollard Tube: Structural steel tube, ASTM A-500, Grade B.
b. Bollard Casting: Aluminum casting.
c. Surface Mount Plate: Investment cast stainless steel with three 7/16" anchor holes on 5-3/8" dia. bolt circle. Fits inside 6.875" outside dia. casting.
d. Fasteners: Carbon steel with MagniCoat rust prohibitor.
e. Leveling Glides: Stainless steel with MagniCoat rust prohibitor
f. Removable Bollard Adjusting Screws:
   a. Stainless steel.

D. FINISHES

a. Finish on Metal, Except Removable Bollard Socket: Landscape Forms, Inc. "Pangard II".
b. Primer: Rust inhibitor.
c. Topcoat: Thermosetting TGIC polyester powder coat. UV, chip, and flake resistant.
d. Test Results: "Pangard II".
   a. Gloss Consistency, Gardner 60 Degrees, ASTM D 523: Plus or minus 5 percent from standard.
   b. UV Resistance, Color and Gloss, ASTM G 155, Cycle 7: Delta E less than 2 at 2.0 mils and less than 20 percent loss.
   c. Cross-Hatch Adhesion, ASTM D 3359, Method B: 100 percent pass.
   d. Flexibility Test, Mandrel, ASTM D 522: 3 mm at 2 mils.
   e. Erichsen Cupping, ISO 1520: 8 mm.
   f. Impression Hardness, Buchholz, ISO 2815: 95.
   g. Impact Test, ASTM D 2794: 60 inch-pounds at 2.5 mils.
   h. Pencil Hardness, ASTM D 3363: 2H minimum.
   i. Corrosion Resistance, 1,500-Hour Test, ASTM B 117: Max undercutting 1 mm.

j. Humidity Resistance, 1,500-Hour Test, ASTM D 2247: Max blisters 1 mm.

e. Tube Color: Stormcloud, confirm with commissioner

f. Casting Color: Metallic Steel, confirm with commissioner

2.4 Precast Planter

A. Manufacturer

a. Wausau Tile, Inc., 1.800.388.8728, info@wausautile.com, www.wausautile.com

B. Model

a. TF4121 Round Concrete Planter

C. FINISHES

a. Acid Wash

b. Color: Charcoal

D. Material:

a. Portland Cement: ASTM C-150 Specifications for Portland Cement.

a. Compressive Strength 5,000 p.s.i. minimum

b. Air Content 6-8%

c. Water-Cement Ration .45

d. Deflection Max: L/720

b. Aggregates: Aggregate shall be blended to meet individual project requirements.

c. Coloring; Pigments used shall be inorganic, resistant to alkalinity and used per manufacturer's recommendations.

d. Reinforcement and Hardware: Reinforce precast with deformed rods as recommended by precast concrete manufacturer.

E. Setting Materials, Caulks & Sealants:

a. Dowel Set

a. Substrate of concrete must be within a tolerance of 1/8"in all dimensions.

b. 3 Dowel sleeves per unit to be set along the outer edge every 12" O.C. minimum.

c. Set units level to establish consistent top of planter height.

d. Epoxy set dowels

b. Color: gray

c. Sealer: Colorless, pure acrylic water repellent sealer. Sealer to maintain natural look of concrete surface with no glaze or gloss, darkening or color change.

3. EXECUTION

3.1 EXAMINATION

A. Verify that substrates are stable and capable of supporting the weight of items covered under this section.

B. Verify that substrates have been adequately prepared to securely anchor those items that will be surface mounted.

C. Footings per drawings.

3.2 Finish

A. Ensure all metal finishes color match to architectural Dark Bronze sample.

3.3 INSTALLATION

A. Install according to the manufacturer's installation instructions, including tamper-resistant screws and thread-locking adhesive.

B. Install in conformance to applicable ADA guidelines and End User's established Accessibility policies.

4. MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. The Work of SITE FURNISHINGS will not be measured for payment.

4.2 PAYMENT

A. No separate payment will be made for the work covered in this section. Payment for the Work of SITE FURNISHINGS will be included in the contract lump sum price as shown in the Schedule of Prices for CIVIL WORK.

4.3 PAY ITEM ACCOUNT NUMBER

A. CIVIL WORK: 020000

END OF SECTION

SECTION 12 93 23

STATION TRASH RECEPTACLES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions and Division 01 Specification Sections, apply to work of this Section.

1.02 SUMMARY

A. This Section includes:

1. Trash receptacles.
2. Trash receptacle liners.
3. Material necessary for anchoring of trash receptacles to platforms and interiorstation concrete floors.

1.03 RELATED WORK

A. Division 12 Sections: Benches, Sandboxes, and other site elements.

1.04 SUBMITTALS

A. Samples: Submit samples of products with materials and finishes specified in this section for approval as required by the Authority.

B. Product Data: Submit manufacturer's technical data, specifications and anchorage instructions for trash receptacles.

C. Shop Drawings: Submit shop drawings showing dimensions, materials and details for construction of trash receptacles. Shop drawings to indicate details for connections to different materials as applicable for each station. Show anchorage and accessory items.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Firm with at least five years of experience in successfully producing fabrications similar to that indicated for this Project, with sufficient production capacity to produce the required number of units.

1.06 DELIVERY

A. Trash receptacles and their accessories shall be delivered with proper protection to preventdamage, including damage to finish, during shipping and handling.

B. Trash receptacles with their accessories shall be as a complete trash receptacle assemblyfor each trash receptacle.

1.07 GUARANTEE

A. The Contractor shall furnish a one (1) year written guarantee that all trash receptacles under this section shall be free from defects. The Contractor shall make good without

expense to the Authority, any materials or fabrications that are defective. Repairs shall be made to the trash receptacles and to their finish as approved by the Authority; or the trash receptacle component shall be replaced if required by the Authority.

PART 2 - PRODUCTS

2.01 TRASH RECEPTACLES

A. Trash receptacles shall be Bethesda Series Model No. SD-42 as manufactured by Victor Stanley, Inc. Brick House Road, Dunkirk, Maryland 20754 or approved equal.

B. Trash receptacles shall have an overall height of 49 inches nominal including lid and top. Overall diameter to be 28 inches nominal at widest point.

C. Vertical bars shall be 3/8 inch by 1 inch solid steel flat bars curved outward at the top. There shall be a total of 42 vertical bars for this receptacle. Three horizontal bands shall be ¼ inch by 2 ½ inch solid steel bars. At top edge, band shall be a 5/8" O.D. steel rod. All joints and connections shall be fully welded. Bars shall be configured and spaced in accordance with the approved shop drawings. Provide steel bars welded to the bars at the base with a ¾ inchsquare anchor bolt hole at the center.

D. Lids shall be Dome Top Model S-2, as manufactured by the same manufacturer as the trash receptacle. Receptacle lids shall be spun steel with a raised steel dome. Minimum steel thickness for the lid shall be 16 gauge. Lid shall be welded to the receptacle at 5, one inch long locations, equally spaced around the receptacle, prior to galvanizing and powder coating.

E. Trash receptacles liner shall be Model NPL-36 high density plastic liner with a 36 gallon capacity. Color shall be black.

F. Fabrication: Top ring and horizontal bands shall be rolled and welded into a continuous circle. The entire assembly shall be welded at every junction for unitized strength. Raised steel dome top shall be supported from inner ring with three vertical bars, all connections welded. Liner shall be accessible from a hinged section of the receptacle; hinges to be stainless steel. Hinged section to have a lock and two keys. Five leveling feet of 3/8 inch diameter threadedsteel shaft, rubber-tipped, shall be factory installed.

G. Finish: Unit shall be mechanically etched by shot-blasting to a near white and chemically cleaned using a multi-stage phosphate system prior to the finishing process. All components shall be hot dipped galvanized after fabrication. After galvanizing, all components shall then be treated as required per ASTM D7803, "Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Powder Coating", and electrostatically powder coated with a thermosetting TGIC polyester powder coat top to a minimum thickness of 8-10 mils in accordance with manufacturer's recommendations. Color shall be Federal Standard No. 595B, Gloss Black.

H. Fasteners: Trash receptacles shall be anchored to concrete using 1/2" diameter stainless steel expansion bolts and to wood platform decks with ½ inch diameter stainless steel lagscrews.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Securely anchor trash receptacles to station floor or platform at locations indicated on drawings, as specified herein, and in accordance with manufacturer's written instructions.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 12 93 23, Station Trash Receptacles shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 12 93 23, Station Trash Receptacles shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 13 06 00

CUSTOMER ASSISTANT'S KIOSK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and other Division 01 Specification sections, apply to this section.

1.02 SUMMARY

A. Provide and install a complete and functional Customer Assistant’s Kiosk consisting of thefollowing components, features, equipment and fixtures, as shown on the drawings and approved shop drawings:

1. Steel vertical supports and horizontal roof/ceiling structure, clad with stainless steel cladding; stainless steel insulated wall panels; stainless steel door frame and door;fixed and sliding windows; attack resistant glazing.
2. Stainless steel shelf, counters, drawers and cabinets.
3. Finish hardware for door and window.
4. Suspended ceiling system with aluminum parabolic louvered panels.
5. Equipment: Lighting fixtures, wall heaters, air conditioner, fire extinguisher, Authority provided audio/visual equipment, communication equipment, security equipment, call button and signage.
6. Manual window shades.

B. Customer Assistant’s Kiosk Types:

1. Prefabricated: Kiosk unit constructed with the materials and components specifiedherein, to the size and shape indicated on the drawings, and fabricated completelyor mostly off site for delivery to the project site and installed at the location shownon the drawings.
2. Site Built: Kiosk of custom design, shape and size as shown on the drawings; constructed of the materials and components specified herein unless shown and approved otherwise; and built and assembled at the site to conform to the customdesign, shape and size. Site built or custom kiosk may partially utilize stationhousewalls and/or other construction. For uniformity and functionality, the custom kioskshall utilize similar materials and components and conform as much as possible tothe design of the prefabricated kiosk.

C. Install kiosk where shown on the drawings. Secure vertical supports and wall panel structure directly to stationhouse floor with stainless steel bolts. Perform all required utility connections including electrical, communications and monitoring systems. All conduits and pipes to beconcealed in wall cavities. Provide stainless steel chase to hide additional conduits and mechanicals from view; as required inside of kiosk and outside of kiosk (for bringing utilitiesto kiosk).

D. See drawings for specific sizes, layouts, doors, windows for the kiosk and furnishings, hardware and equipment to be supplied with the kiosk. See drawings for location of kiosk andspecific installation details. Verify all conditions and dimensions in the field.

E. The Contractor’s construction of the kiosk can deviate from the CTA Kiosk Guide Drawingsand these guide specifications provided shop drawings, product data, calculations,

samples and other information is submitted for the Authority's review and approval prior to fabricationof the kiosk.

F. Related Requirements: The following sections contain requirements that relate to thisSection:

1. Division 07 Sections - Roofing.
2. Division 08 Sections - Doors and Windows: Glass.
3. Division 10 Section - Fire Extinguisher.
4. Division 22 Sections - Plumbing.
5. Division 23 Sections - Mechanical; Unit Heaters and Air Conditioners.
6. Division 26 Sections - Electrical; Electrical Power, Wiring, Switches and Light Fixtures.
7. Division 27 Sections - Communications.
8. CTA Kiosk Guide Drawings.

1.03 REFERENCES

A. AISC - Specifications for the Design, Fabrication and Erection of Structural Steel forBuildings.

B. AISI -Specification for the Design of Cold Formed Steel Structural Members and Design ofLight Gauge Steel Diaphragms.

C. ANSI A115.1 - Preparation of Mortise Locks in 1-3/8 inch and 1-3/4 inch Standard SteelDoors and Frames - New edition expected in 2003.

D. ASTM A36 - Standard Specification for Carbon Steel.

E. ASTM A167 - Standard Specifications for Stainless and Heat Resisting Chromium- Nickel Steel Plate, Sheet, And Strip.

F. ASTM A269 - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.

G. ASTM A276 - Standard Specifications or Stainless and Heat Resisting Steel Bars and Shapes.

H. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs.

I. ASTM A500 - Standard Specification for Cold Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

J. ASTM A501 - Standard Specifications for Hot Formed Welded and Seamless Carbon Steel Structural Tubing.

K. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated or Zinc-Iron Alloy Coated by Hot Dip Process.

L. AWS - Structural Welding Code Standard Qualification Requirements, American WeldingSociety.

M. FS FF-B-588 - Bolt, Toggle: And Expansion Sleeve, Screw.

N. FS FF-W-84 - Washers, Lock (Spring).

O. FS FF-W-92 - Washer, Flat (Plain).

P. FS FF-S-111 - Screw, Wood.

Q. FS HH-I-524 - Insulation Board, Thermal (Polystyrene).

1.04 SUBMITTALS

A. Submit in accordance with Division 01 section, “Submittals”.

B. Shop Drawings: Provide shop drawings for the kiosk unit showing all sizes, sections, details for construction and layout of equipment and fixtures. Include catalog cuts, design fabrication and erection drawings, finish specifications, and other data necessary to clearly describe design, materials, sizes, layouts, construction details, framing, fasteners, hardware, insulation, glass, and erection. Submit small scale layouts of floor, wall, and roof panels, and large scale details of panel joints, edge conditions, door and window details, door and window frames, fasteners, door and window hardware and sealant placement. Indicate alldimensions, plans, elevations, sections, details and installation details.

C. Furnish wiring diagrams for all systems of the work.

D. Product Data: Submit manufacturer's technical data for all equipment and fixture items including light fixtures, heaters, air conditioner and fire extinguisher. Submit manufacturer’sdata for all door and window hardware.

E. Submit product data, shop drawings and samples indicating construction materials and details for roof systems at exterior located kiosks. Include type of roof, insulation, flashing,edge details and drainage.

F. Samples: Comply with the General and Special Conditions and Division 01 requirements:

1. 6" x 6" sample of stainless steel polished finish.
2. 6” x 6” sample of stainless steel textured finish.
3. 12" x 12” sample of wall panel assembly.
4. 12" x 12" sample of glass panel and sample of corner mitered joint assembly.
5. 12” x 12" sample of egg-crate louver ceiling.
6. Mock-up of “stainless to stainless” sealant for color approval in field.

G. Provide manufacturer’s warranty information, operating instruction materials and maintenance requirements for all mechanical, electrical and other equipment, heaters, airconditioner, fire extinguisher and door hardware for Authority’s review and approval.

H. Coordinate submittal for the door and frame with the hardware submittal to locate the hardware and provide reinforcement for attachment of all hardware. Show reinforcement onthe door and frame submittal.

1.05 QUALITY ASSURANCE

A. Reference Standards: The work is subject to requirements of applicable portions of the Underwriters' Laboratories. Provide electrical components that are U.L. labeled and listed. Comply with applicable requirements of Architectural Woodwork Institute. Provide qualifying welding processes and welding operators in accordance with AWS "Standard QualificationProcedure."

B. Manufacturer shall have at least ten continuous years of experience in the manufacture ofsimilar enclosures and be able to submit evidence of ability to comply with these specifications. No fabrication shall be started until name of manufacturer has been submittedby the contractor for approval of the Authority.

C. Manufacturer's plant shall be open to the Authority for its inspection. Complete fabrication methods and procedures shall be demonstrated to the Authority upon request.

D. Manufacturer shall demonstrate that manufacturer's plant is adequate enough to handle thefabrication of the kiosk within the allotted construction period.

E. Assemble kiosk in manufacturer's plant to the greatest extent possible to ensure that all partsfit and conform to the design intent. Disassemble only to the extent required for shipping.

F. Installer shall demonstrate that he has the equipment and man power that is capable andexperienced to transport and install the prefabricated kiosk.

1.06 DESIGN CRITERIA

A. The walls, windows, doors, hardware and external components of kiosk shall have tamper-resistant characteristics and the glazing shall have attack resistant and ballistic protection characteristics.

B. Perform engineering of the Customer Assistant's Kiosk based on the design, the materials,and the performance criteria specified. The Drawings for the work establish the design thatconsists of dimensions, alignment of components, member and component profiles and sight lines. Details indicated are not all inclusive. Provide additional details as may be necessary.

C. Do not modify the design except as can be demonstrated to be absolutely necessary to meet specified performance or design requirements and to coordinate the work and then only withthe approval of the Authority.

D. Fabrication of Customer Assistant's Kiosk to be based on the approved shop drawings, contract drawings, design drawings and these specifications. The Contract Drawings establish the design which consists of dimensions, alignment of components, member andcomponent profiles and sight lines.

1. Preliminary drawings showing modifications to the design (if any) shall be submittedto the Authority for review and approval prior to award of contract.
2. Structural Steel: For structural steel members, comply with the requirements of theAmerican Institute of Steel Construction's (AISC) "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings".
3. Light Gauge Steel: For light gauge steel members, comply with the requirements of the American Iron and Steel Institute's (AISI) "Specification for the Design of Cold Formed Steel Structural Members" and "Design of Light Gauge Steel Diaphragms".
4. For welded connections, comply with the American Welding Society's (AWS) "Standard Code for Arc and Gas Welding in Building Construction" for welding procedures.

E. Structural Properties: The structure shall be designed to withstand the following Wind Load: Positive (inward) and negative (outward) pressures of not less than 30 psf. Maximum deflection of any member, in a direction normal to the plane of the wall, shall be not more thanL/240 of the clear span. Influence of glass on stiffness when it reduces deflection, shall notbe considered.

F. Design of kiosk must conform to the dimensions, heights and conditions of the stationhouse. Kiosk design may deviate based on the location of walls, columns and other fixed structures. Coordinate location of utility connections, power, security, safety and communication. Forthe air conditioner condensate drain line, a floor drain must be located adjacent to the kioskwall. The floor of the stationhouse must be suitable for the kiosk floor.

1.07 DELIVERY, STORAGE AND HANDLING

A. Packaged materials shall be delivered to the project in sealed containers bearing manufacturer's name and material identification. Materials shall be stored in strict accordance with the manufacturer's printed directions. Protect all stainless steel surfaces with pressure sensitive vinyl protective covering, which shall be removed after completionof installation.

B. Protection: Protect materials against damage from mechanical abuse, plaster, salts, acids, staining, and other foreign matter by an approved means during transportation, storage, and erection, and until completion of construction work. All unsatisfactory materials shall be removed from the premises, and all damaged materials replaced with new materials at noadditional cost to the Authority.

1.08 INITIAL MAINTENANCE AND WARRANTY

A. Maintenance Service: Provide full maintenance service by skilled employees of the kiosk installer for a period of 18 months after the station opens to revenue service. Preventative maintenance shall be performed during normal working hours and shall include lubricating,cleaning, and adjusting all components of the kiosk a minimum of once a month as part of the initial maintenance and warranty. Exclude only repair/replacement due to misuse, abuse, accidents, or neglect caused by persons other than installer's personnel.

B. Warranty: Kiosk and all components, hardware and equipment shall be warranted for a period of one (1) year minimum from the date of substantial completion unless a longer warranty is offered or required. Any component, hardware item or piece of equipment thatfails or does not function properly during the warranty period shall be repaired or replaced,as approved by the Authority, at no cost to the Authority.

1. The air conditioner shall have a ten year warranty on compressor and all parts.

1.09 OPERATION AND MAINTENANCE MANUAL

A. Submit operating instructions, maintenance schedules, and parts lists for all equipment inaccordance with the Contract Documents.

1. Provide specific operation and maintenance instructions for heaters, air conditioner, fire extinguisher and other equipment.

B. Operating and maintenance manuals shall be prepared by the manufacturer, with written instructions relative to the care, adjustments, and operation of all parts of the equipment.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturer shall have not less than 10 years' continuous experience in the manufactureof enclosures of the same type as required for the Project and be able to

submit evidenceof ability to comply with requirements of the Specifications to the satisfaction of the Authority. Kiosk fabrication shall not begin until such evidence has been submitted to and Manufacturer has been approved by the Authority.

1. Cabworks.
2. Chicago Architectural Metals.
3. Chicago Bullet Proof Systems, Inc.
4. National Bullet Proof Inc.
5. Specialty Construction.
6. Approved equal.

2.02 MATERIALS

A. Metals: Use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, roughness, "oil canning", discoloration or other imperfections.

B. Steel framing of prefabricated components shall consist of ASTM A 36 steel.

C. Steel Tubing: ASTM A 500 or ASTM A 501.

D. Stainless Steel: Type 316 stainless steel with non-directional satin finish to match approved sample.

1. Bar Stock: ASTM A 276.
2. Plate or sheet: ASTM A 666.
3. Tubing: ASTM A 269.

E. Cold-Formed Steel Framing Members:

1. Vertical structure to be steel framing, shape and size(s) as shown on drawings or as structurally necessary for design and function, roll formed from steel complying with ASTM A 500 or A 653.
2. Structure at top of kiosk to be fabricated of steel framing, shapes and size(s) asshown on drawings or as structurally necessary for design and function
3. Provide framing at top, corners, ends and at openings of kiosk.
4. Steel framing to be welded, ground flush and smooth, primed and touched up in thefield as required.
5. Exposed metal framing to be clad with 16 GA., Type 316 stainless steel with non-directional satin finish.

F. Galvanized Sheet Steel roof: ASTM A 653 (commercial quality), or lock forming quality, galvanized coating designation G 90, 0.90 oz./ft.^{2} zinc coating, mill phosphatized. 1/16 inch thick.

1. If kiosk is to be located at an exterior location, provide a modified bituminous sheetroofing system, standing seam metal roof or other weather resistant roofing system.

G. Wall Panels: Fabricate wall panel framing and any required reinforcing from 3 inch steel framing (as structurally required) welded and primed. Fill voids with batt or rigid insulationand face on both sides with 16 gauge stainless steel sheets welded to the framing and ground smooth. Vertical edge of panels to be one piece formed with the outside face of stainless steel sheet. Inside sheet of stainless steel to be screw fastened. Interior stainless steel sheet shall be satin non-directional finish. Exterior stainless steel shall be horizontally textured or smooth as shown on the drawings. The 3” base to be smooth as shown on the drawings. Stainless steel cladding to be continuous all sides. Provide internal reinforcement at openings and forsecuring hardware, cabinets and fixtures.

1. Textured stainless steel, where shown, to be 16 gauge, 5 HR or 2 FL patterned finish, as selected by the Authority and as manufactured by Rigidized Metals, Inc. or approved equal.
2. Smooth stainless steel, where shown, to be 16 gauge, Type 316 stainless steel with non-directional satin finish to match approved sample.

H. Ceiling:

1. Fabricate framing and any required reinforcing from steel tube, channel or angle structural steel shapes as shown on the drawings; welded and primed. Use steel framing of size as required for supporting the air conditioner, light fixtures, suspended ceiling and other loads. Fill voids with rigid insulation; mechanically fastened as required.
2. Galvanized Steel Roof Deck: ASTM A 653 Structural Quality steel sheet, Fy = 33,000 psi, hot-dip galvanized with G 90, 0.90 oz./ft^2 zinc coating, mill phosphatized. Deform ends of panels so that a 2" telescoping end lap shall lay flush. Steel thickness as necessary to fulfill performance requirements and support all loads, but not less than 20 gauge.

    a. Narrow Rib Roof Deck: Depth approximately 1-1/2". Ribs spaced not morethan 6" o.c. Width of rib opening at roof surface not more than 1". Width ofbottom rib surface not less than 1/2".
    b. Steel Accessories for Roof Deck: Provide items required for complete installation of the Work. Fabricate of same material and finish to match deck.

3. Galvanized flat plate, 16 gauge smooth plate, to cover top of roof decking. Providesealant as required.
4. Provide 1”x1” 16ga bent angle at perimeter top of kiosk as shown on drawings.
5. Provide modified bituminous sheet roofing system, EPDM roofing system or otherroofing system as approved by the Authority at exterior kiosks or kiosks exposed tothe elements; including insulation, flashing, edge detail and drainage.

I. Steel Framing Member Finishes:

1. All steel framing members for kiosks located in interior spaces to be shop primed withTnemec 1099 primer, as manufactured by Tnemec Co., Inc. or an approved equal.Primer to be touched up as required in the field after installation of the steel and afterwelds are ground flush and smooth.
2. All steel framing members for kiosks located at exterior locations to be hot dip galvanized. Galvanize in largest fabrication possible. Galvanizing to be touched upas required in the field after installation of the steel and after welds are ground flushand smooth.

    a. Provide separation between all dissimilar metals to prevent galvanic action between the metals. Use Black Bituminous Paint as manufactured by C.R. Laurence Co., Inc. or an approved equal.

J. Wood: Each piece grade stamped with inspection agency stamp. All wood and plywood tobe exterior grade.

1. Plywood: PS 1 and thickness as shown.
2. Backing at Stainless Steel Counters: APA A C exposure.

K. Polystyrene Insulation: Insulation shall be built into kiosk's ceiling, wall panels and doors. Molded Polystyrene Plastic Board Insulation: Closed-cell, expanded polystyrene beads molded into rigid boards, complying with ASTM C 578, Type IX. Insulation shall provide a "R"

factor of 4.76 @ 40 deg. F, and compressive strength of 25-33 psi. Insulation thickness forwall panels to be 3” and thickness for doors to be 1-3/4”.

1. Manufacturer: Subject to compliance with requirements, provide products of one ofthe following:

    a. Polyfoam Packers Corp.
    b. AFM Corporation.
    c. W. R. Grace.

L. Doors and Frames: Doors and frames shall be constructed of stainless steel meeting the requirements specified under Design Criteria. Door frames to be 8 guage stainless steel, non-directional satin finish, secured to stainless steel clad kiosk structural frame consisting of 3” x 2”galvanized steel tube clad with stainless steel. Door shall be 1-3/4 inch total thickness andcomprise of molded polystyrene plastic board insulation with 16 gauge stainless steel sheets all sides and edges. Provide internal corner, edge and hardware reinforcement as required and/or shown. Weld stainless steel sheets to reinforcement. All edges and corners of stainless steel to be continuously welded and ground smooth. Exterior side of door to be clad with horizontally textured stainless steel to window height. Exterior 3” high base of door (align with adjacent panels), other areas and interior side of door to be non-directional satin finish stainlesssteel. Door and frame shall be properly internally reinforced for mortise and surface mountedhardware. Coordinate with hardware. Provide cutout in door for vision panel and operablevent. Glazing stops to be 8 gauge stainless steel and shall secure to interior side of door and be secured with fasteners spaced not over 8 inches on center. Door glazing to be ¾” laminated security glazing ballistic and attack-resistant similar to the glazing used for the operable and fixed windows.

M. Kiosk Door Hardware:

1. Hinge: Provide heavy-duty stainless steel continuous hinge on door (plain finish) Ives 700 series pin and barrel hinge in 630 finish or Authority-approved equivalent,of width required for door thickness. Use stainless steel tamperproof screws.
2. Lockset: Provide one lockset per door; corrosion resistant deadbolt with cylinder and thumb turn, operated by key from outside and by turn knob from inside with 630 (satinstainless steel) finish manufactured by Schlage; storeroom lock series, L9480 L400 TORX or approved equal. 1” throw stainless steel deadbolt, heavy duty cylinder through bolted, brass 6-pin cylinder per ANSI A 156.5 2001 Grade 2 with stainlesssteel strike.
3. Strike: ANSI A115.1.
4. Cylinder: Best removable core cylinder with construction core No. 1 E74 C265RPSUS32D cylinder. Provide construction core and control key from local office. Contractor shall provide uncombinated cylinder and removable core to the Authority for combinating and installation.
5. Keying: Customer Assistant's Kiosk - Best system keyed independently.
6. Closer: LCN (4110 series).
7. Weatherstripping: Zero, No. 328A all around.
8. Metal Threshold with Weatherstripping: 4-inch wide, aluminum, Zero, No. 544A orapproved equal; set in mastic and secured to floor.
9. Lockguard: LG12 630 finish by Ives or approved equal.

N. Fasteners: All exposed fasteners to be stainless steel and all exposed screw heads shall be tamper-resistant flat head type, in stainless steel, unless noted otherwise.

1. Bolts and Nuts: Regular hexagon head type, ASTM A307, Grade A.

a. Use stainless steel bolts to secure kiosk to stationhouse floor and securepanels to intermediate, perimeter and corner framing.

2. Screws: Stainless steel tamper-resistant flat head type.
3. Toggle Bolts: Tumble wing type, FS-FF-B-588.
4. Plain washers: Round, carbon steel, FS-FF-W-92.
5. Lock Washers: Helical spring type carbon steel, FS-FF-W-84.

O. Door Monitor Switch: Concealed design for use with steel doors. Concealed magnetic contact with both switch and magnet isolated from surrounding steel. Rhodium plated contacts to prevent sticking and cold welding. 3/4 inch diameter magnetic contact rated for7/8 inch maximum gap.

P. Security Glazing:

1. Stationary Windows: Glazing stops shall be 8 gauge stainless steel. Stops shall besecured to interior of modular enclosure panels. Provide performed wedge strips orcompression gaskets, black neoprene ASTM C 509, Type II, closed cell extrudedor molded and silicone sealant glazing. Miter corners of glass where shown on the drawings; fill gap with clear sealant.
2. Sliding Windows: Frames shall be stainless steel and designed for installation in enclosure panels. Vision panels shall be manufactured so as to be able to slide open.Sliding window tracks, rollers, sliding mechanism and all hardware shall be as provided or recommended by the window manufacturer. Vision panel shall be lockable from the inside with stainless steel flush bolt assembly with turn knob at the sliding window meeting stiles.

   a. Provide stainless steel flush bolt assembly for window lock.

3. Glazing stops to be mitered at corners.
4. Provide continuous 1 ½" neoprene gasket secured to both sides of fixed windowframe.
5. Security glazing shall be Ballistics, Attack and Forced Entry Resistant glass-cladpolycarbonate laminate assembly to consist of the following:

   a. 3/4 inch overall thickness consisting of:

      1) 3/16 inch thick clear, heat strengthened glass.
      2) 0.050 inch clear Urethane interlayer.
      3) 5/16 inch clear polycarbonate interlayer.
      4) 0.050 inch clear Urethane interlayer.
      5) 3/16 inch thick clear, heat strengthened glass.

6. Security Glazing assembly to be certified to meet the following tests:

   a. Weatherability Tests: Meets ANSI Z.26.1-1977 and Z.26.1a-1983 and ASTM E773 and E774.
   b. Clear Light Transmittance: 76 percent visible.
   c. Attack resistance: Tested and certified by H.P. White Laboratories to meetLevel I Forced Entry.
   d. Ballistic Protection: Tested by H.P. White Laboratories to meet Level B Ballistics Assault, 9 mm, Lugar: 3 shots in an 8 inch circle; 124 grain Full Metal Jacket, 25 feet.
      Results: Spall: No penetration.

7. Provide single responsibility for all phases of manufacturing, from the heat strengthening of the raw glass through the final lamination.
8. Manufacturer and/or trade name security glazing to be one of the following:

    a. “Secur-Tem + Poly” as manufactured by Globe/ Aemeroda Glass Co.
    b. “Glass-Clad No. 31554 as manufactured by Guardian Industries,
    c. “Guard-Vue 200” as manufactured by Viracon.
    d. US Armor LLC.
    e. Approved equal.

9. Provide and install a sacrificial film on the exterior side of all kiosk glazing for vandal protection. The sacrificial protective film to be one layer of Polyethylene Terathalate (PET), 6 mils thick. There shall be an acrylic pressure sensitive adhesive on the back of the film, protected by a peel-off release liner, for installation to the glass.

    a. The sacrificial protective film and adhesive to be as manufactured by Madico, Inc.; product number LCL-600-XSRG; or approved equal.

10. Provide and install a glare reduction film on the interior side of all kiosk glazing. The glare reduction film to be one layer of Polyethylene Terathalate (PET), 6 mils thick. There shall be an acrylic pressure sensitive adhesive on the back of the film, protected by a peel-off release liner, for installation to the glass.

    a. The glare reduction film and adhesive to be as manufactured by Madico, Inc.; or approved equal.

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11. Provide continuous 1 ½” neoprene gasket secured to fixed window frame, both sides.

Q. Manual Window Shades:

1. Shade: Manual operating, chain drive shade, shade pocket, with 2-inch removable closure, white finish. Fabricate PVC free, FR, shade-cloth to hang flat without buckling or distortion. Fabricate with heat sealed trimmed edges to hang straight without curling or raveling. Fabricate unguided shade-cloth to roll true and straight without shifting sideways more than 1/8 inch in either direction for 96 inch of shade height due to warp distortion or weave design. No horizontal seams.

    a. MechoShade “EcoVeil 1550 Series, #1569 Silver birch, 3% openness, 63 inch wide shade material, vertical seams to align with mullions.
    b. Symmetrical light gaps of not more than 1/2 inch typical.
    c. Shade mounting position adjustable, while shade is installed, to center shade

R. Counters, Drawers and Cabinets:

1. Countertop, cabinets, communication equipment cabinet, audio/visual console, doors, shelves, and drawers shall be 16 gauge stainless steel non-directional satin finish. Counters to be constructed of plywood backerfully clad in stainless steel. Provide shop drawings indicating reinforcing, supports,edges, fastening, fasteners, welds and other details for counter, drawer and cabinetcomponents. Shop drawings to indicate fabrication of countertop, cabinets, doors, shelves and drawer units including sizes and fabrication details. Provide continuous formed pulls for drawers. Provide a recessed base for floor mounted cabinets. Indicate all required hardware and method of fastening. Bend ends of stainless steel for

strength. All edges shall be smooth without sharp edges. Provide the following, unless approved otherwise:

a. Two cabinets 17.5” W x 14” D with 3 drawers.
b. One cabinet 17.5” W x 14” D with 2 drawers.
c. One 24” W x 18” D communication box with door and rack rails.

2. Counter support shall be 1/8" steel bracket assemblies to adequately support counter. Anchor to wall panels, reinforce wall panels internally at brackets. Brackets shall be at 3'-0" o.c. and at all end conditions.
3. Contractor to determine shelf/counter height based on actual window supplier.
4. Hardware: Provide cabinet hardware and accessories associated with architectural cabinets. All casework hardware shall be stainless steel, US32D.

a. Piano hinges-concealed.
b. Cylinder lock keyed for "Best" ZB-6 keys.
c. Drawer Slides - ball bearing with 70 lbs. capacity.
d. Pulls - continuous formed handle.
e. Catches - magnetic.
f. Standards and clips.

S. Ceiling: Provide a suspended ceiling system composed of aluminum T-shaped suspensiongrid, suspended by wire from structure above, and lay-in aluminum formed baffles, egg cratepanels supported by the suspension grid.

1. Parabolic Louver: Ecolite Co. PL Series, PL .75, or approved equal. Aluminum parabolic louver 1" x 1" cell width, 3/4" deep, Semi-Specular Silver finish.

a. Armstrong.
b. Chicago Metallic Corporation, Type 730.
c. National Rolling Mills.
d. Donn Acoustical Suspension Systems.
e. Or approved equal.

T. Heaters (2):

1. The heater units shall be commercial grade equipped with sufficient 1500 watt, 240vac heaters to maintain interior temperatures of 75 deg. Fahrenheit when the outside temperature is -10 deg. Fahrenheit and all equipment is turned off. Theroom air circulation shall be a minimum of 175 CFM. A separate over-temperaturethermostat shall be provided which shall override the manual and automatic heatercontrol to turn off the heat. The heaters shall be wall mounted with a thermal insulation between the wall and the heaters. Location and number of heater(s) asshown on Drawings.
2. The heaters shall be controlled by both a single thermostat and a manual switch. The manual switch shall be three positions, "OFF", "ON" and "AUTO". When the switchis in the "OFF" position, the thermostat will not be able to turn the heater(s) on. Whenthe switch is in the "ON" position, the thermostat will not be able to turn the heatersoff. When the switch is in the "AUTO" position, the heater(s) will be controlled by the thermostat only.

U. Air Conditioner:

1. Air conditioner unit to be mounted to the roof structure and set into the drop ceilinggrid.
2. Air conditioner unit shall be 0.5 ton, 2’ x 2’ size to fit into ceiling space, 25 dBA sound pressure level, adjustable vents with downward air flow into the space, minimum 200CFM, 7,500 Btu/hr rated cooling capacity, 208-230 volts, 60 Hz, Single Phase.

a. Air Conditioner as manufactured by Daikin, Model No. FXZQ07MVJU9 orapproved equal.

3. Air conditioning unit's conduit for power, condensate line, refrigerant supply line and refrigerant return line to be concealed in kiosk wall chase. Provide outlet to drain condensate to open site floor drain provided inside of kiosk.
4. Provide thermostat and controls for air conditioner on interior wall of kiosk.
5. Make all required electrical and other wiring and piping connections for the air conditioner's operation.
6. Condenser unit for system may be installed at station roof or kiosk roof as determined at the site.

V. Light Fixtures:

1. Surface mounted (above egg crate suspended ceiling) 4"-0" long single tube LEDfixture with lens. Two (2) fixtures unless shown otherwise.

W. Power:

1. Provide duplex outlets above counters and other locations where shown on thedrawings.
2. Provide power and make connections for heaters and air conditioner.

X. Communication and Data:

1. Help point phone in paid area and in unpaid area mounted in kiosk wall recessed orsemi-recessed.

Y. Fire Extinguisher: Provide and install one (1) multi-purpose 17 lb. dry chemical multi-purpose, hand type fire extinguisher.

1. Extinguisher to be UL and FM approved.
2. Provide manufacturer's bracket for mounting on wall.
3. Extinguisher shall be stamped "PROPERTY OF CTA".
4. Extinguisher to be approved for low temperatures as low as -65 deg. F.
5. Extinguisher shall be model 10-A: 60-B:C; as manufactured by Ansul Fire Protectionor approved equal.

Z. Fresh air vent: Towards the bottom of the door provide a stainless steel operable vent (6"x 15") as shown on the drawings.

2.03 FABRICATION, GENERAL

A. Customer Assistant Kiosk shall be custom fabricated as detailed and shall be complete with fixtures and accessories shown, installed in place and in proper working order. Final connections to services are specified in the electrical and mechanical work.

B. Fitting and assembly of the work shall be done in the shop. Work that cannot be permanentlyshop assembled shall be completely assembled, marked and disassembled before shipment to ensure proper assembly in the field.

C. The metal interior and exterior for the kiosk shall be electrically continuous and provision made for connecting to equipment ground system at station.

D. Use only proven methods that produce the workmanship specified for the work. Methods ofassembly and joining which will affect the appearance of the work shall be subject to the acceptance of the Authority.

E. All exposed work shall be carefully matched to produce continuity of line and design. All joints in exposed metal work shall be accurately fitted and rigidly secured.

F. Form metalwork to required shapes and sizes, with true curves, lines and angles. Providenecessary rebates, lugs and brackets for assembly of units. Use concealed fasteners wherever possible.

G. Fabricate and fasten metalwork so that the work will not be distorted nor the fasteners overstressed from the expansion and contraction of the metal.

H. All welding shall be in accordance with the American Welding Society for recommended practices in shop welding using electrodes specified by the manufacturer of the alloys beingwelded. Provide welds behind finished surfaces without distortion or discoloration of the exposed side. All weld beads on exposed surfaces shall be ground and finished to match andblend with finish on adjacent parent metal. Grinding and polishing shall be done only with clean wheels and compounds free from iron and iron compounds.

I. Mill edge joints to well-defined lines. Cope or miter corner joints. Provide all surfaces with nosharp edges.

J. Completed kiosk to be water and air tight; form joints exposed to weather to exclude waterpenetration.

K. After grinding, polishing or forming metal surfaces, clean surfaces with a detergent solution(containing no chlorides to remove all extraneous materials, rinse thoroughly with clear water and dry.

2.04 WALL PANEL AND DOOR FABRICATION

A. Fabricate stainless steel wall panels and door to be rigid, neat in appearance and free fromdefects warp or buckle. Accurately form metal to required sizes and profiles. Weld exposedjoints continuously; grind, dress, and make smooth, flush and invisible.

B. Exposed Fasteners: Do not use exposed fasteners except where unavoidable. Exposed fasteners shall be countersunk flat Phillips or Jackson heads for exposed screws and bolts.

C. Prepare doors and frames to receive concealed finish hardware, including cutouts, reinforcing, drilling and tapping in accordance with templates provided by hardware manufacturer.

D. Fabricate stainless steel insulated wall panels and doors of two (2) continuous stainless steel sheets not less than 16 gauge. At exterior surfaces, weld stainless steel sheet to stainless steel 8 gauge channel frame and channels at perimeters. Wall panels to be 3” thick. Doors to be 1-3/4” thick. Fill with rigid insulation. Vertical edge of panels and doors may be one piece formed with the outside face of stainless steel sheet. All exposed edges to be stainless steel. Inside sheet of stainless steel shall be screw fastened. Continually weld and ground smooth exposed joints. Construct with smooth, flush surfaces, without visible joints or seams on exposed faces or stile edges. Provide corner reinforcement angles at exterior corners.

E. Door Frames: Fabricate door frames of 14 gauge stainless steel. Provide full-welded unit construction, with corners mitered, reinforced, continuously welded full depth and width. Provide anchors to wall panel construction.

F. Stops: Form fixed stops and moldings integral with frame. Provide removable stainless steel stops. Secure with countersunk machine screws spaced uniformly not more than 12" on center. Form corners with mitered hairline joints.

G. Clad both sides of wall panels and door with 16 gauge stainless steel sheets; non-directional satin finish to match approved sample.

1. Textured stainless steel, where shown, to be 16 gauge 5 HR or 2 FL pattern finish, as selected by the Authority and as manufactured by Rigidized Metals, Inc. or approved equal.

2.05 KIOSK FABRICATION

A. Fabricate kiosk to sizes and details as shown on approved shop drawings. Verify all dimensions and installation conditions in field. Coordinate height of cabinet countertops with sill of window glass.

B. Top of kiosk to be formed of fabricated steel channels or other framing clad with 16 gauge textured stainless steel sheets.

C. Steel channels and perimeter angles or other framing to support galvanized roof deck. Cutroof deck to fit. Cover top of deck with 16 ga galvanized flat plate with 1" return at all sides.Secure plate to decking with stainless steel screws with neoprene washers.

D. Vertical column supports for kiosk to be steel tube or other framing clad at exterior and interiorwith stainless steel. Columns to support kiosk walls and ceiling.

E. All steel framing to be sized as shown on the drawings or as required structurally and approved by the Authority. All steel framing to be welded as required and ground flush andsmooth. Steel framing to be factory primed and touched up in the field.

F. Kiosks located in the stationhouse to be fabricated without a floor of its own; the floor of thekiosk to be the stationhouse floor. Kiosks for exterior applications to have a raised floor anda waterproof roof and be fabricated to be resistant to the elements.

G. Stainless steel wall fabricated panels to be secured to vertical columns with stainless steel bolts at 12" on center and directly to station house floor with stainless steel bolts. Provide continuous stainless steel cladding both sides.

H. Secure window and vision panels to top tube frame, vertical tube frame, and wall panels with 8 gauge stainless steel stops secured to tubes and wall panel frames. Miter glazing stopsat corners. Miter corners of glass and fill gap with clear sealant at outside corners. Door frames to be secured to wall panel frames.

I. Provide a vertical pipe chase as shown on the drawings framed with 8 GA. Min. steel galvanized channels clad with stainless steel and chase enclosed with stainless steel sheets.

J. Provide 1-1/2” x 1-1/2” 8 GA. corner angle guard adhered at outside corners with silicone adhesive.

PART 3 - EXECUTION

3.01 PREPARATION

A. Field Measurements: Take field measurements prior to preparation of shop drawings andfabrication where possible, to ensure proper fitting of the work. Do not delay job progress. Allow for adjustments and fitting where taking of field measurements before fabrication might delay the work.

B. Coordinate anchor plate installation and setting drawings, diagrams, templates, instructions and directions for installation and anchorage to concrete slab.

3.02 INSPECTION

A. Inspection of Structure: Before components are delivered to the site, examine the kiosk's final location and report in writing to the Authority, any conditions which in the installer's opinion will prevent the proper execution of the work or endanger its permanency. The erection shall not proceed until such conditions are corrected or adjusted satisfactorily.

3.03 INSTALLATION

A. Set prefabricated kiosk, or assemble kiosk components accurately in location, alignment, and elevation. Set work plumb, level, true and free of rack.

B. Fit exposed field connections accurately together to form tight hairline joints unless otherwise shown.

C. Limit field welding to those connections which will be concealed in the finished work. Comply with AWS code for procedures of manual shielded metal arc welding, appearance and quality of welds made, and methods used in correcting welded work.

D. Install components without distortion so that doors and drawers fit openings properly and areaccurately aligned. Adjust hardware to doors and drawers to provide unencumbered operation.

E. Restore protective cover if damaged during shipping and installation. Remove protective cover when there is no possibility of further damage from construction activities. Remove protective cover from kiosk all at one time to prevent uneven discoloration.

F. Cut standard size parabolic louvered panels precisely to fit grid spacing.

G. Coordinate the installation of mechanical work as required and specified in Divisions 22 and 23.

H. Coordinate the installation of communication work and electrical work as required and specified in Division 25 and Division 26, respectively. Provide and install conduit, boxes, receptacles, switches and make all necessary connections.

I. Electrical Conduit and Junction Boxes: Provide electrical conduits and junction boxes concealed in kiosk walls. Materials and installation shall comply with requirements of Electrical Section, "Basic Electrical Materials and Methods".

J. Provide two each 3/4 inch diameter concealed electrical and communication conduit feeds from end fare collection equipment to electrical room and communication room for future fareequipment reader. See drawings for locations.

K. Contact CTA communications department for communication equipment and connection details.

L. Provide neoprene closure strip and sealant where kiosk column meets stationhouse walls and ceiling. Provide sealant where kiosk meets station house floor. Kiosk installation for exterior applications to be resistant to the elements.

3.04 STEEL FRAMING INSTALLATION

A. Install steel framing members with fasteners of stainless steel or of same material being fastened or weld as shown or required.

1. All welds to be ground flush and smooth.

3.05 WALL PANEL INSTALLATION

A. Bolt wall panels to steel tube columns and, at interior locations, bolt directly to stationhousefloor with stainless steel anchors embedded a distance of 4” minimum. Shim kiosk walls asrequired for level installation.

3.06 ERECTION OF STEEL ROOF DECK

A. Attachments: Secure 1 ½” galvanized steel roof deck to supporting steel framing with fasteners or ¾ inch welds spaced not more than 12 inches o.c. At joints, fasten or weld bothpanels to supports. Fasten side joints of deck panels with welds or screws spaced 30" maximum. Lap end joints in roof deck panels by 2 inches. Weld or mechanically fasten accessories to the deck.

B. Hanging Loads: Do not hang concentrated loads exceeding 50 lbs. per hanger device fromthe deck. Do not hang concentrated loads from roof deck.

C. Finish top of kiosk with galvanized steel plate over roof deck.

D. Install a modified bituminous sheet roofing system, EPDM roofing system or other roof as approved by the Authority for exterior located kiosks or kiosks exposed to the elements. Provide details to Authority for approval. Include insulation, flashing edge detail and drainage for the roof system.

3.07 TOUCH-UP PAINTING

A. Touch-Up Painting: Touch-up damaged and abraded surfaces of shop applied coatings, connection surfaces previously left uncoated, fasteners and welds, and abraded or rusty surfaces on steel framing and deck members after erection. Thoroughly clean the surfacesand apply primer in accordance with paint manufacturer's recommendations. Repair galvanized surfaces with specified zinc-rich primer paint. Touch-up painted surfaces with same paint as used in shop-applied coating.

3.08 FIRE EXTINGUISHER

A. Install fire extinguisher using manufacturer’s wall bracket inside kiosk at location shown onthe drawings or as otherwise directed.

3.09 ADJUSTING AND TESTING

A. Adjust all operating parts such as doors and drawers for proper and free operation.

B. Coordinate the testing of all systems which are controlled from the kiosk in cooperation withinstalling contractors of the various systems and in the presence of the Authority.

3.10 PROTECTION AND CLEANING

A. Protect all materials against damage from mechanical abuse, plaster, salts, acids, staining or other dirt during erection and until completion of construction work. All unsatisfactory materials shall be removed from the premises, and all damaged materials replaced.

B. After substantial completion, clean down all exposed surfaces, including glass.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 13 06 00, Customer Assistant's Kiosk shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 13 06 00, Customer Assistant's Kiosk shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 13 39 00.S
TEMPORARY PASSENGER AND EMPLOYEE FACILITIES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and other Division 01 Specification sections, apply to this section.

B. CTA's MASTER SPECIFICATIONS.

C. CTA's DESIGN GUIDELINES

D. Local Codes and Ordinances.

1.02 SUMMARY

A. This Section specifies requirements for providing all materials, labor and equipment required to construct and provide temporary facilities for the Authority's customers and employees. Temporary facilities allow the access, operation and use of the Authority's services for customers and employees while permanent facilities are being constructed or remodeled adjacent to or nearby the temporary facility site.

B. The temporary facilities required may be for a fully self-sufficient facility or a partial installation that supplements the existing permanent facility that remains accessible and useable by customers and employees.

C. The temporary facilities may be required in phases and may have to be altered or moved during various phases of construction as shown and required by the process plan, phasing plan and schedule for the project.

D. The temporary facilities are typically a part of the overall project and contract for the work being performed at the permanent facility and the responsibility of that Contractor or the temporary facilities may be a separate project and contract and may have a different Contractor, in which case coordination is required by all parties and with the Authority.

E. Temporary passenger and employee facilities may include all or some of the following, but are not limited to:

1. Stationhouse enclosure including fare control, concession, customer assistant kiosk, employee washroom, janitor closet, communication equipment room, electrical room, storage closet and other passenger and employee areas.
2. Other Enclosures.
3. Stair and Ramp Systems.
4. Platforms including supervisor's booth, windbreaks, benches, trash receptacles, sand boxes, gap filler and enclosure, local control panel booth (if applicable), end railings and gates.

    a. Minimum number of benches, trash receptacles and other amenities similar to CTA guidelines for permanent installations.

5. Canopies.
6. Pavements for roads and walks
7. Signage, way-finding, informational signage, digital imaging signage. Provide signage at platform level, in stationhouses, at exterior, at entrances and other locations as required. Provide bulletin boards and/or white boards in stationhouses. Provide operations right-of-way signage.

8. Concession areas, if applicable.
9. Track access stairs and track level footwalk.
10. Temporary Pedestrian Bridges.

F. Temporary employee facilities may include the following, but are not limited to:

1. Field offices.
2. Classrooms.

G. Temporary facilities includes providing required services, support, security and protection for customers and employees.
1. Utilities.
2. Heat and lights.
3. Waste disposal services.
4. Enclosures.
5. Roads, walks, curbs and gutters.
6. Shelters.
7. Fencing, barricades.
8. Fire protection.

a. Provide fire extinguishers as required on platforms, station houses, kiosks and other areas.

9. Bike Racks.
10. Signage and Wayfinding.
11. Warning signs and lights.
12. Exit signs and emergency lighting with backup power..
13. Environmental protection.
14. Customer Assistant (CA) call buttons on platforms and other locations.

H. Temporary utilities and equipment required include but are not limited to:

1. Water service and distribution.
2. Electric power and light.
3. Transformers.
4. Electric Generator.
5. Telephone and communication service.
6. Security system.
7. Cameras and monitors to assist with train operator’s visibility 8. Storm and sanitary sewer.

1.03 RELATED SECTIONS

A. The following specification sections may include information required for providing and constructing the temporary facilities required for this project. Refer to the individual specification sections for requirements:

1. All Master Specification Sections, Divisions 02 thru 34, provide technical information for the products and execution of the specific work of that section and are to be referred to as applicable for the Temporary Passenger and Employee Facilities Projected.

1.04 SYSTEM PERFORMANCE REQUIREMENTS

A. Buildings and Enclosures:

1. Conform to all applicable building codes for structures. The following design live loads must be confirmed by the structural engineer for the actual loading and conditions and must be added to the actual dead loads.

    a. Floor design live load: 100 PSF.
    b. Roof design live snow load: 30 PSF.
    c. Wind design live load: 30 PSF.
    d. Point design live load: 200 Pounds.

B. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:

1. Exterior Wall Framing: Horizontal deflection of 1/360 of the wall height.
2. Interior Wall Framing: Horizontal deflection of 1/360 of the wall height.
3. Floor Framing: Vertical deflection of 1/360 of the span.
4. Roof Framing: Vertical deflection of 1/360 of the span.
5. Ceiling Framing: Vertical deflection of 1/360 of the span.
6. Bridges: Maximum allowable deflection must not exceed 1/360 of the span length.

C. Thermal Movement: Design, fabricate and install framing systems and other Work to provide for movement due to expansion and contraction without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 degrees F (-20 degrees F. to +100 degrees F.) which may result in an exterior metal surface temperature exceeding 180 degrees F..

D. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:

1. Upward and downward movement of ½ inch.

E. Design Factor of Safety: Design, fabricate and install component parts of Work, including roofing panels and connections, with a factor of safety not less than 1.5, such that failure of any component shall not occur at less than 1.5 times the maximum design load, except where more stringent requirements are specified. Failure is defined as breakage, component disengagement, or permanent distortion in excess of 0.2% of the span of each member.

F. Thermal Movement: Design, fabricate and install the Work to withstand expansion and contraction forces resulting from a 120oF ambient temperature range of -20oF to +100oF, which may result in exterior metal surface temperature exceeding 180oF.

G. All temporary facilities structures and other construction to be designed, constructed and installed to withstand the vibration of the adjacent transit operations.

H. Stair and Railing Systems:

1. Structural Performance of Stairs and Landings: Stairs and landings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.

    a. Uniform Load: 100 lbf/sq. ft..
    b. Concentrated Load: 300 lbf applied on an area of 4 sq. in. at center of tread span.

c. Wind pressure (if applicable): 10 lbf/sq. ft.
d. Uniform and concentrated loads need not be assumed to act concurrently.
e. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
f. Limit Live Load deflection of treads, platforms, and framing members to L/360 or 1/4 inch, whichever is less. Structural Performance of Railings: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.

2. Handrails and Top Rails of Guards:

a. Uniform load of 50 lbf/ ft. applied in any direction.
b. Concentrated load of 200 lbf applied in any direction.
c. Uniform and concentrated loads need to be resisted when applied simultaneously.

3. Infill of Guards:

a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.
b. Infill load and other loads need not be assumed to act concurrently.

5. Stair and Railing System must conform to all applicable codes:

a. Width of stair for passenger load.
b. Maximum riser height and minimum tread width, including nosing.
c. Distance between landings and size of landings.
d. Height and design of railings.
e. Size and distance from wall of rails.
f. Spacing of pickets.

I. Ramps:

1. Ramp system must conform to all applicable codes.

a. Width of ramp.
b. Maximum slope of ramp.
c. Distance between landings.
d. Size of landings.

B. Bridge Design Criteria: Except as modified herein, the bridge shall be designed in accordance with the AASHTO LRFD Guide Specifications for Design of Pedestrian Bridges, 2nd Edition and the design shall meet all Chicago Building Code requirements. Where a conflict exists, the more stringent criteria shall apply.

C. Lighting:

1. Provide lighting levels for temporary facilities equivalent to permanent facilities and as required by the Authority's design guidelines. Provide sufficient lighting for all areas including exterior areas, station house, stairs, ramps, platforms and other areas.

a. Lighting at exterior public areas shall be controlled by timers or light sensors unless required otherwise by the Authority.
b. Provide exit lighting, emergency lighting, stairway and corridor lighting; which shall remain on at all times and have backup power.

c. Provide footcandle requirements as stated in CTA Design Guidelines for specific areas and conditions:

1) Station areas, Supervisor Booth, Kiosk: 35 footcandles
2) Platforms, Stairs: 20 footcandles.
3) Entry, Exits areas: 15 footcandles.
4) Electrical, Mechanical Rooms: 30 footcandles.
5) Service rooms, service areas: 20 footcandles.

d. Lighting shall be LED unless approved otherwise.

1.05 SUBMITTALS

A. Contractor to submit the following for the Authority's review and approval according to Division 01 Section, "Submittals":

B. Drawings: If not provided by the Authority or the Authority's consultant, the Contractor shall provide drawings for the Authority's review and approval; drawn to scale by a licensed Architect and/or Engineer (to be submitted for permit if required by the city) including, but not exclusive of the following:

1. Site plan indicating locations of all temporary facilities for each phase of the work. Site plan to show existing conditions; proposed temporary facilities including buildings; structures; platforms; canopies; parking areas, drives, walks, stairs, ramps, bus loading areas and other pavements; fencing; barricades; utilities and other site conditions.

a. Site plan to indicate all existing facilities to remain including tracks, buildings pavements and other fixed elements. Show and locate all existing utilities above ground and buried.
b. Site plan to indicate any required demolition of existing site elements; materials to be salvaged and materials to be disposed of.

2. Floor plans of temporary buildings, structures, enclosures and platforms.
3. Elevations of all buildings and structures.
4. Wall sections and details of structures and facilities.
5. Signage and graphics (size, locations, etc.)
6. Electrical and lighting plans and details.
7. Plumbing and mechanical plans and details.
8. Communication, fire and safety equipment and details.
9. Fare control equipment.
10. Equipment and furnishings provided.
11. Customer assistant kiosk and supervisor's booth.
12. Benches, trash cans, sand boxes, gap filler, bicycle rack, wind breaks or shelters.
13. Schedules for doors, hardware, finishes, light fixtures, etc.
14. Shop drawings to indicate all dimensions and details for construction of temporary facilities.
15. Shop drawings to indicate all materials to be used for construction and all exterior and interior finish materials.
16. Shop drawings, details and product data for kiosk and supervisor's booth layout, materials and construction.

C. Structural Drawings and Calculations:

1. Structural drawings and calculations by a structural engineer licensed in the State of Illinois indicating support and structure of the temporary facilities including foundations, piers, beams, floor, wall and roof construction.

    a. Include any required structural concrete work including foundations, slabs, and walls.
    b. Include any required structural steel framing or supports required for the temporary facilities.
    c. Include wood structure, framing, panels and trim for buildings, stairs, platforms, canopies, kiosk and other elements.

D. Bridge Submittals:

1. Design Calculations and Design Drawings: The contractor shall submit to the Authority six sets of design calculations and six sets of design drawings of the bridge. The calculations and drawings shall be prepared and sealed by a licensed Illinois Structural Engineer.

2. Shop Drawings: Prior to fabrication, the Contractor shall submit shop drawings for fabrication and erection prepared by a qualified detailer. The shop drawings shall indicate all member materials, sizes, connections, and other details for the bridge. The shop drawings shall also include the Contractor's proposed staging or procedure for installing and removing the bridge. The Contractor shall review all shop drawings and verify all dimensions and procedures. The Contractor shall submit shop drawings to the Authority for Engineer's review. Fabrication shall not commence until approval is received from the Authority. The Authority's approval of the shop drawings in no way shall relieve the Contractor of responsibility for erectability, fabrication and fit in the field.
3. Existing Platform: Contractor shall submit to the Authority calculations prepared and sealed by a licensed Illinois Structural Engineer showing that the existing platform and foundation is adequate to carry any loads from the temporary bridge.

E. Temporary Utilities: Submit reports of tests, inspections, meter readings and similar procedures performed on temporary utilities.

1. Implementation and Termination Schedule: Submit a schedule indicating implementation and termination of each temporary utility within 21 days of the date established for commencement of the work.

F. Provide submittals for all materials and equipment to be used and provided for the temporary facilities. Submittals to include product data, specifications, installation instructions, maintenance instructions, operation instructions, shop drawings and other information for each material, product and equipment to be utilized for the temporary facilities. The materials and equipment submittals are to be provided for include, but are not exclusive of, the following:

1. Roofing for temporary facilities, waterproofing, flashing and sealants.
2. Windows, glazing, doors, frames and door hardware.
3. Painting and finishes.
4. Graphics, signage.
5. Rotogates.
6. Louvers, vents.
7. Wire mesh panels and frames, fencing, barriers.
8. Toilet accessories, lockers and storage cabinets.
9. Plumbing fixtures and piping.
10. Heating, ventilating, air conditioning and heat tracing equipment and systems.

11. Electrical service, wiring, fixtures, lighting.
12. Communication systems, wiring, conduit, speakers, phones, cameras, video screens.
13. Earthwork required for providing and installing temporary facilities.
14. Concrete and bituminous pavements, curbs and gutters.
15. Landscaping.
16. Wood treatment data.

G. Provide samples as requested by the Authority for individual items and for colors and finishes to be selected by the Authority.

1.06 QUALITY ASSURANCE

A. Regulations: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction, including but not limited to:

1. Building code requirements.
2. Fire code regulations.
3. ADA requirements.
4. Health and safety regulations.
5. Utility company regulations.
6. Police, fire department and rescue squad regulations.
7. Environmental protection regulations.
8. Local regulations for construction site cleanliness, including Chapter 7-28 of the Municipal Code of Chicago.
9. Local regulations for closure of lanes and streets from traffic.
10. Local regulations for closure of sidewalks to pedestrian traffic.

B. Standards: Comply with NFPA Code 241, "Building Construction and Demolition Operations", ANSI A 10 Series standards for "Safety Requirements for Construction and Demolition", and NECA Electrical Design Library "Temporary Electrical Facilities".

1. Refer to "Guidelines for Bid Conditions for Temporary Job Utilities and Services", prepared jointly by AGC and ASC, for industry recommendations.
2. Electrical Service: Comply with NEMA, NECA and UL standards and regulations for temporary electrical service. Install service in compliance with National Electric Code (NFPA 70) and Chicago Electrical Code.

C. Inspections: Arrange for authorities having jurisdiction to inspect the temporary facility construction and inspect and test each temporary utility before use. Obtain required certifications and permits.

D. All work for temporary facilities shall be performed by tradesmen licensed and experienced to perform the specific type of work required and the work shall be performed according to industry standards, irregardless of their temporary status.

E. Requirements: All temporary facilities must be designed and constructed to provide facilities with the following characteristics:

1. Meet all applicable codes.
2. Meet the Authority’s Design Criteria and design standards.
3. Must be durable and able to withstand all conditions at least for the time period the facilities are required to be used.
4. Must be safe for passengers and employees. Maintain clear and sufficient exits.
5. Must be watertight, waterproof and windproof. Seal all openings.

6. There shall be no tripping hazards or gaps. Ramp and/or cover transitions in floor levels.
7. There shall be no slippery conditions when dry or wet. Provide adequate water management and positive drainage. Slope pavements, platforms, floors and other surfaces to drain. Eliminate conditions that may cause the formation of ice. Provide new drains as required.
8. Provide overlaps at roof panels, roof overhangs and gutters and downspouts to eliminate water migration and protection from the rain for passengers.
9. There shall be no projections, protrusions, sharp edges or gaps that may cause personal injury. Cover any protruding bolts or similar protrusions.
10. Provide sufficient lighting at all areas. Provide lighting at and around scaffolding and barriers.
11. Maintain exit lights, emergency lighting and fire extinguishers.
12. All electrical shall be grounded.
13. Security: Avoid the creation of obstructed areas or areas hidden from view that may invite dangerous or unsafe conditions for passengers. All entrances should be able to be secured when necessary. Secure paid areas of the station house from unpaid areas. Exit doors, gates and panic hardware shall be equipped to prevent illegal or unauthorized entry.
14. Provide enclosures for protection from the elements including rain, snow, wind and cold. Provide doors to stationhouses and other enclosures unless approved otherwise by the Authority.
15. Must be operational and functional for its intended purpose.

1.07 PROJECT CONDITIONS

A. Drawings: Drawings for the temporary facilities including layout of the site and construction details may be included with the Project Documents for the overall project, may be presented as a separate project or may be the responsibility of this Contractor. In all cases, the Contractor must submit shop drawings as a part of the submittal process.

B. Permits: The Contractor is required to obtain and pay for a permit for all his work, including the work for the temporary facilities if required by the City. The Contractor must also obtain any other approvals such as for closing walks or streets, and pay all required fees. All work must conform to all applicable codes and regulations including building codes, fire codes and ADA unless a written waiver is received, with copy to the Authority, by the governing authority due to the temporary nature of the facilities.

C. Contractor shall notify the utilities that will be affected and the required governmental agencies, building departments and offices of Underground of the temporary facility construction. Upon execution of the contract, the Contractor shall meet with and advise the Office of Underground Coordination and the utilities of the start of construction and verify and coordinate with the utilities any conditions of conflict or interference.

D. Temporary Utilities: Prepare a schedule indicating dates for implementation and termination of each temporary utility. At the earliest feasible time, when acceptable to the Authority, change over from use of temporary service to use of the permanent service.

1. It is hereby understood by the Contractor that no use will be made whatsoever of the existing utilities at the site for the Contractor's own use or use in connection with the work, including electric power, lighting, gas, water, sewers and toilet facilities.

E. Conditions of Use: Keep temporary facilities clean and neat in appearance. Operate in a safe and efficient manner. Take necessary fire prevention measures. Monitor temporary utility conditions and connections. Do not overload facilities or permit them to interfere

with progress. Do not allow hazardous, dangerous or unsanitary conditions, or public nuisances to develop or persist on the site.

F. Contractor for the temporary facilities shall coordinate all work with the Authority. All work shall be scheduled with the Authority and interfaced with the work for the permanent facilities. Unless approved in writing otherwise, there shall be no disruption to service.

1.08 WARRANTY

A. All materials and labor provided for temporary facilities shall be warrantied for the amount of time that the temporary facilities are expected to be required for use and until the permanent facilities are available; or one year minimum.

B. Repair or replace temporary facilities as required during the warranty period to the satisfaction of the Authority and at no cost to the Authority.

PART 2 PRODUCTS

2.01 GENERAL

A. General: Provide new materials. If acceptable to the Authority, undamaged previously used materials in serviceable condition may be used with the Authority's written permission. Provide materials suitable for the use intended.

B. Unless indicated otherwise, all materials required to construct and complete all temporary facilities shall be as specified in the respective specification sections of the Authority's master specifications.

2.02 GALVANIZED STEEL FRAMING MATERIALS

A. General: Select size and gage of framing members and establish spacing to comply with requirements of ASTM C 754 and actual design loads for maximum span and spacing, unless otherwise specifically indicated.

1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal, unless otherwise indicated.
2. Protective Coating: ASTM A 653, G60 hot-dip galvanized zinc coating.

B. Cold-Formed Steel Framing Design Standards:

1. Floor and Roof Systems: AISI S210.
2. Wall Studs: AISI S211.
3. Headers: AISI S212.
4. Lateral Design: AISI S213.

C. AISI Specifications and Standards: Unless more stringent requirements are indicated, comply with AISI S100 and AISI S200.

D. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

E. Minimum Base-Metal Thickness of framing members: 14 gauge or 0.0677 inch.

F. Size of runners and vertical members as shown on the drawings, unless noted otherwise or otherwise required structurally for actual conditions, loads or unsupported length.

G. Steel framing materials to be secured to substrates and to each other with stainless steel or galvanized screws and anchors of type, size and length required for the actual application and conditions.

H. Steel Studs and Runners: ASTM C 645, with flange edges of studs bent back 90 degrees and doubled over to form 3/16-inch wide minimum lip (return), and complying with the SSMA (Steel Stud Manufacturers Association) requirements for minimum thickness or gauge of base (uncoated) metal, width, spacing and limiting heights, braced or non-braced, based on using with 5/8" thick Gypsum board panels and 5 psf load perpendicular to partition or furring with an allowable detection of L/360.

1. Stud System Accessories: Provide stud manufacturer's standard clips, shoes, ties, reinforcements, fasteners and other accessories as needed for a complete stud system.

    a. Steel Channel Bridging: Cold-rolled steel, 0.0677-inch minimum thickness of base (uncoated) metal and 7/16-inch wide flanges, 1-1/2 inches deep, 475 lb/1000 feet, unless otherwise indicated.
    b. Steel Flat Strap and Backing Plate: Steel sheet for blocking and bracing complying with ASTM A 653 or ASTM A 568, length and width as indicated, and with a minimum base metal (uncoated) thickness as follows:

2. Thickness: 0.0677 inch where indicated.

I. Steel Joists, Rafters and Framing: C – Channel sections, hot dip galvanized. Size, gauge or thickness, spacing as indicated on the drawings for the specific loading and spans without exceeding a deflection of 1/360 of the span.

1. Minimum Gauge: 14.
2. Stiffeners, bridging and accessories as shown, required or recommended by the manufacturer.

J. Framing Accessories: Fabricate steel-framing accessories from steel sheet, ASTM A 1003, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

1. Supplementary framing.
2. Bracing, bridging, and solid blocking.
3. Web stiffeners.
4. Anchor clips.
5. End clips.
6. Foundation clips.
7. Gusset plates.
8. Stud kickers and knee braces.
9. Joist hangers and end closures.
10. Hole reinforcing plates.
11. Backer plates.

K. Anchors, Clips and Fasteners:

1. Fasteners for Metal Framing: Provide fasteners of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel framing and furring members securely to substrates involved; complying with the recommendations of gypsum board manufacturers for applications indicated.
2. Anchor Bolts: ASTM F 1554, threaded carbon-steel and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153, Class C.
3. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E 488 conducted by a qualified testing agency.
4. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.
5. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.

    a. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

2.03 LUMBER AND PLYWOOD

A. General: Review the Summary of Work to determine if the lumber and plywood specified for each application must be pressure treated, fire treated or not treated. Comply with the requirements of the individual applicable wood specification section.

1. Where fire treated wood is specified, provide as a minimum UL labeled, fire-treated lumber and plywood for framing, sheathing and siding.
2. For signs and directory boards, provide exterior type, Grade B-B High Density Concrete Form Overlay Plywood conforming to PS-1, of sizes and thickness indicated.
3. For fences and vision barriers, provide exterior type 3/8" minimum thick plywood.
4. For safety barriers, sidewalk bridges and similar uses, provide a 5/8" minimum thick exterior plywood.
5. Review the Summary of Work to determine which wood is to be primed and painted, stained and varnished, sealed with a clear sealer or left unfinished.

B. Pressure Treated Wood: When specified, pressure treatment shall comply with applicable requirements of AWPA Standards C2 (Lumber) and C9 (Plywood).

1. All lumber shall be treated in accordance with the American Society of State Highway and Transportation Officials (AASHTO) M 133-10 Standard Specification for Preservatives and Pressure Treatment Processes for Timber. Treatment shall meet applicable AWPA Standards T1-12 and U1-12.
2. Pressure treat above ground items with Micronized Copper Azole (MCA) preservatives to comply with AWPB LP-2 to a minimum retention as specified in ICC-ES and AC 326.
3. Micronized copper azole treatment shall comply with the requirements of the International Code Council – Evaluation Service (ICC-ES) and AC-326 Acceptance Criteria for Proprietary Wood Preservative Systems – Common Requirements for Treatment Process Test Methods and Performance including Appendix A.

4. After treatment, kiln-dry lumber again to a maximum moisture content of 19 percent. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.
5. Complete fabrication of treated items prior to treatment, where possible. All boards milled (i.e. for tactile edging or expansion joint cover), cut or drilled for any reason after pressure treatment shall have the milled, cut, or drilled surface sealed and coated per AWPA M4.
6. Identify pressure treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.
7. Treated wood shall not contain arsenic or chromium; shall not be toxic and shall afford long term protection from rot, decay and termite infestation.

C. Fire Retardant Treatment: Decking and lumber specified to be pressure treated with fire retardant chemicals must also be approved for exterior applications. Fire retardant treatment shall comply with applicable requirements of AWPA Standard C20.

1. Fire treated wood must meet the surface burning characteristics of one of the following tunnel test: UL 723, ASTM E84, NFPA 255 or UBC Standard 8-1. The fire treated wood must have an acceptable rating for flame spread and smoke development after 10 minutes and show no progressive combustion when the test period is extended to 30 minutes.
2. Fire retardant lumber shall have a flame spread rating of 25 or less when tested in accordance with ASTM E-84, “Standard Test Method for Surface Burning Characteristics of Building Materials.”
3. Each piece of fire retardant treated lumber shall be manufactured under independent third party inspection service, and shall bear the appropriate qualified inspection agency’s label indicating surface burning characteristics in the 30 minute ASTM E-84 flame spread test. Each piece to also be labeled indicating kiln dried after treatment (KDAT).
4. There shall be no increase in the listed classification when tested after ASTM D-2898 “Standard Method of Accelerated Weathering of Fire Retardant Treated Wood for Fire Testing.”
5. Identify fire retardant treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.
6. Pressure treat all lumber with exterior type, non-leachable fire retardant chemicals.
7. The fire retardant formulation must be free of halogens, sulfates, chlorides, or ammonium phosphate.
8. Fire Retardant Products:

    a. Exterior Fire-X by Hoover Treated Wood Products, Inc.
    b. FRX chemicals manufactured by Chemco Acquistion.
    c. Or approved equal.

9. Complete fabrication of treated items prior to fire retardant treatment, where possible. If cut after treatment, coat cut surfaces to comply with AWPA requirements. Do not rip or mill fire retardant lumber; limit cutting to end cuts, drilling holes and joining cuts.
10. All exterior fire retardant treated wood shall be kiln dried after treatment to a moisture content of 19% for lumber and 15% for plywood. Kiln drying after treatment shall be monitored by manufacturer of fire retardant product or their designated inspection representative. Inspect each piece of lumber after drying and discard damaged or defective pieces.

2.04 CORRUGATED METAL PANELS

A. Corrugated Metal Panels, General: Manufacturer's standard factory-formed lap-seam panel system designed for mechanical attachment of panels to roof framing using concealed clips and sealants. Form panels of minimum 20-gage zinc-coated steel sheets. Roof panels shall be continuous lengths without lap seams.

1. Galvanized and Shop Primed Steel Sheet: ASTM A 653, Structural Steel Grade 33 minimum; ASTM A 924 G90 zinc coating; cleaned, pretreated, and painted in accordance with deck and coating manufacturers' recommendations.
2. Design Uncoated Steel Thickness: 20 gauge or as required for design loading.
3. Span Condition: Single Span.
4. Side laps: Deck shall have full-depth side laps that can be mechanically fastened together.
5. Edges must be able to receive trim pieces; trim pieces by panel manufacturer.
6. Rating: UL Classified 90 rated (wind uplift) panel assembly.
7. Flashing and Trim: 22 ga, galvanized and finished to match panels.
8. Fasteners: Manufacturer's standard to obtain the required performance, stainless steel, finish to match panels.

B. B Corrugated Metal Panels:

1. Panel width: 36 inches.
2. Panel profile: Corrugated.
3. Texture: Smooth.
4. Galvanized and Shop Primed Steel Sheet: ASTM A 653, Structural Steel Grade 33 minimum; ASTM A 924 G90 zinc coating; cleaned, pretreated, and painted in accordance with deck and coating manufacturers' recommendations.
5. Texture: Smooth.
6. Panel Dimension: Manufacturer's standard.
7. Design Uncoated Steel Thickness: 20 gauge or as required for design loading.
8. Span Condition: Single Span.
9. Side laps: Deck shall have full-depth side laps that can be mechanically fastened together.
10. Edges must be able to receive trim pieces; trim pieces by panel manufacturer.
11. Rating: UL Classified 90 rated (wind uplift) panel assembly.
12. Roof Flashing and Trim: 22 ga, galvanized and finished to match panels.
13. Fasteners: Manufacturer's standard to obtain the required performance, stainless steel or galvanized metal with finish to match panels; as selected by the Authority.
14. Panels to be Corrugated or Sinewave; 2.5 inch or 2.67 inch by ¾ inch.

2.05 ROOFING MATERIALS

A. Roofing Materials: Provide the following as indicated in the Summary of Work, as indicated on the drawings or as approved in writing by the Authority:

1. Provide minimum UL Class "A" standard weight asphalt shingles complying with ASTM D 3018.
2. Provide UL Class "C" mineral surfaced roll roofing complying with ASTM D 249 on roofs of job-built temporary facilities.
3. Provide EDPM single ply roofing.
4. Provide galvanized metal corrugated roofing panel system.
5. Provide pre-finished metal roof panel system.

2.06 GLAZING MATERIALS

A. Polycarbonate Glazing:

1. Thickness: 1/4 inch nominal thickness (0.236 inch actual) unless noted otherwise.
2. Type: With UV and abrasion or mar-resistant coating on both sides similar to GE Lexan “Margard” MR-10, and (unless noted otherwise) with “HPW Nu-View” 0.10" thick laminate on both sides, or approved equals. Laminate and adhesives to be formulated for exterior applications. Laminate may be in lieu of sacrificial film upon approval of the Authority.
3. Polycarbonate shall be glazed using neoprene or polyvinyl chloride “PVC” gaskets as recommended by polycarbonate manufacturer and approved.
4. Polycarbonate shall be guaranteed against breakage, coating failure, increased haze, excessive yellowing, and loss of light transmission for the life of the temporary installation. Polycarbonate failing within that period shall be replaced at no cost.
5. Polycarbonate glazing shall be pre-sized and fitted to allow for thermal expansion and contraction of the glazing material. Follow manufacturer’s recommendations for handling and installing the polycarbonate.

2.07 FINISH MATERIALS

A. Paint: Comply with the requirements of the finish schedule and/ or notes on the drawings as to what materials and which temporary facilities are to be primed and painted, stained and varnished, sealed or left unfinished.

1. For job-built temporary wood enclosures, wood fences or barricades and other exposed lumber and plywood, provide exterior grade acrylic-latex emulsion over exterior primer.
2. For sign panels and applying graphics, provide exterior grade alkyd gloss enamel over exterior primer.
3. Provide two finished coats of paint over primer where specified or required for proper coverage.
4. Prime and paint metal as indicated except galvanized metal is typically left exposed.

2.08 ELECTRICAL

A. Electrical: All electrical per code. All wiring in rigid conduit. Conduit shall be buried in walls and not exposed except as approved and conduit at ceilings may be exposed. Electrical includes devices, connections, connections at the panel, circuit breaker panels and electric service to the facility.

1. Refer to CTA Master Electrical Specification sections for detailed requirements
2. Provide exit lighting and emergency lighting with backup power.
3. Provide interior and exterior lighting according to drawings or per the Design Criteria and power for outlets and equipment as shown required or per code.
4. Lighting that has been obscured/blocked by temporary enclosures shall be improved with additional temporary lighting located on the affected side of the enclosure. Install on the building walls or on poles.

2.09 FENCING

A. Chain Link Fencing:

1. Fence Fabric: Zinc coating in accordance with ASTM A 392, Type II, Class 2, 2.0 oz/sq.ft. Provide 2" diagonal mesh of wire, 0.192 inch diameter with Barber selvage.

2. Posts and Framing Size and Thickness: Posts in accordance with ASTM F 1083 for pipe; framing in accordance with ASTM F 1043, unless indicated otherwise
3. Steel Pipe: ASTM F 1083, Schedule 40, with not less than 1.8 oz./ft2 zinc coating of surface area coated.
4. End, Corner, and Pull Posts: Steel pipe. Minimum 3" O.D. with a .160 wall thickness for fences up to 10" in height.
5. Line and Intermediate Posts: Steel pipe. Size 2 1/2" O.D. with a .130 wall thickness for fences up to 10' in height.
6. Swing Gate Posts: Minimum 2-1/2" O.D. with a .130" wall thickness.
7. Horizontal-Slide Gate Post: Minimum 2-1/2" O.D. with a .130" wall thickness.
8. Horizontal Rails: Steel pipe, 1 5/8" O.D. with a .111 wall thickness. Provide with couplings and fittings for attachment to posts.
9. Gate Frame: 1" diameter pipe.
10. Caps: Caps for posts and rails manufactured from steel or cast iron with hot dipped galvanized finish. Weathertight design for use on top of posts.
11. Tension and Stretcher Bars: One bar for each gate and end post and 2 bars for each corner and pull post. Minimum 1/4" x ¾" flat steel.
12. Stretcher Bar Bands: Galvanized flat steel bar not less than 1/8" x 1" with 3/8" carriage bolt.
13. Brace: Horizontal member approximately 1/3 the height distance from top, secured to posts, at both sides of terminal (pull) posts, corner posts, and at fence side of gate posts. Brace to be 1-5/8" deep channel with 1-1/4" web, 0.0747 thick.
14. Tie Wire: 12 gage with Class 3 zinc coating.
15. Tension Wire, top and bottom: 0.177 inch diameter Type II not less than 2 oz/ sq.ft.of uncoated steel wire surface galvanized with turnbuckles.
16. Truss Rods: One diagonally at ends, two diagonally at gates, steel rod and turnbuckle assembly.
17. Gates: Use 1" diameter steel pipe frame, Schedule 40, assemble gates by welding framing members. Use truss rod cross bracing to prevent sagging. Swing gates to have welded frame corner construction; 5/16 inch diameter adjustable truss rods for panels 5 feet wide or wider.
18. Hardware: Provide operating hardware including hinges, gate latch to accommodate padlock, plunger rod with latch with provision for locking, and foot bolt with keeper for each gate leaf to hold gate in open position. Galvanized finish in accordance with ASTM A 153. Rolling gate mechanism, rollers, latch, stop for sliding gate operation. Latches to permit operation from both sides of gate, hinges and keepers for each gate leaf.
19. Horizontal-Slide Gates: Use Type II cantilever slide, Class I roller assemblies. Welded frame with 5/16 inch diameter adjustable truss rods for panels 5 feet wide or wider. Latches permitting operations from both sides of gate, roller assemblies, hangers, stops, guide roller assemblies and locking devices fabricated from galvanized steel with stainless steel fasteners. Fabricate latches with integral eye openings for padlocking.
20. All metal to be used for chain link fencing, including all posts, fabric, pipes, accessories, wires, etc. to be hot dip galvanized with a minimum zinc coating weight of .90 ounces per square foot hot dip process.

B. Tarpaulins and Screening: Provide water-proof, fire-resistant, UL labeled tarpaulins and screening with flame-spread rating of 15 or less. For temporary enclosures provide translucent nylon reinforced laminated polyethylene or polyvinyl chloride fire retardant tarpaulins.

2.10 EQUIPMENT

A. General: Provide new equipment for temporary facilities except, if acceptable to the Authority, undamaged previously used equipment in serviceable condition may be used. Provide equipment suitable for use intended.

B. Water Hoses: Provide 3/4" heavy-duty, abrasion-resistant, flexible rubber hoses 100 feet long, with pressure rating greater than the maximum pressure of the water distribution system; provide adjustable shutoff nozzles at hose discharge.

C. Electrical Outlets: Provide properly configured NEMA polarized outlets to prevent insertion of 110-120 volt plugs into higher voltage outlets. Provide receptacle outlets equipped with ground fault circuit interrupters, reset button and pilot light, for connection of power tools and equipment. All electric to be grounded.

D. Electrical Power Cords: Provide grounded extension cords; use "hard service" cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords, if single lengths will not reach where construction activities are in progress.

E. Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Temporary facilities to be illuminated in compliance with the Authority's design criteria. Provide guard cages or tempered glass enclosures, where exposed to breakage. Provide exterior rated fixtures where exposed to moisture. Typical light fixtures shall be one foot by 4 foot fluorescent industrial type with acrylic drop lenses, Provide and install exit lighting and emergency lighting.

F. Heating Units: Provide temporary electric heating units that have been tested and labeled by UL, FM or another recognized trade association. No volatile fuels or open flames shall be used.

G. Temporary Toilet Units: Where approved in writing by the Authority, provide and maintain self-contained single-occupant toilet units of the chemical, aerated recirculation or combustion type, properly vented and fully enclosed with a glass fiber reinforced polyester shell or similar non absorbent material.

H. First Aid Supplies: Comply with governing regulations.

I. Fire Extinguishers: Provide hand-carried portable UL-rated, class "A" fire extinguishers for temporary offices and similar spaces. In other locations provide hand-carried, portable, UL-rated, class "ABC" dry chemical extinguishers, or a combination of extinguishers of NFPA recommended classes for the exposures.

    1. Comply with NFPA 10 and 241 for classification, extinguishing agent and size required by location and class of fire exposure.

J. Rotogates and High Barrier Gates: Provide overhead conduit and wiring for data and electric for fare control equipment. Temporary fare control equipment and barrier to be provided and installed by the Authority.

K. Security: Provide cameras and CA call buttons in stationhouses, stair enclosures, access areas, platforms and other areas as required similar to a permanent facility. Verify which equipment is to be supplied by the Authority and which equipment is to be provided by the Contractor. Contractor to provide conduit and wiring, install all equipment and make all connections for cameras, monitors, speakers, phone and signs including floor mounted signs.

1. Refer to CTA Design criteria for security and communications requirements. See respective CTA Master Specification sections for equipment and installation requirements.

L. Signage: Provide and install all signage as shown on the drawings and as required for vehicle operations, wayfinding, directional and informational purposes for operation of the facility. Signage and graphics to be as shown on the drawings and as specified in the specifications. Relocate or replace signage as required as the project progresses.

M. Posting Permits: Provide weather-proof, glass enclosed, outdoor bulletin board near construction office for posting all permits during entire construction period.

PART 3 EXECUTION

3.01 INSTALLATION

A. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve the project adequately and result in minimum interference with performance of the work. Relocate and modify facilities as required.

B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not move or remove totally or partially temporary facilities until the facilities are no longer needed, or are replaced by authorized use of completed permanent facilities.

3.02 TEMPORARY UTILITY INSTALLATION

A. General: Engage the appropriate local utility company to install temporary service or connect to existing service. Where the company provides only part of the service, provide the remainder with matching, compatible materials and equipment; comply with the Company's specifications.

1. Arrange with the company and existing users for a time when service can be interrupted, where necessary, to make connections for temporary services.
2. Provide adequate capacity at each stage of construction. Prior to temporary utility availability, provide trucked-in services.
3. Obtain easements to bring temporary utilities to the site, where the Authority's easements cannot be used for that purpose.

B. Water Service: Install water service and distribution piping of sizes and pressures adequate for temporary facilities until permanent water service and permanent facilities are in use.

1. Sterilization: Sterilize temporary water piping prior to use.

C. Temporary Electric Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics for temporary facilities. Include meters, transformers, overload protected disconnects, automatic ground fault interrupters, generators and main distribution switch gear. Entire electrical system shall be grounded at all times.

1. Power Distribution System: Install wiring where least exposed to damage. Where permitted, wiring circuits not exceeding 125 volts, AC 20 ampere rating and lighting circuits may be non-metallic sheathed cable where overhead and

exposed for surveillance. The circuits installed shall be the minimum number required by building codes.

D. Temporary Lighting: Provide temporary lighting with local switching for temporary facilities including exterior illumination for the site.

1. Install and operate lighting that will fulfill security and protection requirements, without operating the entire system, and will provide adequate illumination for the temporary facilities and exterior areas.

E. Temporary Telephones, Communication, Data and Security: Provide temporary telephone service and other wiring (in conduit) for temporary facilities communication, data and security requirements.

F. Sewers and Drainage: If sewers are available, provide temporary connections to remove effluent that can be discharged lawfully. If sewers are not available or cannot be used, provide containers to remove and dispose of effluent off the site in a lawful manner.

1. Filter out excessive amounts of soil, construction debris, chemicals, oils and similar contaminants that might clog sewers or pollute waterways before discharge.
2. Connect temporary sewers to the municipal system as directed by the sewer department officials.
3. Maintain temporary sewers and drainage facilities in a clean, sanitary condition. Following heavy use, restore normal conditions promptly.

G. Maintain grading of site to drain. Provide, operate, and maintain pumping equipment if required.

1. Protect the site from puddling or running water.

3.03 TEMPORARY FACILITIES CONSTRUCTION AND INSTALLATION

A. Location of Temporary Facilities: Locate temporary facilities and other temporary construction and support facilities where assigned by the Authority.

1. Maintain temporary construction and support facilities until required to be moved, altered or removed for the next phase of the project. Remove the temporary facilities upon final completion of the project or earlier, as approved by the Authority.

B. Combustibility: Provide non-combustible construction for facilities located within the construction area, or within 30 feet of building lines, unless approved otherwise. Comply with requirements of NFPA 241.

C. Collection and Disposal of Waste: Provide for means for collection of waste from temporary facilities on a regular basis.

D. Rodent and Pest Control: Before work begins at any worksite, retain a local exterminator or pest control company to recommend practices to minimize attraction and harboring of rodents, roaches and other pests. Employ this service to perform extermination and control procedures at regular intervals so the project will be relatively free of pests and their residues at Substantial Completion. Perform control operations in a lawful manner using environmentally safe materials.

E. Temporary Stationhouse and Platforms: Locate as shown on drawings, directed by the Authority and as required to provide temporary and safe access for customers and personnel.

3.04 GENERAL

A. Temporary facilities and site shall not create any hazards for passengers and employees. Avoid sharp edges, gaps, projections and protrusions. Avoid tripping hazards. Seal all openings. Provide water management and positive drainage to eliminate ponding of water, slippery walking surfaces and ice.

1. Exposed wood edges shall have smooth rounded edges.

B. All stairs, landings, ramps, platforms, walking surfaces and floor finishes shall be slip resistant with a coefficient of friction of 0.6 or better.

C. Areas encompassing fare control equipment, ticket vending machines, rotogates and similar equipment shall be enclosed, protected from the elements or, at a minimum, under cover.

D. All walls, ceilings and floors at all locations shall be enclosed or sheathed on both sides of its framing with siding, plywood, metal siding, sheet rock or other material unless approved specifically by the Authority.

E. Provide concrete curbs at station house walls and other areas where water infiltration may be an issue or where sufficient slope for drainage cannot be achieved.

3.05 DEMOLITION

A. Perform removal and demolition of existing facilities as shown on the drawings; as required to provide for the installation of the temporary facilities and as approved by the Authority. Salvage existing equipment as directed for use with the temporary facility or to be retained by the Authority. Deliver salvaged materials to the Authority's facility as directed by the Authority. All other materials to be removed from the site and sent to a recycling center or, if not recyclable, disposed of legally.

3.06 TEMPORARY STATIONHOUSE

A. Construct temporary station house facilities to enclose vending, ATM, fare collection, customer assistance, concession, vending, employee washroom, janitor closet, communication closet, electrical closet storage and other facilities for customers and employees.

B. Stationhouse enclosure to provide transition from unpaid to paid areas, access to exits, access to platforms, access to stairs and other facilities for customers and employees.

C. Sanitary facilities include temporary toilets, wash facilities and drinking water fixtures. Comply with regulations and health codes for the type, number, location, operation and maintenance of fixtures and facilities.

1. Temporary Toilet Units: Provide self-contained single-occupant toilet units of the chemical, aerated recirculation or combustion type, properly vented and fully enclosed with a glass fiber reinforced polyester shell or similar non absorbent material.

2. If shown or required, provide a temporary insulated and heated trailer with toilet room as approved by the Authority. Maintain the trailer for the duration of the project.
3. Provide toilet tissue, paper towels, paper cups and similar disposable materials for each facility. Provide covered waste containers for used materials. Service units at least twice weekly.
4. Toilets: Install self-contained toilet units. Shield toilets to ensure privacy.
5. Drinking Water Facilities: Provide containerized tap-dispenser bottled-water type drinking water units, including paper cup supply or provide electric water coolers to maintain dispensed water temperatures at 45 to 55 degree F.

D. Temporary Stationhouse Construction:

1. Stationhouse to be enclosed with wood or metal framed walls and sheathed inside and outside with plywood sheathing or metal panels. Voids to be filled with batt insulation. Provide waterproof membrane.
2. Floor of stationhouse to be concrete or framed with wood and sheathed with plywood. Provide operational floor drains as required; slope concrete floors to drain.
3. Roof of stationhouse to be framed with wood or metal and sheathed with plywood or metal decking. Roofs to be sloped to drain.
4. Stationhouse roof to be protected with felt and asphalt shingles, mineral surfaced roll roofing, EDPM single ply roofing system, corrugated metal panel system or prefinished metal roof panel system.
5. Windows to have wood, aluminum or vinyl frames and be fixed and non-operating unless required otherwise. Doors to be wood with wood frames and with specified hardware including closers, panic hardware, , locksets, and , weatherstripping, Glazing for doors and windows to be polycarbonate as specified herein.
6. All exposed unfinished pressure treated wood and other materials shall be primed and painted unless noted otherwise. Use fire retardant paint where noted or required.
7. Finish floor shall be vinyl tile, sheet goods or epoxy paint as noted on drawings and approved by the Authority. Provide a vinyl base.
8. Provide or construct a customer assistant’s kiosk. See drawings and master specification section for details. If a temporary kiosk is built for this facility, see below for allowable deviations for materials and construction of kiosk.
9. Provide electrical power for equipment, electrical outlets and lighting fixtures. Provide exit lighting and emergency lighting.
10. Provide security cameras, telephone and communication wiring and devices including CA call buttons and speakers; provide required conduit and wiring.
11. Provide fire extinguisher(s). Provide fire alarm panel if required.
12. Provide signage, wayfinding, graphics, braille signage, illuminated signage, information boards and digital messaging boards as shown, required and approved.
13. Provide approved trash cans.
14. Provide electric and data for fare control equipment. Provide and install turnstiles, high barrier gates, barricades and gates.
15. If a washroom is provided; provide toilet, lavatory, mirror and shelf, electric hand dryer, toilet accessories, grab bars, etc.
16. Provide a janitors closet with mop basin and hot water heater.
17. Make all required utility connections per code including water, sewer, electric, communication and data.
18. Stationhouse structure to be supported as indicated on the drawings and approved by the Authority. Use concrete foundations, concrete piers, concrete slab on grade, concrete curbs, steel beams, wood beams or other structural

support. Structural support shall be designed by a structural engineer licensed in the State of Illinois who shall provide sealed shop drawings and calculations. Structure shall be sufficient for the loads and other conditions per code and as specified for the duration of the stationhouse use.

19. Provide and connect floor drains at stationhouse floor.
20. Provide infrared heaters where shown and provide power for the heaters as required.
21. Manage stationhouse roof drainage with gutters and downspouts. Roof drainage to be galvanized metal or prefinished metal. Downspout to drain to sewer or ballasted area if approved by the Authority and code. .
22. Provide bike racks as directed by the Authority.

E. Temporary Kiosk or Supervisor's Booth:

1. The walls, floor, ceiling and roof to be of wood framing or light metal framing. Interior and exterior surfaces to be of exterior plywood, prefinished plywood, corrugated metal panels or flush metal panels as approved by the Authority. The operating windows and fixed glazing to have vinyl, wood or metal frames as approved by the Authority.. The glazing for doors, operating windows and fixed windows to be tempered glass, laminated glass or polycarbonate as approved by the Authority. The cabinets and counters to be constructed of wood and laminate or stainless steel. Other deviations as approved by the Authority. All kiosks and booths shall have a heater and air conditioner unless approved otherwise. The wood and other unfinished materials for the temporary kiosk or booth shall be primed and painted, the walls and ceiling shall be insulated, If exposed to the exterior, the roof of the kiosk or booth shall have fully adhered EPDM roof membrane and flashing, prefinished galvanized metal gutter, downspout and fascia. Floor of kiosk or booth shall have a plywood subfloor with a finish floor of vinyl tile, sheet goods or epoxy paint as noted on drawings and approved by the Authority. Provide a vinyl base. The door and frame shall be hollow metal and primed and painted. The sliding windows shall be lockable. The door shall have all required hardware including closer and cylinder lock. Provide electrical for the kiosk or booth including outlets, 1' x 4' fluorescent light fixtures, conduit, wiring, devices and all connections. Provide conduit and wiring for electrical, communication, security and data. Provide chairs, trash cans and other furniture and fixtures.

F. Temporary Offices or Classrooms:

1. Provide temporary offices or classrooms with heating, air conditioning and adequate number of operating screened windows; hollow metal frames and doors with cylinder locks, closers and other hardware; electric lights and outlets; communication, security and data; all as directed by the Authority. Size and other details as directed by the Authority.

    a. Contractor's Office: Provide and maintain in neat and serviceable condition, a temporary construction office as headquarters for conduct of work. The office shall include a conference room for meetings with the Contractor, Subcontractors, and authorized CTA Representatives.

3.07 TEMPORARY STAIR ENCLOSURE

A. Construct temporary stair enclosure where shown on the drawings to enclose transition and access from grade to stationhouse, from station house to platform, access to stairs, access to exits, access to platforms and other facilities for customers and employees.

B. Temporary Stair Enclosure Construction:

1. Enclosure to be similar to temporary stationhouse enclosure unless shown otherwise.
2. Floor and roof of stair enclosure to be similar to floor and roof of temporary stationhouse enclosure unless shown otherwise. .
3. Windows and doors of stair enclosure to be similar to the windows and doors used for the temporary stationhouse.
4. All exposed unfinished wood and other materials shall be primed and painted unless noted otherwise. Use fire retardant paint where noted or required.
5. Finish floor at stair landings shall be sheet goods or tactile tile for slip resistance as required by code, noted on drawings and approved by the Authority. Stair treads to have non slip metal treads secured to the wood treads.
6. Provide electrical power for electrical outlets and lighting fixtures. Provide exit lighting and emergency lighting.
7. Provide security cameras and wiring as shown on the drawings. Provide CA button and wiring as shown on the drawings. Provide speakers for communication as shown on the drawings.
8. Provide fire extinguisher(s).
9. Provide signage, wayfinding, graphics, braille signage, information boards and digital messaging boards as shown, required and approved.
10. Provide approved trash cans.
11. Provide and install turnstiles, high barrier gates, barricades and gates.
12. Make all required utility connections per code including electric, communication and data.
13. Stair enclosure structure to be supported as indicated on the drawings and approved by the Authority. Use concrete foundations, concrete piers, concrete slab on grade, concrete curbs, steel beams, wood beams or other structural support. Structural support shall be designed by a structural engineer licensed in the State of Illinois who shall provide sealed shop drawings and calculations. Structure shall be sufficient for the loads and other conditions per code for the duration of the stair enclosure use.
14. Provide and connect floor drains at all enclosed spaces.
15. Manage stair enclosure roof drainage with gutters and downspouts unless approved otherwise.. Roof drainage to be galvanized metal or prefinished metal. Downspout to drain to sewer or to ballasted area if approved by the Authority and code.

3.08 TEMPORARY STAIRS AND RAMPS

A. Construct temporary stairs and ramps as shown and as required for access to stationhouse, access to platform, access to exits and other locations. All stairs and ramps to be constructed to meet code. Stair and ramp assemblies include treads, risers, landings, platforms, railings and all required stringers, framing and support.

B. Temporary Stair and ramp construction:

1. Temporary stair assemblies to be constructed of wood framing with lateral bracing supporting temporary wood stairs, landings, deck and stair enclosure, as applicable.. Ramp assemblies to also be constructed of wood unless shown to be of paving or other material. Railings to be wood or metal attached to walls with metal brackets or supported with wood vertical and horizontal framing and supports as detailed on the drawings.
2. If specified, temporary stair and railing assemblies to be of prefabricated metal construction. Provide shop drawings for specific construction details and dimensions for each location.

3. Wood stairs, landings and platforms are not to be painted unless specified otherwise. Unfinished wood stairs, landings and platforms are to be sealed.. Wood handrails to be stained and varnished. Metal railings to be stainless steel unless approved otherwise. If wood or metal is required to be primed and painted, use fire retardant paint where noted or required for stair assemblies.
4. Finish floor at ramps or stair landings shall be exposed wood, sheet goods or tactile tile for slip resistance as required by code, noted on drawings and approved by the Authority. Stair treads to have removable non slip aluminum metal treads secured to the wood treads.
5. Provide electrical power for lighting fixtures. Provide exit lighting and emergency lighting. Lighting to be installed on wood poles, on adjacent walls or secured to canopy ceiling, if applicable.
6. At stair and ramp areas, provide security cameras and wiring as shown on the drawings, CA call button and wiring as shown on the drawings, and speakers for communication as shown on the drawings; secured to wood poles, on adjacent walls or secured to canopy ceiling, if applicable.
7. Provide fire extinguisher(s) where shown.
8. Provide signage, wayfinding, graphics, braille signage, information boards and digital messaging boards as shown, required and approved.
9. Where shown, as a part of the stair or ramp system, partial height walls are to be framed with wood and sheathed with plywood and have a wood cap.
10. Stair and ramp structure to be supported as indicated on the drawings and approved by the Authority. Use concrete foundations, concrete piers, concrete slab on grade, concrete, steel beams, wood posts and beams or other structural support. Structural support shall be designed by a structural engineer licensed in the State of Illinois who shall provide sealed shop drawings and calculations. Structure shall be sufficient for the loads and other conditions per code for the duration of the stair and ramp system use.
11. Provide floor drains or trench drains where required for water management.

3.09 TEMPORARY PLATFORMS

A. Construct temporary platforms as shown on the drawings as required for passenger access to the system and as approved by the Authority.

B. Temporary Platform construction:

1. Temporary platform to be constructed of wood unless shown otherwise. Supports, framing, sleepers and decking to be of wood of type indicated on the drawings with galvanized metal fasteners. Platform decking to be 2” x 6” unless indicated otherwise. Provide expansion joints as required using aluminum metal expansion joint covers.
2. All exposed unfinished wood and decking for platform shall remain unfinished unless individual materials are indicated to be sealed or primed and painted. Use fire retardant paint where noted or required.
3. Provide blue tactile edge at platform edges, except at the stopping location of the first car of the longest train operated at the station, where a yellow tactile tile will be installed.
4. Provide wood rails and guardrails where shown or required.
5. Provide wood posts secured to the platform and guardrail system to support signage, light fixtures, speakers and other equipment. Posts may also be for canopy support.
6. Provide electrical power for electrical outlets and lighting fixtures. Provide exit lighting and emergency lighting as shown on the drawings and as required by code..

7. Provide security cameras, telephone and communication wiring and devices including CA call buttons and speakers.
8. Provide fire extinguisher(s).
9. Provide signage, wayfinding, graphics, braille signage, information boards and digital messaging boards as shown, required and approved.
10. Provide approved trash cans.
11. Provide gap filler and enclosure. .
12. Provide two sand boxes per platform.
13. Provide three benches per platform.
14. Provide two windbreaks per platform.
15. Provide and install turnstiles, high barrier gates, barricades and gates where shown and required.
16. Make all required utility connections per code including electric, communication and data.
17. Platform structure to be supported as indicated on the drawings and approved by the Authority. Use concrete foundations, concrete piers, concrete slab on grade, steel beams, wood beams or other structural support. Structural support shall be designed by a structural engineer licensed in the State of Illinois who shall provide sealed shop drawings and calculations. Structure shall be sufficient for the loads and other conditions per code for the duration of the platform use.
18. Platforms to be sloped to shed water and avoid slippery conditions.
19. Provide infrared heaters at windbreaks or where shown and provide power for the heaters as required.
20. Provide or construct a supervisor's booth. See drawings and master specification section for details. If a temporary booth is built for this facility, see above for allowable deviations for materials and construction of the booth.

3.10 TEMPORARY CANOPIES

A. Construct temporary canopies as shown on the drawings and as required to protect passengers on platforms, stairs, ramps and other areas.

B. Temporary Canopy construction:

1. Canopies to be constructed of wood. Supports, posts, framing and decking to be of wood.
2. Canopy roof to be framed with wood and sheathed with plywood or metal decking.
3. Canopy roof to be protected with felt and asphalt shingles, mineral surfaced roll roofing, EDPM single ply roofing system, corrugated metal panel system or prefinished metal roof panel system; as approved by the Authority..
4. All exposed unfinished wood for canopies to be sealed or primed and painted unless indicated otherwise. Use fire retardant paint where noted or required.
5. Provide wood rails and guardrails where shown or required as part of canopy support system.
6. Wood posts for canopies shall be secured to the platform and guardrail system and may also be used to support signage, light fixtures, speakers and other equipment. Verify other structural considerations for posts including loadings and design details.
7. Provide electrical power for electrical outlets and lighting fixtures located at the canopy ceiling. Provide exit lighting and emergency lighting attached to the canopy system.
8. Provide security cameras, telephone and communication wiring and devices including CA call buttons and speakers attached to the canopy system.
9. Provide fire extinguisher(s).

10. Provide signage, wayfinding, graphics, braille signage, information boards and digital messaging boards as shown, required and approved to be attached to the canopy system.
11. Make all required utility connections per code including electric, communication and data.
12. Canopy to require roof drainage including gutters and downspouts unless shown otherwise.. Roof drainage to be galvanized metal or prefinished metal. Downspout to drain to sewer or ballasted area as shown on the drawings.
13. Canopy structure to be supported as indicated on the drawings and approved by the Authority. Use concrete foundations, concrete piers, concrete slab on grade, concrete curbs, steel beams, wood beams or other structural support. Structural support shall be designed by a structural engineer licensed in the State of Illinois who shall provide sealed shop drawings and calculations. Structure shall be sufficient for the loads and other conditions per code for the duration of the platform use.
14. Provide infrared heaters where shown and provide power for the heaters as required.

3.11 TEMPORARY BRIDGES

A. Temporary pedestrian bridges shall be ten (10) feet wide unless shown or approved otherwise by the Authority.

B. Vehicular and Pedestrian Traffic: Vehicular traffic shall be maintained at all times. The existing vertical clearance shall not be reduced by the temporary bridge.

C. Protection of Platforms: There shall be no damage whatsoever to the new platform by the temporary bridge.

D. End of Bridge Ramp: At each end of the bridge there shall be a ramp carrying passengers from the raised bridge to the platform. No stairs will be permitted. The ramp must meet the ADA requirement for slope rate.

3.12 TEMPORARY PAVEMENTS, FENCING, SIGNAGE AND SITE WORK

A. Construct temporary pavements as shown on the drawings and as required for passenger access to the system, bus loading, traffic control, pedestrian traffic and other requirements.

B. Provide fencing for security, protection and access control as shown and required.

1. Provide and install precast reinforced concrete jersey barriers where shown or required for traffic control, security and safety.

C. Temporary Pavements and Site Work construction:

1. Temporary pavements to consist of concrete or asphalt and include roadways, sidewalks, curbs and gutters, ADA ramps, curbs to support walls, piers, posts and other surfaces.
2. All pavements to have compacted granular stone base.
3. Provide 4” wide thermoplastic pavement marking where shown or required; provide universal symbol for handicap parking.
4. Provide fencing, gates and hardware where shown to enclose the site and areas within the site. Unless indicated otherwise, fence and gates to be constructed of galvanized chain link ¼” open mesh fencing with galvanized steel posts and cross members. Height as shown on the drawings. Hardware for gates to consist

of hinges, closers, pulls, and locks. Fence posts shall be set into concrete piers or set into a compacted mixture of gravel and earth as directed by the Authority.

5. Provide bollards where shown or required. Bollards to be galvanized steel, filled with concrete and set into concrete.
6. Provide drip pans under the structure where shown or required to protect customers and pedestrians. Drip pans to be of galvanized corrugated steel unless indicated otherwise. Provide galvanized gutters and downspouts where necessary for water management.
7. Provide signage for way-finding, directions and information where shown or required within the temporary project site. Signage to be secured to structures or secured to wood or metal posts set into the ground. Provide illuminated station identifier signage and other illuminated signage as shown or required; location, type, size and graphics as required and approved by the Authority.
8. Provide exterior lighting as shown or required. Exterior light fixtures to be secured to buildings and other structures or to wood or metal posts set into concrete piers in the ground.
9. All pavements to slope for drainage and to avoid ponding of water, the formation of ice and slippery conditions. Provide exterior drains and catch basins to underground sewers where shown or required.
10. Provide precast or poured in place concrete pads for transformers and other equipment.
11. Provide approved trash cans.
12. Provide bike racks.
13. Provide benches.
14. Provide windbreak.
15. Provide heaters.
16. Make all required utility connections per code including electric, communication, water and sewer.

3.13 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Except for use of permanent fire protection as soon as available, do not change over from use of temporary security and protection facilities to permanent facilities until Substantial Completion, or longer as requested by the Authority.

B. Temporary Fire Protection: Until fire protection needs are supplied by permanent facilities, install and maintain temporary fire protection facilities of the types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 10 "Standard for Portable Fire Extinguishers", and NFPA 241 "Standard for Safeguarding Construction, Alterations and Demolition Operations".

1. Locate fire extinguishers where convenient and effective for their intended purpose.
2. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways and other access routes for fighting fires. Prohibit smoking in hazardous fire exposure areas.

C. Barricades, Warning Signs and Lights: Comply with standards and code requirements for erection of structurally adequate barricades. Paint with appropriate colors, graphics and warning signs to inform personnel and the public of the hazard being protected against. Where appropriate and needed provide lighting, including flashing red or amber lights.

1. Precast reinforced concrete barriers or approved fencing shall be provided to separate restricted work-hour area from the unrestricted work-hour area. The exact location and number of the barriers shall be approved by the Authority. The

materials and installation of the temporary concrete barriers shall be in accordance with Standard 2383-1 of the IDOT Highway Standards.

2. Enclosure fences shall have lockable entrance gates. Locate where indicated, or enclose the entire site or the portion determined sufficient to accommodate construction operations. Install in a manner that will prevent people, dogs and other animals from easily entering the site, except by the entrance gates.
3. Solid Safety Barriers: The Contractor shall build and maintain a solid barrier if the work creates a safety hazard for the public utilizing the temporary facilities.. This barrier should be 8 feet high minimum. The condition of the barrier to be checked on a daily basis and maintained by the Contractor. The Barrier shall be removed upon completion of the Work or as directed by the Authority.

D. Covered Walkway: Erect a structurally adequate protective covered walkway for passage of persons along the adjacent public route adjacent to construction operations. Coordinate with entrance gates, other facilities and obstructions. Comply with regulations of authorities having jurisdiction.

1. Construct using scaffold or shoring framing, waterproofed wood plank overhead decking, protective enclosure walls, handrails, barricades, warning signs, lights, safe and well-drained walkways and similar provisions for protection and safe passage. Paint and maintain in a manner acceptable to the Authority.
2. Install warning lights and alarms to alert pedestrians of vehicles crossing temporary passage ways.

E. Security Enclosure and Lockup: Install security temporary enclosure with locking entrances to prevent unauthorized entrance, vandalism, theft and similar violations of security at the construction site and at areas belonging to the Authority and off limits to the public.

1. Provide and install lockable swing or pull down gates as shown or required to secure areas of the site, platform or stationhouse and secure entrances from access by passengers and public.

F. Environmental Protection: Construct temporary facilities in ways and by methods that comply with environmental regulations, and minimize the possibility that air, waterways, and subsoil might be contaminated or polluted, or that other undesirable effects might result. Avoid use of tools and equipment which produce harmful noise or dust. Comply with all local ordinances.

3.14 MAINTENANCE, TERMINATION AND REMOVAL

A. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage by freezing temperatures and similar elements.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation and similar facilities on a 24 hour day basis where required to achieve indicated results and to avoid possibility of damage.
2. Protection: Prevent water filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.
3. Repair or replace materials that become damaged, worn, deteriorated or unsightly prior to removal.
4. Replace or repair light fixtures and other equipment that becomes inoperative. Replace light bulbs as required on a timely basis.
5. Refinish and repaint materials as required and as determined by the Authority prior to their removal.

6. Maintain and make repairs as required for temporary facilities on a regular basis. Keep temporary facilities clean.
7. Re-paint temporary facilities as required to maintain their appearance. Remove or re-paint over graffiti as soon as possible.
8. Maintenance requests shall be responded to within 24 hours or as required by the Authority.
9. Maintain temporary facilities in a safe and functional manner. Keep connections tight and immediately replace any damaged members.

B. Termination and Removal: Provide temporary facilities, utilities and bridges until final completion or approval of the Authority and at no extra cost to the Authority. Remove each temporary facility when the need has ended, or when replaced by authorized use of a permanent facility. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged work, clean exposed surfaces and replace construction that cannot be satisfactorily repaired.

C. Materials and facilities that constitute temporary facilities are to be dismantled, removed and removed off site as follows:

1. Materials designated to be salvageable on site for the Authority's use: Contractor to remove materials carefully to avoid damage and for re-use at the site for the permanent facilities. These materials shall be stored on site in locations and in such a manner as directed by the Authority.
2. Materials designated to be salvageable and stored off site for the Authority's use: Contractor to remove materials carefully to avoid damage, protected and stored on site temporarily, transported and delivered by the Contractor to a CTA facility designated by the Authority for storage and future use on another project.
3. Materials designated as the property of the Contractor to be removed and discarded legally off site by the Contractor.

D. Return the site to its original condition or as designated by the Authority.

1. Remove temporary paving that is not intended for or acceptable for integration into permanent paving. Where the area is intended for landscape development, remove soil and aggregate fill that does not comply with requirements for fill or subsoil in the area. Remove materials contaminated with road oils, asphalt and other petrochemical compounds, and other substances which might impair the growth of plant materials or lawns. Repair and/or replace street paving, curbs and sidewalks at the temporary entrances, as required by the governing authority.

E. At completion, Contractor shall clean and renovate permanent facilities that have been used or damaged during the time the temporary facilities were in use, including, but not limited to:

1. Touch up or repaint with matching colors painted areas that have been scarred by construction activity or noticeably worn or soiled by use.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of TEMPORARY PASSENGER AND EMPLOYEE FACILITIES shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of TEMPORARY PASSENGER AND EMPLOYEE FACILITIES shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000.

END OF SECTION

SECTION 14 24 00
HYDRAULIC ELEVATORS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes all labor, materials and equipment required to provide and install the holeless hydraulic passenger elevator(s) as shown on the Drawings, specified herein, andas otherwise required for a complete functional installation.

B. Elevator schedules at the end of this section indicate required performances, controls, capacities, dimensions, features and finishes for each elevator required for this project.

C. Elevator components, controls and machinery must be non-proprietary.

D. Related Sections:

1. Division 03 Sections, Concrete.
2. Division 04 Sections, Masonry.
3. Division 05 Sections, Metals and Structural Steel.
4. Division 07 Sections, Damp-proofing, Sealants.
5. Division 08 Sections, Glazing.
6. Division 09 Sections, Paint.
7. Division 21 Sections, Fire Suppression.
8. Division 22 Sections, Plumbing.
9. Division 23 Sections, Mechanical.
10. Division 25 Sections, Automation.
11. Division 26 Sections, Electrical.
12. Division 27 Sections, Communications.
13. Division 28 Sections, Safety.
14. Division 31 Sections, Earthwork.

E. Related Work: Contractor is ultimately responsible for providing and constructing a complete functional elevator system according to the drawings, specifications and code. Contractorto coordinate elevator installation with the elevator manufacturer, the elevator subcontractor and all other subcontractors responsible for the work at the station and platform in order tomaintain the schedule, avoid conflicts and to ensure the orderly sequence of the work. Provide sleeves, inserts, and anchoring devices in a timely fashion to maintain theconstruction schedule as required for installation under the Contract. Coordinate installationof the hydraulic elevators with the hoistway shaft construction including foundation and elevator pit construction and machine room construction.

F. Work that must be supplied under other sections include foundation work, elevator pit, structure and enclosure for hoistway, metal (and glass) panel system, temporary lighting for hoistway, hoistway ventilation, guide rail support, lifeline attachments, elevator cab cameras and communication, pit lighting, control space

lighting, access doors, sump pit and sump pump in elevator pit and other work as required for a complete operational system.

G. Work that must be provided under other sections also include the construction of a machineroom as required for the elevator(s) and include the following, as required: Door, frame, hardware, ventilation, heat, air conditioning, lighting, outlet, switch, electrical service, smoke detector, floor drain, and other items.

H. It is the Contractor's responsibility to coordinate the structural design of the hoistway and coordinate the electrical, mechanical, communication and other requirements with the elevator manufacturer for the particular elevator to be used.

I. Pit drainage: Contractor shall coordinate location of sumps, pumps, pipe and related wiringwith elevator installer.

J. Provide and install OSHA compliant metal pit ladder; adhere to any applicable codes.

K. Coordination Meetings: Coordination meetings shall be held bi-weekly during the elevatorconstruction period with all responsible parties to facilitate the coordination and executionof the work.

1.03 REFERENCES

A. Comply with all applicable codes and regulations of the authorities having jurisdiction. AISI:American Iron and Steel Institute.

B. ASME A17.1, A17.2, A17.5; current required edition; Safety Code for Elevators and Escalators.

C. ASME A17.3, Safety Code for Existing Elevators and Escalators.

D. ASTM A36 - Standard Specification for Carbon Structural Steel.

E. ASTM B151 - Specification for Copper-Nickel-Zinc Alloy (Nickel Silver) and Copper-NickelRod and Bar.

F. ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

G. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

H. ASTM A240 REV B - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications

I. ASTM A264 - Standard Specification for Stainless Chromium-Nickel Steel-Clad Plate

J. ASTM A276 - Standard Specification for Stainless Steel Bars and Shapes

K. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes

L. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc- Iron Alloy-Coated (Galv-annealed) by the Hot-Dip Process

M. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire

N. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft

O. ASTM D471 - Standard Test Method for Rubber Property-Effect of Liquids

P. AWS D1.1/D1.1M ERTA - Structural Welding Code - Steel.

Q. ICC A117.1 - Accessible and Usable Buildings and Facilities

R. IEEE 1202 CORR 1 - Flame-Propagation Testing of Wire and Cable Corrigendum 1

S. NEMA C80.1 - Electrical Rigid Steel Conduit

T. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum)

U. NEMA KS 1 - Heavy-Duty Enclosed and Dead-Front Switches (600 Volts Maximum)

V. NEMA MG 1 - Motors and Generators

W. NEMA PB 1 - Panelboards

X. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy.

Y. NFPA 13 - Standard for the Installation of Sprinkler Systems

Z. NFPA 70 - National Electrical Code

AA. NFPA 72 - National Fire Alarm and Signaling Code

BB. NFPA 80 - Standard for Fire Doors, Fire Windows.

CC. NFPA 130 - Standard for Fixed Guideway Transit and Passenger Rail Systems

DD. UL 6 - Electrical Rigid Metal Conduit – Steel

EE. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations

FF. UL 62 - Flexible Cords and Cables

GG. UL 98 - Enclosed and Dead-Front Switches

HH. UL 360 - Standard for Safety Liquid-Tight Flexible Metal Conduit

II. UL 486A-486B - Wire Connectors

JJ. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-BreakerEnclosures

KK. UL 514A - Metallic Outlet Boxes

LL. CTA Design Criteria

MM. Any additional requirements imposed by local agencies and/or codes having jurisdiction shall be incorporated into elevator installation.

NN. In the event of a conflict between codes, regulations or standards, the most stringent requirement as determined by the Contractor and approved by the Authority shall take precedence unless specifically addressed herein.

OO. Chicago Building Code.

PP. FCC: Federal Communications Commission.

QQ. AFBMA Standard 9 and 11

RR. Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG).

SS. American Public Transportation Association (APTA): Heavy Duty Elevator Design.

TT. IBC: International Building Code.

1.04 DEFINITIONS

A. Hydraulic Elevators: Elevators in which cars are hoisted either directly or indirectly by action of a hydraulic plunger and cylinder (jack); with other components of the Work, including fluidstorage tank, pump, piping, valves, car enclosures, hoistway entrances, operation systems, signal equipment, guide rails, electrical wiring, roping (roped hydraulic applications), buffers, and devices for operations, safety, security, required performance at rated speed and capacity, and for complete elevator installation.

B. Defective Elevator Work: Operation or control system failures; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; the need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.

C. Heavy Duty Elevator: An elevator designed specifically for the harsh environment and dutyload cycles common to transportation system usage.

D. Elevator: A hoisting and lowering mechanism, equipped with a car or platform, which movesin guide rails or racks and serves two or more landings.

E. Elevator, Passenger: An elevator used primarily to carry persons other than the operator andpersons necessary for loading and unloading.

F. Elevator, Hydraulic: A power elevator in which the energy applied, by means of a liquid under pressure, in a hydraulic jack.

G. OEM: Original Equipment Manufacturer.

H. Dwell Time: The period of time the elevator is at a landing while the doors open, passengerstransfer and doors close.

I. Elevator Substantial Completion: The point at which the elevator is ready for use, whetherthe site is finished or not. This is where the jurisdictional inspection usually takes place.

J. Elevator Final Acceptance: The point at which the owner accepts the elevator project as being complete including all submittal requirements. This may be a different point in time thansubstantial completion.

K. Interim Maintenance: Maintenance from the point of substantial completion, but prior to Service.

L. Beneficial Use: When the elevator is placed into service, may be prior to the site being readyfor public use.

M. Revenue Service: The station or facility opening date.

N. Notice to Proceed (NTP): Within this document shall mean the date which the elevator installer is notified to proceed with the project.

O. Override Switch: A switch located in a kiosk panel, which disables the Hall Call Buttons.

P. SDS: Safety Data Sheet.

Q. BOM: Bill of Material.

R. SMNT: Systems Maintenance (WMATA).

S. WMATA: Washington Metropolitan Area Transit Authority.

T. Elevator MCP: Maintenance Control Program as defined in the ASME A17.1 Code.

U. ICC: International Code Council - Identified in Section 1.03 References of the 14245 Geared Traction Passenger Elevator Specifications.

V. NIST: National Institute of Standards and Technology.

W. NESC: National Electrical Safety Code

X. NEII: National Elevator Industry, Inc.

Y. SPI: Society of the Plastics Industry

Z. NAAMM: National Association of Architectural Metal Manufacturers.

1.05 PROJECT AND SITE CONDITIONS

A. Contractor shall be responsible for coordination of the elevator subcontractor and all tradesand making sure that the elevator system including machines rooms, control rooms and hoistways conforms to all applicable codes and standards.

B. Elevator Manufacturer shall certify in writing that hoistway, pit and machine room layout and dimensions including all auxiliary equipment as indicated on Drawings, and electrical service, as shown and specified are adequate for elevator system being provided.

C. The Contractor shall restrict operations to facilitate rail and passenger traffic during rush hours at stations open to rail traffic. Provide temporary barricades to protect installations fromweather, personnel and passengers during installation.

D. Elevators shall not be used for construction purposes or Contractors use of

transporting materials or equipment during construction.

E. Protection: During installations, and until elevator systems are fully operative, contractor shall make necessary provisions to protect systems from damage, deterioration, injury to pedestrians, the general public and environmental conditions.

F. Coordination Requirements:

1. Alterations: Contractor shall coordinate any alterations required to accommodateelevators with the Owner.
2. Floor finish in cab: Contractor shall install cab flooring as specified.
3. Lock and key requirements: Contractor shall coordinate with the Owner.
4. Pit Drainage: Contractor shall coordinate location of sump pits, pumps, pipes andrelated wiring with elevator installer.
5. Rigging Plan: Contractor shall supply a rigging plan that is approved by the Owner.
6. Safety Training: Contractor shall attend appropriate safety training programsprovided by the Owner at no extra cost.
7. Methodology: The contractor shall meet with the Owner and provide a written method of installation for approval.
8. Electrical: The installer shall coordinate with the contractor and appropriate trade in relation to CCTV, communications, smoke detectors, shunt trip breakers, CCTV, power and cab lighting requirements.
9. Construction schedule: Installer shall coordinate deliveries, installation and testingwith the Contractor.
10. Shop drawings to indicate the individual responsibilities for each component of theelevation system. Noting “by others” is not allowed.

1.06 DESIGN CRITERIA

A. Provide elevators designed for transit system usage, capable of being in operation 24 hoursper day, 7 days per week.

B. Exterior Installation: Provide units designed to operate while exposed to natural elementssuch as sunlight, rain, snow, ice, dust, and temperatures ranging from -20 degrees to +125degrees Fahrenheit.

C. Interior Shaft and Cab Installation: Provide units designed to operate while exposed to temperatures ranging from –20 degrees Fahrenheit to +125 degrees Fahrenheit.

1. Push button operation within the cab shall operate fully within this temperature range.
2. The vertical travel distance of the cab shall be uninterrupted within this temperaturerange.

D. Elevator systems shall be designed with provisions for thermal expansion and contractionof the complete assembly.

E. Temperature Control: The ambient temperature of the elevator equipment rooms, shaft, etc.must be maintained at a temperature range recommended by the manufacturer. Contractorto provide auxiliary heat, air conditioning and/or ventilation, including equipment, fans, dampers, controls and electrical power, as required to maintain that range. Provide product data and shop drawings of mechanical equipment for Authority’s approval. Provide data andcalculations

indicating the possible design temperature extremes based on location, environmental conditions and other factors. Coordinate work with other trades.

1.07 SUBMITTALS

A. Submit the following according to the Conditions of the Contract and Division 01 Specification Sections.

B. Submit elevator manufacturer's project specific QA/QC plan.

C. Submit coordinated BIM model for review and approval. Provide clash detection log proving no conflicts.

D. Product Data:

1. The summation of product information shall be submitted, in tabular form, of all partsincorporated in the entire group of elevators supplied under this Contract. Hard copies and electronic copies on the Flash Drive shall be submitted
2. Submit manufacturer's product literature for each principal component or product ofeach elevator, including certified test reports on required testing. Indicate capacities, dimensions, design, layout, finishes, accessories, available options, and similar information. Provide information on performance and operating characteristics, features of control system, signals, and operating system. Indicate any variationsfrom specified requirements.
3. Manufacturer's design data, material specifications, drawings, installation and maintenance instructions including preventive, predictive and general maintenance, and other data pertinent to the components used in the elevator systems, including,but not limited to, detailed repair data for all components, including disassembly, inspection/gauging/torque requirements, reassembly, testing and other related information. Submittals to cover all mechanical components, operating panels and indicators and electronic equipment to control and monitor elevator control functions. Exploded view drawings shall be included to facilitate repair and maintenance functions.
4. Lubricants, sealers, paints, and any other potentially hazardous substances are subject to review and approval by the Authority. The Contractor to submit the necessary Safety Data Sheets
5. The following information to be provided

    a. Nomenclature of part.
    b. Elevator Contractor's part number.
    c. Nomenclature of next higher assembly in which used.
    d. Manufacturer and part number.
    e. Model number(s) of elevator(s) on which used.
    f. Total quantity in entire group of elevators.
    g. Current unit price to the Authority.
    h. Recommended spare parts list showing parts with prices for each part. Theparts listing to be provided on or before 90 days prior to scheduled completion.
    i. Loads on supporting members, reaction points, and deflections under varying loads.

        1) Loads imposed on the structure shall be coordinated with the Authority and not exceed agreed limits. This

requirement to be verified, documented, and stamped by a registered professional engineer.

2) Supporting calculations to be provided for record file.

E. Shop Drawings:

1. Shop Drawings including dimensioned drawings for each elevator showing plans,elevations, sections and large-scale details indicating service at each landing, clearances, coordination with building structure and relationships with other construction, and details of car enclosures and hoistway entrances. Indicate required hoistway and pit dimensions, showing guide rails, buffers, and other components in hoistway. Indicate maximum rail bracket spacing. Include elevatordiagrams to indicate elevator service to each level. Provide shop drawings showing location and layout of all elevator equipment, signals, control panels, call stations, indicator lights, graphics, and similar items. Indicate any variations from specifiedrequirements plus maximum dynamic and static loads imposed on building structureat points of support. Indicate hoist beam requirements. Indicate access andventilation for elevator machinery rooms and hoistways; indicate location, sizes, and details of access doors and hoistway door and frames.
2. Elevator Manufacturer to provide a letter certifying that hoistway, pit and machineroom layout and dimensions including all auxiliary equipment as indicated on Drawings, and electrical service, as shown and specified are adequate for elevatorsystem being provided.
3. The Contractor to provide detailed drawings that shows the dimensions and tolerance, specification that may include the material specification, hardness or electrical rating for each component that is being used. In regard to assemblies theymust provide a top-level drawing with BOM and quantities with detailed material specifications and drawings with dimensional tolerances. The contractor also to provide as-built CAD models of all elevator components
4. The name of the manufacturer and type or style designation shall be listed on each page of the equipment shop drawings. Drawings submitted shall include, butnot be limited to, the following
5. Fully dimensioned layout in plan and elevation, showing the arrangement of equipment and all pertinent details of each specified elevator unit, including as appropriate

    a. All equipment located in machine rooms.
    b. Location of circuit breaker, switchboard panel or disconnect switch, light switch, and feeder.
    c. Extension points in machine room. These electrical components to not beblocked.
    d. Location in hoistway of outlets for connection of traveling cables for car light,fire detectors, communication, and control system.
    e. Car, hydraulic cylinder and plunger, supporting beams, guide rails, buffers,and other components located in the hoistway.
    f. Maximum guide rail bracket spacing. Guide rail brackets shall be providedat every horizontal structural member and to be of sufficient strength to meetthe ASME Code.
    g. Reactions at points of supports.
    h. Weight of principal parts.
    i. Top and bottom clearance and over-travel of car.
    j. Complete wiring diagram of the elevator system and subsystems. Complete data regarding electrical characteristics and

connection requirements.

k. Refuge space on top of car and pit.
l. Cab design, dimensions, and layout.
a. Color/material schedule and selection chart for cab and entrance features.
b. Hoistway Ventilation: Thermostatically Controlled, positive mechanicalventilation system.
c. Hydraulic jack details
d. Machine/Pump Room area, pit, and hoistway layout.
e. Hydraulic piping layout indicating layout, type, size, and schedule of piping from machine room to elevator pit(s) indicating orientation of valve(s), andlocation of shut-off valve(s), and shall include calculations of working pressures.
f. Drawings of the hoistway entrances and doors showing their method of operation, details of construction, and fastenings to the structural membersof the station structure.
g. Drawings of the car for each design specified, showing dimensions, detailsof construction, fastenings to platform, car-lighting, ventilation, air conditioning (if applicable), communication, and location of equipment.
h. Cuts or drawings showing details of all signal and operating devices, identifying graphics, and detailed design with diagram and schematic of kiosk annunciator panel.

2. Hydraulic Drive:

a. Cylinders and plunger.
b. Power unit, including volume, rate of flow, working pressure, rpm of pump,and horsepower, voltage, frequency, service factor, and rpm of the motor.
c. Piping, fittings, and couplings.
d. Valves.
e. Storage tank.
f. Muffler.
g. Hydraulic Jack Details Drawings.
h. Fluid flow diagram showing all valves, operating devices, and controls.
i. Complete assembly detail of machine/pump, hydraulic tank mounting, withall load calculations

3. Elevator controller, including manufacturer's technical data and catalog cuts, and interface hardware and software requirements.
4. Power door operator.
5. Door interlocks and electrical contacts including test reports showing that hoistwaydoor interlocks, car door contacts, and car top emergency contacts meet the requirements of the ASME Code and certification by the NIST or other approved laboratory.
6. Car ventilation fan.
7. Car Air Conditioning (if applicable).
8. Car lighting.
9. Cabling.
10. Buffer, including stroke and, certified maximum striking speed for car.
11. Communication and intrusion system design details covering electrical, mechanical, and architectural aspects.
12. Design and architectural details, including light ray unit locations, of the

electrical protective device for car doors.

13. Where the use of adjoining dissimilar metals is required, descriptions of protectivemeasures to be employed to avoid corrosive damage.
14. Certification from independent testing laboratory that glazing gaskets meet thespecified requirements.
15. Hall and car fixtures at each landing including the Car Operating Panel (COP).
16. Interface wiring diagrams with other systems showing terminal board location andidentification.
17. Expected heat dissipation of elevator equipment in machine room and control areas(i.e. BTU's/hr.) based on 240 round cycles per hour.
18. Complete wiring diagram of the elevator system and subsystems. Complete data regarding electrical characteristics and connection requirements.
19. Complete assembly detail of machine/pump, hydraulic tank mounting, with all loadcalculations.
20. Lubricants, sealers, paints and any other potentially hazardous substances are subject to review and approval by the Authority. The Elevator Contractor shall submit the necessary Safety Data Sheets

B. Elevator Machine Room:

1. Provide shop drawings for elevator machine room including plans, elevations, sections and details for construction. Show locations of equipment and panels.
2. Provide product data for all components of construction for the machine room including wall, floor and ceiling finishes; door and frames; hardware; heating, cooling andventilation; floor drain; lighting, electrical power and safety; communication; fireprotection and other components and equipment.

C. Provide specification compliance checklist. Checklist should include all sections of this specification. Indicate whether the requirement can or cannot be met. Indicate all deviations from the specifications including the explanation why the requirement cannot be met.

D. Wiring diagram detailing locations and wiring for power, signal and control systems and differentiating clearly between manufacturer-installed wiring and field-installed wiring.Indicate maximum and average power demands.

1. All circuits to be organized and numbered.
2. Provide electrical characteristics and connection requirements.
3. Provide the expected heat dissipation of elevator equipment space, elevator shaftand controller space BTU based on maximum possible full load starts per hour.

E. Samples of exposed finishes of car enclosures, hoistway entrances, and signal equipment.Provide 6 inch to 8 inch square samples of sheet materials and 10 inch to 12 inch lengthsof running trim members. Submit color samples of car floor finish material for selection bythe Authority. Provide samples, as requested by the Authority, of other elevator components including, but not exclusive of, call buttons, indicator lights, glazing, etc.

F. Operation and Maintenance Manuals:

1. Six sets and electronic copy of the approved manuals, elevator installation,operation instructions, troubleshooting techniques and related equipment drawings and software (all publication must be in English) – two (2) copies of which to be delivered to the Engineer representing the Authority at least sixty (60) days prior tothe final acceptance. Each binder

shall have the Binder Cover and Spine Insert which contain the Station Name and Unit ID.

2. Submit an electronic copy of the Manual for the review and approval, afterinstallation and at least ninety (90) days prior to the final acceptance. TheInformation shall be saved/presented as follows:
3. Graphic images in ".dwg" AutoCad, and ".pdf" formats. All revisions shall be madeby using computer software. Hand written changes are not acceptable.
4. Text in Microsoft Word .doc, ".pdf" or approved equal format.
5. Electronic copies of the Operation and maintenance manuals shall be searchable,indexed, with each section bookmarked and linked to the table of content
6. The manuals shall include the following:

    a. Complete operation and maintenance Instructions of the elevator equipment included complete illustrated, exploded views of all assemblies, and a complete illustrated, exploded view for identification all system parts
    b. Complete nomenclature of replaceable parts, part numbers, current cost,and warehouse location. If product source is another vendor, Contractor shall include name and address of the other vendor
    c. Furnish a summation, in tabular form, of all parts incorporated in the elevators supplied under the Contract. Include but not be limited to the following:

        1) Nomenclature of part.
        2) Contractor's part number.
        3) Nomenclature of next higher assembly in which used.
        4) Manufacturer and part number.
        5) Model number of elevator on which used.
        6) Total quantity.
        7) Current unit price to the Authority.
        8) Serial numbers of all serialized assemblies, subassemblies, motors, and other major components supplied and installed
        9) Include an exact copy of the elevator data plate, rope data plateand crosshead data plate and any other tags or plates required bythe ASME 17.1 with each Operation and Maintenance manual. Data plate should comply with ASME 17.1 requirements.

G. Elevator Maintenance Control Program (MCP)

1. Provide a separate Maintenance Control Program (MCP) for each unit as requiredby A17.1 Code.
2. Submit an electronic copy of the MCP to CTA Engineering for their review andapproval.
3. Provide one (1) copy of the approved MCP at each elevator machine room.
4. Three (3) sets of hard copies and electronic version of the approved MCP to be submitted to the CTA.
5. The MCP to include, but not be limited to, the Code required maintenance tasks, maintenance procedures, examination and tests procedures.
6. The MCP to specify examinations, tests, cleaning, lubrication, and adjustments toapplicable components at regular intervals.

7. The MCP is to only contain information related to equipment installed under this contract. Generic information that does not pertain to the equipment installed to notbe included.
8. Scanned documents are not allowed.
9. The instructions to be permanently legible with characters a minimum of 0.125 in.in height.
10. All covers to be resistant to oil, moisture, and wear commensurate with their intended use. Diagrams and illustrations are not to be loose or in pockets. All printed material are to be capable of being reproduced on dry copying machines.
11. Each unit to be treated as a whole and not as a grouping of disassociated parts. Thematerial in the MCP to be organized and indexed by the elevator classifications. Each binder to have a Binder Cover and Spine Insert which contain the Station Nameand Unit ID.

H. Submit for Authority's review and approval diagnostic tools to be provided by the elevatormanufacturer including, but not limited to, laptop computer Windows based with latest operating system with non-proprietary program and software installed, product data and specifications, Elevator program with all input/outputs descriptions showing each rung, allcables and accessories and software.

I. Certificates and Permits: Provide the Authority with copies of all inspection/acceptance certificates and operating permits as required by governing authorities to allow normal, unrestricted use of elevators. One permanent frame for the certificate or operating permit tobe mounted in the car (or alternate location in the Customer Assistant Shelter as approvedby the City of Chicago) and a duplicate to be provided in the cab frame.

J. Wiring Schematics: Submit wiring schematics and interconnections for the elevator controland drive system. Also, submit intercom system connection and controls.

K. Contractor shall submit control wiring diagrams. Control diagrams shall be ladder type. Allcontrol diagram rungs/ lines should be numbered. All control points and equipment points
i.e relays should be tagged.

L. Contractor should submit control panel layout showing location of all equipment installed inthe control panel including relays, circuit boards, transformers, power supplies, wiring traysetc.

M. Contractor shall submit control wiring diagrams. Control diagrams shall be ladder type. Allcontrol diagram rungs/ lines should be numbered. All control points and equipment points
i.e relays should be tagged.

N. Contractor should submit control panel layout showing location of all equipment installed inthe control panel including relays, circuit boards, transformers, power supplies, wiring traysetc.

O. Documentation certifying the experience requirements of the manufacturer, certifying the experience of the installer, and a list of completed projects.

P. Upon completion, as-built drawings are to be submitted including architectural, structural, electrical, mechanical and plumbing. Also provide as-built drawings for schematic control wiring and electrical wiring diagrams and electronic and hard

copies of ladder diagrams, logic, program with all input/outputs descriptions showing each rung, software, cables andlaptop computer windows based with the latest operating system with the non- proprietaryprogram and software installed.

Q. Pre-acceptance test forms

1. ASME A17.1, Safety Code for Elevators and Escalators, Appendix X.
2. ASME A17.2, Guide for Inspection of Elevators, Escalators and Moving Sidewalks,Appendix B.

R. Plans, details and materials for providing and constructing temporary solid barricades for protecting the elevator work area, personnel and passengers.

S. Temperature Control: Contractor to provide data and calculations indicating the possible design temperature extremes based on location, environmental conditions and other factorsand how the temperature variations will be controlled. Provide product data and shop drawings for required temperature control equipment and installation including auxiliary heat, air conditioning and/or ventilation equipment, fans, dampers and controls.

T. Submit a copy of the warranty for CTA's review and approval.

1.02 QUALITY ASSURANCE

A. Manufacturer qualifications:

1. The Manufacturer shall provide documents stating that their firm has successfullyproduced elevators for transit system applications for a minimum of ten (10) yearsand regularly engaged for the past five (5) years in the manufacture of major components for hydraulic passenger elevators. As a standard of quality, the elevator equipment design and installation shall comply with the Code.
2. Elevator manufacturing plants and manufacturing processes shall operate a quality management system that complies with the requirements of the ISO 9001. The scope of the certification shall include design, manufacturing, and installation of the elevator components and systems.

B. Installer Qualifications:

1. The Installer shall be the original manufacturer of elevator equipment or manufacturer's authorized agent who is trained and approved for installation of unitsrequired for this Project.
2. The Contractor shall obtain and pay for all permits and licenses and perform all required inspections.
3. Engage the elevator manufacturer or an Installer approved by the elevator manufacturer and who has completed the elevator installations similar in material,design, and extent to that indicated for this Project and with a minimum of ten (10)years experience installing elevators and has a record of successful in-service performance. Documentation shall be submitted to support this requirement.
4. Elevator installer shall operate a quality management system that complies with the requirements of the ISO 9001. The scope of the certification shall include design,manufacturing, and installation of the elevator components and systems

C. Welding

1. Welding to be performed in accordance with the requirements of AWS or CWB. Welders must produce evidence of the current certification by

AWS or CWB.

D. Labeling:

1. Every elevator controller shall be clearly marked permanently on the controller withrated load and speed, manufacturer serial number, and the designated Owner identification.
2. Every elevator shall be clearly marked with rated load, speed, manufacture serialnumber, and the designated Authority identification

E. Regulatory Requirements: In addition to local governing codes and regulations, test and comply with applicable requirements of the following:

1. ASME/ANSI A17.1, Safety Code for Elevators and Escalators (hereafter referred toas the “Code”)

    a. Seismic Risk Zone: Project is located in Zone O.
    b. Earthquake Emergency Operation: Comply with requirements in ASME A17.1.

2. National Electrical Code.
3. Institute of Electrical and Electronic Engineers (IEEE) standards.
4. National Fire Protection Association (NFPA 70, 80)
5. American National Standards Institute “American National Standard for building and facilities – providing Accessibility and Usability for Physically Handicapped People”ANSI A 117.1 and the ADA Title 49 CFR TRANSPORTATION, Part 37.9 STANDARDS FOR ACCESSIBLE TRANSPORTATION FACILITIES, Appendix A,Section 4.10 ELEVATORS to the exclusion that they do not conflict with each other.
6. Chicago Building Code: Conform to all applicable codes for manufacture and installation of elevator system.
7. Provide and pay for all tests and permits.
8. Requirements of Regulatory Agencies

    a. Contractor shall notify the proper inspectors to witness required testing
    b. Contractor shall obtain and pay for all necessary permits, and perform suchtests as may be required for acceptance and approval of elevators by jurisdictional agencies.

1.03 SPARE PARTS AND STOCK

A. Provide adequate spare parts on-site to ensure minimal downtime of the elevators during thewarranty period. Spare parts shall include the list below at a minimum.

B. Parts must be coded for tracking purposes for replenishment

C. Parts may be used by the Contractor for maintenance but shall be restocked within two weeks of their use at no additional cost to CTA.

1. Spare Parts and Maintenance Material: The Contractor shall provide to CTA’s designated location, the following spare parts. The parts shall become CTA’s property. The parts shall be delivered prior to Substantial Completion.

    a. Two (2) safety/governor assemblies
    b. Four (4) hoistway door rollers
    c. Two (2) car door rollers
    d. Four (4) hoistway door gibs

e. Four (4) cab door gibs
f. Two (2) electronic door detectors
g. One (1) set of replacement lights for the elevator cab
h. One (1) box of each type of fuses
i. Two (2) complete door interlock assemblies
j. Two (2) door operator motors
k. Two (2) complete pushbutton assemblies for car operating station and hallstations
l. Four (4) complete set of brake pads
m. Two (2) microprocessor controllers

D. Factory Visit

1. The Contractor shall coordinate factory visits for up to three of the Owner's representatives to visit the factory where the elevator control panels are being manufactured. The Contractor shall not ship the control panels without the writtenapproval of the Owner after conclusion of the factory visit
2. The Contractor shall coordinate factory visits for up to three of the Owner's representatives to visit the factory where the elevator is being manufactured. TheContractor shall not ship the elevator without the written approval of the Owner afterconclusion of the factory visit.
3. Fabrication Hold Points will be established during the course of the project.

1.10 DELIVERY, STORAGE AND HANDLING

A. If the construction site is not prepared to receive the elevator equipment at the agreed shipdate, the equipment shall be stored in a secure, dry, protected, and easily accessible storagearea.

1.11 WARRANTY

A. Warranties: Provide warranty, signed by the Contractor, elevator installer, and elevator manufacturer; guaranteeing to correct failures in the elevator system; replace, repair, or restore defective components, materials and workmanship of elevator work or equipment which occur during the warranty period.

1. Warranty period shall be for twenty four (24) months starting on the date of BeneficialUse for the project.

B. The elevator warranty shall not deprive the Authority of other rights the Authority may haveunder other provisions of the Contract Documents and shall be in addition to other warranties made by the Contractor under requirements of the Contract Documents.

C. Warranty to start after the 30 day test period which will consist of continuous operation of theelevator without any interruptions caused by the warrantable defects.

PART 2 - PRODUCTS

2.01 ELEVATOR SYSTEM

A. General

1. Elevators furnished under this Contract shall be of the heavy duty automatic hydraulic-type with direct –acting dual jack and holeless.
2. All parts shall be built to standard dimensions, tolerances, and clearances so thatsimilar machines and devices supplied under contract

are completely interchangeable.

3. Elevator components, controls and machinery must be non-proprietary to facilitatethe Authority's future maintenance of the equipment.

B. Fasteners

1. Fasteners shall be compatible with materials being fastened.
2. Fasteners shall be furnished with self-locking nuts or retaining rings (springwashers, toothed disks).
3. Fasteners shall be equal to, or of greater corrosion resistance than the most corrosion-resistant metals being fastened.
4. The mechanical fastening used throughout the equipment on parts subject to wearand requiring replacement shall be keyed and seat, nut, screw, or other removableand replaceable type not requiring physical deformation or field positioning. The useof rivets or similar devices will not be acceptable as mechanical fastenings for suchparts

C. Doors of elevators shall be of the horizontal sliding type, single speed, and center-opening.The doors shall be arranged for low-speed electric power operation

D. System Performance Requirements

1. The elevator schedules indicate required performances, controls, capacities, and electrical requirements for each elevator or group of elevator systems.
2. The elevators shall be designed for continuous operation seven (7) days per week,twenty four (24) hours per day.
3. Elevators shall be designed, installed, and tested to operate with full-specified performance while exposed to the climatic and environmental conditions specified.In addition, during installation and until the beginning of scheduled maintenance service, the elevators will be subject to more extreme environmental conditions. The Contractor shall furnish protection necessary to prevent damage to or deterioration of the elevators during this period.

    a. Elevators shall be designed to operate in dry bulb temperature range of - 10°F to 140°F and operate while exposed to the natural elements of weather, including sunlight, rain, snow, slush, and salt. Also all Elevators shall be designed for all conditions of relative humidity, de-icing chemicals,debris, airborne dust, and corrosive elements.
    b. The elevators shall have a special winter operation. The elevators shall bedesigned to operate in the event the outside temperature falls below a pre-established minimum value. The Elevator Contractor shall furnish andinstall the necessary timers and thermostat to accommodate the desired function

4. Operation Under Fire or Other Emergency Conditions: The Elevator shall be equipped to function in accordance with the requirements of ASME A 17.1 and applicable local codes
5. Sound Level

    a. No elevator car or elevator power unit shall generate noise in excess of NC45 sound level. Measurement of noise shall be made at a point thirty six (36") inches from the hoistway, machine room entrances, and ventilation openings either free running or under load. For multiple elevator installation,the noise measurements shall be made with only one (1) elevator unit in

operation, but with the entire installation complete and in operating condition. An ambient level is not to exceed forty-nine (49) decibels shall bemaintained prior to units being turned on

6. Car Performance:

   a. Car speed plus or minus 5% of contract speed under any loading conditionor direction of travel.
   b. Car Capacity: Safely lower, stop and hold (per code) up to 125% of ratedload.

7. System Performance:

   a. Vertical Vibration (maximum): 15-17 mg.
   b. Horizontal Vibration (maximum): 10-12 mg.
   c. Jerk Rate (maximum): 3.3 - 5.25 ft/sec2.
   d. Acceleration (maximum) 1.6 - 2.6 ft/sec2.
   e. In Car Noise: = 55 dB(A).
   f. Leveling Accuracy: Plus or minus 3 mm.
   g. Starts per hour (maximum): 240.

8. Accessibility Requirement: Comply with Section 407 of the US ArchitecturalTransportation Barriers Compliance Board's ADA-AB4 Accessibility Guidelines with ICC A117.1
9. Reliability:

   a. Each elevator shall be capable of operating at full load under any of the normal modes of operation at a level of availability of not less than ninetyeight (98%) percent over a period of 365 days.
   b. Availability (A) is defined as the percent of normal operational time duringwhich the equipment is available for use. Or

$$A = \frac{MTBF}{MTBF + MTTR}$$

Where:
MTBF = Mean time between failure in days
= Operating time, t (in days) / Number of failures in time tMTTR = Average time in days required to restore an elevator to operation after a report of a failure.

E. Capacity, Speed, Travel, and Platform Size:

1. All parts of the elevator equipment shall be of such design, size, and material as tosatisfactorily function under all conditions of loading and operation within its rated load and speed, all with a proper factor of safety, maximum mechanical, electricalefficiency, and minimum wear on parts
2. Hydraulic elevators shall have sufficient capacity to lift the rated load at 150 feet perminute, with a tolerance of plus or minus 8.0 percent
3. Provide means to adjust the inspection speed. be adjustable between 25 feet perminute to a maximum of 150 feet per minute.

4. The Elevator shall be of size, arrangement, and capacity and shall comply with design criteria and as shown on the Contract Drawings, and in accordance with therequirements of the ANSI/ASME A17.1. The rated load shall be exclusive of the weight of the complete car and shall be determined in accordance with ASME Coderequirements for passenger-elevators required to carry freight, Class C3 (ASME A17.1 Section 2.16) or 4500 lbs., whichever is greater.
5. The top enclosure shall be reinforced to support two men and be capable of sustaining, without damage or permanent deformation, a load of three hundred (300) pounds on any area foot square and one hundred (100) pounds applied at anypoint. An emergency exit shall be installed in the car top in conformance with the Code.
6. Travel, location terminal floors, number of stops and openings, and overall car platform size shall be as shown on the Drawings.

F. Closed Circuit Television (CCTV)

1. Make provision for and provide a Closed-Circuit Television (CCTV) camera, in theelevator car(s) with the ability to monitor the CCTV from the Kiosk annunciator panel. Submit drawings for approval before fabrication.
2. Provide electrical connections, through shielded traveling cables between the camera and the communications terminal block in the machine room or pit.

G. Painting

1. The pit, pit walls, and machine room floor shall be painted. All machine room equipment shall be given two coats of approved machinery paint. All new iron workshall be given one coat of rust- inhibiting paint.
2. Metal parts visible to the public may be field painted where specifically shown or authorized the Authority.

H. Workmanship

1. Joints shall be welded their full length and dressed smooth and flush on exposed surfaces. Spot welding shall be used where practicable in preference to screw or rivet fasteners.
2. Sheet metal materials shall be accurately rolled and leveled, and have smooth finish and uniform color. Joints shall be formed to a tight fit, with abutting edges flush, andshall be securely welded or riveted together in such a manner as to give strength equivalent to the solid sheet. Riveted construction shall have heavy reinforcementon the back, and no rivets shall show on exposed surfaces. Welds shall be solid and dressed flush, and shall have holes for screws or bolts that are drilled and countersunk.
3. Wrought work shall have joints milled to a tight even fit and, where possible, shallbe made without screws. Square turns and comers shall be sharp. Curves and loopsshall be true and without visible joints. Abutting members shall be welded, riveted,or both. Similar bars shall be halved at intersections and wide bars shall be punched for the small bars to pass through.
4. The finished work shall be strong, rigid, and neat in appearance. Plane surfaces shall be smooth and free from warp or buckle. Molded members shall be clean cut,straight, and true. Miters shall be well formed and in true alignment. Fastenings shallbe concealed from the face side of the material.

I. Corrosion Protection

1. The Contractor shall design the elevator assembly in such a manner as to avoid corrosion and galvanic action due to physical contact between dissimilar metals ordue to other causes

2.02 MANUFACTURERS

A. Fujitec America, Inc.

B. Kone Elevator Co.

C. Mid-American Elevator Company, Inc.

D. Otis Elevator Co.

E. Schindler Elevator Co.

F. ThyssenKrupp Elevator Co.

2.03 ELEVATOR MACHINE ROOM

A. Contractor to provide an elevator machine room of size and location according to approved shop drawings that have been coordinated with the elevator manufacturer's requirements,all applicable codes and the requirements of all subcontractors. Machine room to be sizedfor all the equipment, motors, panels and controls for the specific elevator(s) as well as allowsufficient space for maintenance of the equipment by personnel.

1. Machine room to be of fire rated non-combustible construction per code. Floor of machine room to be structurally capable of supporting the weight and vibration of theequipment.
2. Machine room to be heated and cooled to maintain the temperature required for proper operation of the equipment.as well as ventilated for maintenance personneloccupancy.

B. Machine room to be constructed according with materials that have been submitted and approved by the Authority.

C. General Requirements:

1. Machine room shall be 224 sq. ft. minimum for a single elevator.
2. Machine Room Emergency Lighting: Maintained emergency lighting fittings shall be provided in each elevator machine room.
3. There shall be a minimum of one maintained lighting fixture.
4. Clearance around equipment in each machine room shall comply with provisions ofall applicable codes. Clear distance for the maintenance purposes shall be at least eighteen (18") inches. In no case shall this clearance supersede minimum Code requirements.
5. Equipment in elevator machine room shall be so arranged that replaceable items can be removed for repair or replacement either by overhead hoist and dolly, or other conventional means, without dismantling or removing other equipment components in the same machine room.
6. Machine rooms must be air conditioned and heated to maintain an ambient temperature of 50 deg. F to 80 deg. F and a relative humidity between 35% and 50%.The air conditioner shall be a split system. The heating system for the machine room is also a built-in system. A forced removal should be done by moving the air from the room to the outside

of the building to another part of the building to keepan air exchange through the equipment room. Intake and exhaust vents should notbe located close to each other.

7. Any component attached to the controller shall have a minimum clearance of eighteen (18”) inches from the side(s) of the component requiring access for maintenance and free air circulation.
8. One (1) set of approved electrical and hydraulic diagrams of elevator shall be mounted in an aluminum channel frame with Lucite cover and waterproof fiberglassbacking and installed adjacent to the appropriate drive machine.
9. Provide Mats of insulating rubber or other suitable floor insulation in the front of theControllers.

    a. The Resistance range shall be 1x104<1x106 and shall meet ANSI/ESD requirements.
    b. The rubber mat shall be the width of the controller plus twelve (12) inches.
    c. The length of rubber mat shall be a minimum of twenty-four (24) inches.

10. Provide parts storage cabinet or shelf. Coordinate size with Authority.
11. Provide file cabinet with at least two drawers for elevator documentation, manualsand schematics

2.04 MATERIALS AND COMPONENTS

A. General: Provide manufacturer’s standard pre-engineered elevator systems that comply with or fulfill the requirements of the elevator schedule. Where components are not otherwiseindicated, provide standard components published by manufacturer as included in standardpre-engineered elevator systems and as required for a complete system. All unpainted, unfinished non-wearing surfaces of elevator and equipment, exterior cab and hoistway, shall be painted three coats alkyd enamel (prime and 2 finish coats) manufacturers standard coloras selected by the Authority.

1. All equipment and controls shall be of industrial quality and operate under warrantyexposed to all possible weather and temperature extremes.
2. Hydraulic Machines and Elevator Equipment: Provide holeless single-acting, beside-the-car, or holeless telescoping, beside-the-car, or holeless single-acting, roped hydraulic plunger-cylinder units, or holeless cantilever, with electric pump- tank-control system equipment in machine room as indicated.
3. Hydraulic Power Unit: The power unit (oil pumping and control mechanism) shall include an oil hydraulic pump, electric motor, oil control unit, oil reservoir, oil strainerin the suction line, structural steel outer base with tank supports (tank must be mounted above floor level), inner base for mounting motor pump assemblycombined in a compact and neatly designed self-contained unit.

    a. The pump shall be designed and manufactured for oil-hydraulic elevator service. It shall be of the positive displacement screw type, designed for steady discharge with minimum pulsations.
    b. The pump shall be of proper size and shall deliver oil into the cylinder in sufficient quantity and pressure to lift the elevator car with specified load atspecified speed. During downward trip of elevator, the oil shall be returnedto the tank by gravity
    c. The motor shall be of standard manufacture, alternating current,

208-volt multiphase squirrel cage induction type, designed for oil-hydraulic elevatorservice. It shall have a duty rating to comply with the speed and load herein specified.

d. The oil control unit shall consist of an up valve, down valve, down levelingvalve, check valve, high pressure relief valve, tank shut-off valve and a manually operated lowering valve. All adjustments shall be accessible and be made without removing the assembly from the oil line. Provide pump anddual lines.

e. Oil reservoir shall be a rectangular reinforced tank. It shall include a cover,oil level gauge, drain plug, and initial oil supply. Oil shall be biodegradable.

f. A strainer that can be readily cleaned shall be provided to prevent foreignmaterials from the oil reservoir from entering the pumps and oil control system.

g. When low temperature conditions exist and the car is in a no-demand situation, the motor shall be automatically turned on and the valve set to bypass for maintaining the correct oil viscosity. Provide heater unit for oil including thermostatic control to maintain proper oil viscosity.

h. Hydraulic Silencers: Provide hydraulic silencer containing pulsation- absorbing material in a blowout-proof housing at pump.

i. The power unit shall be equipped with a vibration isolation device suitablefor use with and approved by the power unit manufacturer. The vibration isolation shall effectively prevent the transmission of power unit vibration tothe machine room structure.

4. Piping, Fittings, and Couplings

a. Piping, fittings, and couplings shall be furnished and installed between thestorage tank, pump, muffler, valves, and cylinder complete with necessarysupports.

b. All connections between the discharge sides of the pump check valve, muffler, cylinder, and lowering valves shall be of rigid steel with screw, flanged, welded, or approved mechanical couplings

c. Pipe supports shall be provided within twelve (12”) inches of every changeof direction in piping.

   1) Supports shall not be more than ten (10’) feet apart.
   2) Secure vertical runs properly with iron clamps at sufficiently closeintervals to carry weight of pipe and contents and provide supportsunder pipe to floor.
   3) Furnish and install all piping from remote machine room to hoistway, including necessary supports and/or hangers

d. Size of pipe and couplings between cylinder and pumping unit shall be suchthat fluid pressure loss is limited to ten (10) pounds.

e. Mechanical couplings, when used, shall be of a self-centering type that provide for some degree of deflection, contraction, and expansion.

   1) Couplings that provide for partial or full separation of the two sections of piping being connected are acceptable,

provided all other specified requirements are met.

2) Couplings shall be rated for a pressure at least three times the working pressure of the elevator and shall be so designed that failure of the flexible sealing element or gasket shall not permit theseparation of the parts connected.

3) Flexible sealing elements or gaskets shall be of a type and materialsuitable for use with the hydraulic fluid furnished.

f. Where piping, fittings, and couplings supplied by the Contractor arecontained within sleeves, conduit, trenches, troughs, or other passage means provided by others to allow for the connection of the power unit withthe cylinder and plunger, the Contractor shall provide appropriate devices which shall effectively prevent the transmission of vibration to the surrounding structure

g. The Contractor shall install all piping, fittings, and couplings used to connect the power drive to the cylinder and plunger in such a way that these may beremoved and replaced at a future date. When Victaulic is used, there shallbe access for inspection and maintenance Destruction of portions of theseitems in the process of removal is acceptable but efforts shall be made inthe designs to minimize the necessity to destroy items.

5. Valves

a. Valves shall be of the unitized manifold type with no more than four (4) solenoids and arranged so that all adjustments are individually adjustablewithout the need for sequential readjustment. Valves shall be designed toensure that oil flow will be controlled in a positive and gradual manner, thereby ensuring smooth starts, operation, and stops of the elevator car.

b. Valves shall be designed for quiet operation and shall be mounted abovethe storage tank in a manner that allows leakage to drain back to the tank.

c. A safety check valve shall be provided which will function to hold the elevatorcar with rated load at any point when the pump stops or the maintained pressure drops below the minimum operating pressure required holding thecar in place.

d. A manually-operated lowering valve shall be provided, which shall permitthe manual lowering of the elevator car in the event of power failure. The location of the lowering valve and access to it shall be described in white stenciled lettering on the front panel of the pump unit. The lowering valveoperating means shall be easily and readily accessible and unobstructed bythe valve wiring, conduits or other equipment. A tank shut-off valve shall be provided to permit isolating the oil in the tank during maintenance operations. The location and orientation of the valve shall allow for safe operation of the handle throughout its range of travel.

e. All additional pump relief valves and other auxiliary valves required by theASME Code or necessary to provide smooth, safe, and satisfactoryoperation of the elevator shall be furnished and installed.

f. Any relief valves having exposed pressure adjustment shall have their adjustment sealed after being set to the correct pressure.

g. Manual shut-off valves shall be provided in the hydraulic oil line in the elevator pit and in the elevator machine room. In any portion of its travel, themachine room shutoff valve handle shall not intrude in the walk space or work space or obstruct access to other equipment.

6. Storage Tank:

a. The storage tank shall be constructed of steel and shall be provided with asteel cover, protected vent opening, overflow connection and a valve drainconnection. The tank shall act as a storage tank only. Suitable gauge glasses shall be provided if the top of the tank is over 4 feet above the floor.An initial supply of oil sufficient for proper operation of the elevator shall beprovided. The tank shall have a capacity equal to the volume of oil required to lift the elevator to the top terminal plus a reserve of not less than ten (10) gallons.

b. The oil storage tank cover shall be arranged for easy unobstructed access.Clearance of twenty-four (24”) inches vertical and eighteen (18”) inches horizontal from tank cover shall be maintained for ease of service.

c. The permissible minimum liquid level shall be clearly indicated. Themanufacturer's recommendation of type of oil to be used shall be included in the written instruction for the care, adjustment, and maintenance of theequipment. The flash point of oil used shall be not less than 400 degrees F.

d. Provide an oil filtering system that removes contaminants that can clogvalves and settle in the bottom of the tank.

e. Blowout-proof foil-hydraulic muffler of an approved make shall be furnishedand installed in the oil line near the power unit to reduce noise to a minimum.

7. Oil Temperature Control

a. Tank Heater: Hydraulic oil viscosity/temperature control shall be providedby the application of an internally mounted, thermostatically controlled, tank heater. The oil temperature shall be maintained at a maximum 110 degreesFahrenheit with the use of a 120V AC powered tank heater. The unit shallbe permanently mounted, integral with oil reservoir, and with a lighted switch/indicator to visually confirm unit is powered. The tank heater shall include the switch for disconnection of power during maintenance/repair operations. The unit shall be hard wired to electrical source per ASME A17.1.

b. Hydraulic Oil Cooler: Provide a thermostatically controlled hydraulic oil cooler to maintain hydraulic oil at the OEM’s recommended optimum operating temperature.

c. An Electrical Box for direct wiring to 115VAC, 30 Amp separate circuit.

d. All fittings and hardware needed for adjacent-mount installation and remotewall mount installation.

e. Heat Tracing: Hydraulic piping shall be electric heat traced for maintainingcorrect oil viscosity

1) Heat tracing controller shall be mounted in the elevator controlroom.

2) Heat trace controller shall indicate the system proper operation andsystem failure

8. Hydraulic Jack Assembly: The jack unit shall consist of:

a. A cylinder constructed of steel pipe of sufficient thickness and suitable forthe operating pressure as prescribed by the latest revision of the ASME/ANSI A17.3. Code. The top of the cylinder shall be equipped with acylinder head with a drip ring to collect any oil seepage as well as an internalguide ring and self-adjusting packing.

b. A plunger constructed of selected steel tubing or pipe of proper diameter machined true and smooth with a fine polished finish. A stop ring electrically welded to the plunger to positively prevent the plunger from leaving the jackunit casing. Plunger shall have a double bottom construction.

c. The cylinder head shall be equipped with an adjustable packing gland designed to effectively prevent leakage of oil. A scavenger pump shall beprovided to return oil to the system. It shall be located so as not to obstructthe path between the pit entrance and he cylinder.

d. The packing gland shall be constructed to permit easy repacking.

e. The cylinder shall be provided with a means to release air or other gas andshall have a drip ring below the packing gland to collect all oil leakage.

f. The cylinder shall be isolated from rails, pit channel, building structure, andother sources of possible corrosive or galvanic damage by dielectric insulation of the cylinders.

g. The cylinder shall be coated with corrosion-rust resistant primer and paintedwith a dark gray industrial epoxy or other approved paint

h. Gaskets and pads for dielectric insulation shall be neoprene or approved alternative. Insulating sleeves, washers, and oil line coupling shall be provided where specified or shown

i. The plunger shall have a solid-state control/sensor component detect sudden downward movement of the elevator and immediately grasp the plunger, preventing the elevator from falling. It shall activate automaticallyand shall not damage the plunger, even with repeated settings. It shall beactivated by an overspeed in the downward direction, or by lack of voltageto the DOWN coil when the car is traveling in the down direction.

j. A pipe rupture valve as near as possible to each cylinder as a safety devicein case of failure in the cylinder supply line or when the down speed exceeds the field adjustable limit; bringing the car to a smooth and safe stop.With the valve, the deceleration rate shall be less than 1g and be non-adjustable.

k. Pipe Rupture Valve to be “R10” as manufactured by Electro-Mech. Industries or approved equal.

l. An internal plastic laminate guide bearing.

m. Manufacturers: Provide hydraulic jack assemblies of one of the following:

1) Leistritz Corporation, 165 Chestnut Street, Allendale, New Jersey,Tel.(201) 934-8262.
2) VERTX, 1125 Schilling Boulevard East, Suite 101,

Collierville,Tennessee 38017, Tel. (866) 448¬3789

3) M/S ALGI (Alfred Giehl) GmbH & Co. KG D-65399 ELTVILLE AMRHEIN, Tel. +49 (0) 6123-608-0 Fax -608 150.

9. Guide Rails: The car guides shall be accurately machined standard section planedsteel tee guide rails with tongue and grooved joints, weighting not less than specifiedin the ANSI Code. The rail sections shall be joined together in accordance with therequirements of the Code. The guides shall be erected plumb within 1/8 inch. Theyshall be properly located and supported so as not to become distorted by eccentricloading. They shall be suitably bottomed in the pit and shall extend the full height of the hoistway. All connections and fastenings to track structure shall be isolated from earth ground by neoprene pads and sleeves.
10. Roller Guide Shoes: Roller guide shoes shall be furnished, securely bolted to the car frame at the top and the bottom. Each roller guide shall consist of a set of three sound-reducing wheels to run on the three finished rail surfaces. The wheel shall be mounted in precision type ball bearings and held in contact with the rail surface bymeans of adjustable cushioning devices.
11. Buffers: Substantial spring buffers shall be installed under the cab and counterweight. Buffers in the pit shall be mounted on continuous channels which are fastened to the guide rails. Spring buffers or their equivalent to be permitted to beused where the rated speed is not in excess of 1 m/s (200 ft/min).
12. Inserts: Furnish required concrete inserts and similar anchorage devices for the installation of guide rails, machinery, and other components of elevator work whereinstallation of devices is indicated as work of another specification section or contract

B. Operation

1. Operation shall be automatic. Automatic operation by means of car and landing buttons. Stops registered by momentary actuation of car buttons to be made irrespective of number of buttons actuated or of sequence in which buttons are actuated.
2. Operating panel in the car containing bank of buttons numbered to correspond to landing served position indicators. EMERGENCY CALL button, keyed EMERGENCY STOP button, DOOR OPEN/DOOR CLOSE buttons, independent maintenance key switch, and key-operated light and fan switches, with legends asspecified. Identification as specified for emergency telephone. An Emergency callbutton connected to bell that serves as emergency signal. Panel finish shall be Stainless Steel.
3. Landing: Single push button fixture shall be provided at each terminal landing. Button fixture having push buttons with UP and DOWN legends at intermediate landing shall be provided. Button identification as specified for Person(s) with disabilities per latest ADA regulation (ADA. rule 4.10.3) shall be provided.
4. Momentary pressure on the car button or landing button illuminates that button, which remains illuminated until call is answered. Illuminated buttons serve as visual indication that call has been registered and that car will stop at that landing. The PushButtons shall be round, have a Metalized Halo and center jewel. The metalized halo shall be from different color and approved by CTA Engineer

5. Stops, registered by momentary actuation of landing buttons. All stops subject to respective car or landing button being actuated sufficiently in advance of arrival ofcar at that landing to enable stop to be made. Direction of travel for idle car established by first car or landing button actuated.
6. UP landing calls answered while car is traveling in up direction and DOWN landingcalls answered while car is traveling down, car reversing after uppermost or lowermost car or landing call has been answered and proceeded to answer car callsand landing calls registered in opposite direction of travel.
7. Elevators to park at the secure landing level selected by the Engineer
8. Push button units to be PB-46 NEMA-4x Series or approved equal with button identification as specified by latest ADA regulation shall be provided.
9. Emergency stop shall be key-operated rather than push-pull arrangement with keyremoval only in off position.
10. All elevator car control panel operating devices shall be designated by Braille andby raised standard alphabet characters for letters, Arabic characters for numerals,and standard symbols as required by the Code and ADAAG.
11. Lettering shall have a highly visible coloring, such as white, that is permanently affixed.
12. Independent Service: Provide a key switch in the car operating panel which, whenactuated, shall cancel previously registered car calls, disconnect the elevator fromthe hall buttons and allow operation from the car buttons only. Car door shall remainopen unless closed fully by the door close button
13. Two- Stop Collective Simplex Automatic Operation: The Two-Stop Collective Simplex Automatic Operation shall be used and checked for the following:

    a. The System shall be designed so that when the car is standing at either terminal landing, pressure on car button for the other terminal shallautomatically dispatch car to that landing. Pressure of landing button at either terminal landing shall call car automatically to that landing. If a landing call is registered while the car is making its trip that call shall remain registered until the car responds to that call. If no car calls are registered,the car shall start automatically and respond to hall calls. Provide time limit relay arranged to hold car at landing at which it has stopped for predetermined time after car stops. After all car landing calls have been answered the car shall remain parked at landing where last used with carand hoistway doors closed until another call is registered. Pressing the landing button at floor at which car is parked shall automatically open carand hoistway doors. In all normal operations, the starting of the car shall becontingent upon establishment of hoistway door interlock and car door circuits.
    b. Automatic Dispatching Operation: All two-stop elevators shall include “Step-in-and Go” feature. Calls for the opposite landing will be automaticallyset when the elevator opens its doors for a hall call. This feature shall be provided for all elevators that have public access for two stops (i.e., any elevators with key-operated service landings will be included).

14. Position Indicators

a. Landing Indicator: In accordance with ADA requirements. Two-element direction-of travel indicator mounted above call station or hoistway entranceas shown including one red and one white indicator. Direction of car's operation shown by illumination of red indicator for DOWN and white indicator for UP.
b. Car Indicator: In accordance with ADA requirements. Mounted in vertical row in car-operating panel to show position of car in hoistway by illuminationof indicators corresponding to landing at which the car is stopped or passing. Finish for exposed-to-view metal components: Stainless Steel.
c. In Car signals: Audible signal indicating car's direction of travel, signal sounding once for UP direction and twice for DOWN direction
d. Landing signals: Audible signal at each hoistway entrance indicating car'sdirection of travel, signal sounding once for UP direction and twice for DOWN direction.

15. Lighting

a. Machine Room Emergency Lighting: Emergency lighting shall be providedin each elevator machine room.
b. There shall be a minimum of one lighting fixture.
c. Car interior: LED fixture, 120V operation, with clear prismatic glass diffuser, flush mounted in ceiling, cool white bulbs. Illumination level shall be 15-footcandles minimum at car operating panel.
d. Car top and underside of car floor: Medium base porcelain lamp receptacles, with wire lamp guards.
e. Car Emergency Lighting:

1) Fixture: Recess mounted, with stainless steel frame, location asshown.
2) Diffuser: Prismatic polycarbonate plastic.
3) Lamps: Two (2), size 16 51

16. Remote power supply

a. Power pack: Sealed gel cell battery with integral regulating charger and analarm bell.
b. Capable of operating bell for one (1) hour minimum, light at car-operatingpanel at 0.2 low candles minimum for four (4) hours minimum and ventilationfan for o (1) hour minimum.
c. Location: The remote power supply shall be located in top-of-car or COPwith easy access provided.

17. Inspection Operation: Key switch in car to nullify car and landing buttons permittingoperation of elevator from top of car for inspection purposes:

a. Top of Car Inspection Station: The Inspection Station contains continuouspressure UP and DOWN buttons, emergency stop button and toggle switch to activate inspection devices. The device shall also have an 110v ac outletfor extension cord and provided with a light and guard.

18. Leveling: Automatic 2-way leveling. Leveling device to stop car within 1/8

inch of landing level regardless of load or direction of travel. Landing level maintained withinleveling zone irrespective of hoistway doors being open or closed.

a. Automatic Leveling: The power unit shall be designed and coordinated with the control so that the car shall slow down and stop automatically at the floor after transition from contract speed. Car level shall be maintained automatically within 1/8 inch (3.2 mm) of the landing by an anti-creep leveling device regardless of any deviation that may be caused by the loading or unloading of the car.
b. Landing zone detection shall indicate to the control system the position ofthe car with respect to the floor level.

19. Pit Emergency Stop Switch: An emergency stop switch shall be provided in the elevator pit, designed to bring the car to rest independent of the regular operatingdevices.
20. Low Oil Protective Device: A low oil protective control circuit shall be provided to automatically stop the car should the oil level become insufficient to permit the carto respond to an upper floor call. The system shall automatically bring the car downto the lowest landing and open the doors. It shall then shut down until the conditionhas been rectified, after reaching the lower terminal
21. Hoistway Access Switch: A constant pressure key switch shall be provided at the top and bottom terminal floor. Activation of the access switch shall move the car awayfrom the terminal floor at reduced speed with car door and hoistway door in the openposition for inspection and maintenance.
22. Provide intermittent automatic operation, once every 3-4 hours, through the wholefull run of the cab. Cycling shall be the full 24 hours each day throughout the yearto lubricate the shaft and the seals.
23. When the elevator is not in use or the on/off key switch is in the off position, the cabshall return to the Customer Assistant's Kiosk level or level designated by Authority.
24. Emergency Return: For each elevator provide battery emergency return device interfaced with the elevator control equipment. In the event of either a power failureor a single phase condition the elevator automatically returns to the floor designated by the Authority, where doors open to allow any passengers to exit. After expirationof the door open interval, doors close and the elevator shuts down until normal powerof the 3 phase condition is restored. Doors shall be opened by pressing the door open button from within the car. All other loads such as cab lighting, alarms, and fansshall be connected to the station emergency or standby power system. The elevator recall function shall be programmable.

C. Emergency Service

1. Controls to return elevator to designated floor by means of key-operated switch outside street or ground floor hoistway entrance in compliance with ASME A17.1.
2. In car control during emergency operation by means of key switch in compliance withASME A17.1.
3. Terminals on elevators controllers for connection of circuit from heat and smoke sensing devices, with wiring from sensing devices to elevator controller

D. Telephone Facilities

1. Provide all audio/visual communication, signaling, and monitoring in accordance with ADA. “Hands-free” phone integral with control panel, mounted in accordance with ADA requirements; having inscription EMERGENCY TELEPHONE as specified for Person with disabilities; finish exposed-to-view components to match stainless steel control panel; and color of letters to contrast with panel.

    a. Provide emergency communicators in accordance with ADA requirementsto include auxiliary push button to summon help and visual feedback indicating that the call has been responded to.

2. Provide wiring and jacks for a portable self-contained battery-powered maintenancetelephone system. Jacks shall be located on car top, inside car, and in machine room. Furnish three (3) telephone instruments for use of maintenance personnel.

E. Electrical Equipment:

1. Electric equipment for elevator shall be designed, selected, and fabricated in accordance with NEC, NEMA, IEEE Standards, applicable jurisdictional codes, and additional specified requirements. All equipment including motors, controllers, service cabinets, circuit breakers, switches, panelboards, indicators, lighting, wiring, conduit, boxes, and other appurtenances for proper installation and operation of theelevator shall be furnished and installed by the Contractor.
2. All electrical components shall satisfy the City of Chicago Code.
3. Cable and wire for external circuits between the various items of elevator equipment,exclusive of the traveling cable, shall comply with the requirements specified below. The talk pair of the voice communications intercom system shall be shielded with 0.008-inch, minimum, copper shield.

    a. General Requirements for Single-Conductor and Multiple-Conductor Cable:

        1) Type and size: As shown or as required by code.
        2) Rated voltage: 600 volts.
        3) Conductors:

            a) ASTM B3 or ASTM B8 annealed copper.
            b) Size 10 AWG and smaller: Solid or Class B or Class Cstranded.
            c) Size 8 AWG and larger: Class B stranded.
            d) Other constructions as specified.

        4) Standards: Except as modified, wires and cable complying with the following:

            a) Cross-linked polyethylene (XLPE) insulated cable: NEMAWC 70.
            b) Other cable: NEMA WC 70.

        5) Nonmetallic jacket for single-conductor cable and individual conductors of multiple-conductor cable and as overall covering onmultiple-conductor cable:

a) Choro-sulfonated polyethylene or cross-linked polyolefin.
b) Cross-linked polyolefin complying with the followingphysical requirements.

6) Properties tested in accordance with NEMA WC 70 if ethylene- propylene rubber (EPR) insulation is used or with NEMA WC 70 ifcross-linked polyethylene insulation is used. Jacket material free ofPVC and PVC-based compounds.

a) Tensile strength, minimum pounds per square inch: 1,800.
b) Elongation at rupture, minimum percent: 150.
c) Aging requirement: After 168 hours in air oven test at 100EC, plus or minus one degree C.
d) Tensile strength, minimum percentage of unaged value:100.
e) Elongation at rupture, minimum percentage of unagedvalue: 80.
f) Oil immersion: 18 hours at 121EC, plus or minus onedegree C, ASTM D471, Table 1, 2 oil:

(1) Tensile strength, minimum percentage of unaged value: 80.
(2) Elongation at rupture, minimum percentage of unaged value: 80.
(3) Jacket materials other than cross-linked polyolefin complying with NEMA WC 70. Jacket material free of PVC and PVC-based compounds

g) Flame Retardancy: Single-conductor and multiple-conductor cable demonstrating flame retardancy in accordance with the following

(1) Single-conductor cable and individual conductors of multiple-conductor cable passing vertical flame test in accordancewith UL 1591 or NEMA WC 70. Cable size for testing: 14 AWG.
(2) Single-conductor and individual conductors of multiple-conductor cable passing vertical tray flame test using ribbon gas burner in accordance with IEEE 1202.
(3) Multiple conductor cable passing vertical tray flame test, using ribbongas burner in accordance with IEEE1202

h) Applied voltage testing:

(1) Single-conductor cable and individual conductors of multiple-conductor cable to be given applied ac voltage dielectric

strength test, i.e., six-hour water-immersion test.

(2) For single conductors of multiple-conductor cable, conducttests prior to assembly as multiple-conductor cable.

b. Test procedures:

1) Polyethylene insulated conductors in accordance with NEMA WC70.
2) Other conductors in accordance with NEMA WC 70.

c. Single-Conductor Cable:

1) Insulated with ethylene-propylene-rubber with non-metallic jacketor unjacketed filled cross-linked polyethylene. UL-labeled Type RHW or XHHW.
2) Color coding: In accordance with paragraphs 200-6, 200-7 and 210-5 of the NEC.

d. Multiple-Conductor Cable:

1) Individual conductors:

a) Number of conductors: As shown or as required by code.
b) Construction: Complying with one of the following:

(1) Insulated with ethylene-propylene-rubber, withor without nonmetallic jacket as specified.
(2) Insulated with composite compound of ethylene-propylene-rubber and polyethylene, UL Class EPCV, without outer jacket.
(3) Insulated with filled cross-linked polyethylenewithout jacket.

e. Phase and neutral conductors: Individually insulated.
f. Neutral conductors: Same size as phase conductors.
g. Bare ground conductors: Sized in accordance with the NEC, unlessotherwise shown.
h. UL-listed as Type RHW or XHHW.

4. Conductors assembled with non-wicking, flame-retardant filler to form cable ofcircular cross Section
5. Metallic-sheath: Provide one of the following

a. Continuous smooth aluminum sheath in accordance with NEMA WC 70.
b. Continuous corrugated aluminum sheath in accordance with NEMA WC 70.
c. Interlocked aluminum tape armor.
d. Multiple-conductor cable provided with overall nonmetallic jacket asspecified
e. Cable UL-listed as follows: Metallic-sheathed cable: Type MC, suitable forwet and dry locations

6. Color coding:

    a. Power cables: In accordance with paragraphs 200-6, 200-7 and 210-5 of theNEC.
    b. Control cables: In accordance with NEMA WC 7

7. Fixture Wire: UL 62, with the following additional requirements:

    a. Type: Suit temperature rating of lighting fixture, minimum 194EF.
    b. Conductor: Stranded copper conductor 16 AWG or larger as shown.
    c. Bare Conductor: ASTM B3 or B8, annealed copper conductor; 8 AWG andlarger, class B stranded

8. High temperature wire for ballast resistors

    a. Ballast resistors should be wired using high temperature wiring rated at 200 deg. C minimum.

9. Traveling Cable

    a. The elevator car traveling cable shall be type ETT conforming to the requirements of the NEC with minimum conductor sizes as specified in theNEC. Individual conductors in the cable shall have a distinctive color codefor identification. Traveling cable exceeding 100 feet in length shall have steel supporting fillers. Traveling cable 100 feet or less in length shall havesteel or non-metallic fillers.
    b. Cables shall be free from any possible contact with hoistway structure, caror other equipment. Furnish and install shields or pads to protect the cables.
    c. Two (2) coaxial cables shielded for the CCTV system.
    d. Four (4) twisted shielded pairs for security and telephone systems. Cablesshall be 100% interchangeable and shall be compatible with the Nitek EL1500CW Coax IP Extender or an approved equal.
    e. Cables shall include ten percent (10%) spare wires between each controller, selector, and hoistway junction box, all spares to be properly tagged or otherwise identified with clear and indelible markings.
    f. Traveling cable shall be Draka Superflex® Traveling Cable or an approvedequal.
    g. Traveling cable routing:

        1) Traveling cable should be run to the top of the elevator car throughthe properly sized conduit mounted on the outside of the elevatorcar.
        2) Traveling cable may be routed through the wiring chase designedspecifically for that purpose and build into the elevator car.
        3) Traveling cable should not be routed though the car pushbutton station enclosures.

10. Wiring identification and labeling

    a. Each wire and each cable shall be labeled at terminals and at all

accessiblepoints in equipment, panelboards, control panels, motor control centers, manholes, handholes, and pull boxes. Labels shall be self-sticking wire markers.

b. Each cable run shall be assigned a circuit number and shall be recorded ona cable schedule showing from, to, purpose, number of conductors and length. Each wire shall be labeled according to the submitted shop drawings and wiring diagrams

c. Cable/wire markers shall be the wrap-around self-adhesive type, with factory or mechanical printed numbers, letters and symbols which shall beused to identify all feeders, mains and branch circuit conductors.

d. All conductors shall be tagged on both ends at the time wires are pulled inand tested and markers shall not be removed for any reason.

e. Phase identification letters, in readily visible locations, shall be stamped into the main bus bars of switchboards and panelboards

f. Cable/wire markers shall be installed on both ends of all conductors, bothfor internal and external cables. The cable/wire markers for externalconnections shall comply with Section 26 19 50 Identification. The cable/wire markers for internal wires and cables shall be self-adhesive, self-laminating mechanically printed with a clear protective laminating overwrap or mechanically printed with a clear protective laminating over wrap or sleeve type tubing mechanically printed with permanent non-smearing ink. Sleeve type wire markers shall be properly sized for the conductor theyare being installed on.

11. Equipment grounding shall be furnished and installed. Ground conduits, supports,controller enclosures, motors, platform and car frames, and all other non-current conducting metal enclosures for electrical equipment in accordance with Code. Theground wires shall be copper, green, insulated and sized as required.

12. Terminal connections for all conductors used for external wiring between various items of elevator equipment shall be solderless pressure wire connectors in accordance with Code. The Contractor may at his option make these terminal connections on No. 10 or smaller conductors with approved terminal eyelets set onthe conductor with a special setting tool, or with an approved pressure type terminalblock. Terminal blocks using pierce-through serrated washers are not acceptable.

13. Provide separate disconnect for cab lighting and wiring to cab. Provide a separatedisconnect for sill heaters.

14. Car lighting and fan circuit for the elevators shall be located in circuit breaker panelin the controller space. Cab lighting, fan and alarms shall be connected to a reliablepower panel. In case of a power outage, the reliable panel serving these loads shallbe connected to the building emergency or standby power system.

15. Electric Heater for the Elevator Pit: Washdown duty corrosion resistant unit heater.The heating elements shall be corrosion resistant 300 stainless steel sheathed with 316 stainless steel fins for maximum heat dissipation. The elements are to be attached to junction box with leak resistant stainless steel fittings. Motor should beTEFC, epoxy coated for corrosion protection.

16. Conduits and fittings

    a. All conduits used in elevator shaft and machine room shall be

heavy wall rigid hot dipped galvanized steel except where specified or indicated otherwise.

b. All conduit fittings and connections shall be compression type. The use ofset screw or indentations as a means of attachment is not permitted.

c. Size conduit per NEC for conductor type installed or for Type THW conductors, whichever is larger; 3/4-inch minimum size for conduit.

d. Conduits for small devices such as door switches, interlocks, etc. shall bepermitted at ½ inch.

e. The total overall cross sectional area of the wires contained in any conduitshall not exceed 40 percent of the internal area of the conduit.

f. Arrange conduit to maintain headroom and present a neat appearance.

g. Route exposed conduit parallel and perpendicular to walls and adjacent piping.

h. Maintain minimum 6-inch clearance between conduit and piping.

i. Maintain 12-inch clearance between conduit and heat sources such as flues, steam pipes, and heating appliances.

j. Arrange conduit supports to prevent distortion of alignment by wire pullingoperations. Fasten conduit using galvanized straps, lay-in adjustablehangers, clevis hangers, or bolted split stamped galvanized hangers.

k. Group conduit in parallel runs where practical and use conduit rackconstructed of steel channel with conduit straps or clamps. Provide spacefor 25 percent additional conduit on racks.

l. Do not fasten conduit with wire or perforated pipe straps. Remove all wireused for temporary conduit support during construction, before conductorsare pulled.

m. No conduit shall be attached to a cable tray

n. Approved strain boxes shall be installed for all vertical runs in accordancewith Code.

o. Rigid conduit and fittings shall be UL-Listed rigid galvanized steel conforming to the requirements of UL 6 and NEMA C80.1. The minimum diameter shall be three-quarter (3/4”) inches for power circuits, one inch forfire and intrusion circuits, and two inches for audio and control circuits.

p. Liquid-tight flexible conduit shall conform to the requirements of UL 360 andconsist of a flexible galvanized steel core containing a copper bonding conductor spiral-wound between convolutions and a neoprene or PVC jacket overall. Fittings for liquid-tight flexible conduit shall be watertight andshall conform to the requirements of UL 514

q. All conduits (rigid steel and liquid tight flexible) should be permanently secured with metallic clamps. Zip ties are not acceptable to use aspermanent use.

17. All electrical connections outside of electrical panels or junction boxes shall be madeusing military spec connectors. Connectors shall be waterproof, environmental resisting with strain relief, vibration resistant, Mil-DTL-5015, MIL- DTL-26482, MIL-DTL-22992, MIL-DTL-38999, MIL-DTL-28840, MIL-DTL-83723

18. Electrical Boxes

a. Outlets, junction and pull boxes shall be galvanized sheet steel

or galvanized malleable iron, cast iron, or ductile iron conforming to the requirements of UL 50, UL 514 and NEC paragraph 370-C. Pull boxes shallhave a screw cover with a liquid-tight gasket.

b. Junction boxes on car bottom and hoistway connecting the traveling cableshall contain approved terminal blocks for connection of traveling cable conductors. Terminal blocks shall have indelible identification numbers foreach terminal connection.

c. All wire connection terminal blocks shall have the same identification number as labeled on the associated electrical wiring. All electrical wires shall use a labeling tube and heat shrink and match the terminal numbers.

d. During field installation of junction boxes or control boxes, the Contractor/Subcontractor shall not drill or cut into the top sides of the boxfor wiring.

e. All boxes shall be accessible without removal of other components.

f. All boxes in the machine room or pit shall be mounted on strut channels inorder to prevent future corrosion and water damage. The strut channels shall be mounted on the wall and has a minimum of one and one-half (1-1/2) inches thickness and eighteen (18) inches above the floor.

g. All boxes (junction, pull-through etc.), conduits and any electrical devicesshall be installed in height of twelve (12) inches minimum from the elevatorpit floor. There shall be no electrical conduits installed on the elevator pit floor.

h. All solid state and electrical components located on top of the car enclosure or in the hoistway shall be installed within NEMA 4X enclosures.

i. All connections to and from the cabinetry shall be flexible in order not to compromise the isolation system. Use flexible conduit for the final electrical connection, with all other conduit supports and clamps provided on a neoprene sponge insert. Cabinets shall be NEMA 4X.

19. Disconnect Switches for Car Lights and Mainline Power

a. Disconnect switches shall be the following: UL 98, NEMA KS 1, heavy- duty, quick-make/quick-break switching mechanism with operating handle external to enclosure, with positions labeled ON and OFF, non-defeatable interlock to prevent opening of enclosure door when switch is ON. Enclosures shall be NEMA 250 Type 4X. Label disconnects switches in accordance with the NEC.

b. Mainline power disconnect switch shall be located in close proximity to themachine room entrance and shall be easily identifiable from other disconnects.

20. Circuit Breakers and Panelboards

a. Circuit breakers shall be the following: UL 489, molded-case, bolt-on quick-make/quick-break, mechanically trip-free switching mechanism, withthermal trip for inverse time delay overcurrent protection and magnetic tripfor instantaneous short-circuit protection. The circuit breakers shall be designed to carry continuous rating in ambient temperature of 40ºC.

b. Panelboards shall be the following: UL 50, NEMA PB 1, latch and handlein accordance with UL 50, minimum side gutter size of four (4") inches, a busbar of 98-percent-conductivity copper with contact surfaces silver-plated ortin-plated, rating of neutral and ground buses equal to phase bus rating, neutral bus mounted on insulated block, neutral and ground buses equipped with integral mechanical connectors, one (1) inch high engravedplastic nameplate with two (2) inch high letters on black and attached withstainless steel fasteners. Enclosures shall be NEMA 4x.

21. Pit Receptacles and Lights

a. Electrical power receptacles shall be furnished and installed in the elevator hoistway, pit, and top of car as shown or required by code. Each receptacleshall be duplex, ground fault interrupter type, resettable at the receptacle;waterproof; grounded, and rated for 120V at 20A.
b. Maintenance lighting shall be furnished and installed in the elevator hoistway as shown or required by code. Lighting shall be vapor-tight servicelights with quick start type PL compact fluorescent lamp. Furnish and install light switches; waterproof; grounded. The light switches shall be so located as to be accessible from the pit access door.

22. Drive Unit Motor

a. Motor shall be designed specifically for elevator service. The drive motor shall be of the alternating current, intermittent duty, 120 starts per hour, service factors, squirrel cage induction type design adapted to the severerequirements of elevator service. The Elevator Drive Unit Motor shall be single-speed. The motor shall be suitable for operation on a 208V, three-phase, and 60Hz supply and capable of developing the required starting torque. In lieu of 208V, Contractor may furnish and install a transformer for conversion of 208V to 480V.
b. The Motor shall be rated in accordance with NEMA Standard MG 1 for 60-minute rating motors and shall have sufficient capacity to operate the elevator with specified rated load at specified rated speed without overheating. The insulation and the starting and running torque of the Motorshall be capable of permitting operation in accordance with NEMA MG 1.Standard factory motor test data and motor dimensions shall be submitted to the Contractor for approval. Each Motor nameplate shall include the motor HP rating, voltage; full-load amperes, locked rotor amperes, full-loadspeed, design temperature rise, and NEMA design rating of the Motor. Each Motor shall be provided with ring or other suitable lifting means. The Motorframe shall be tapped and drilled for a copper cable grounding connection. Insulation of windings shall be NEMA Class B, fully impregnated and baked to prevent the absorption of moisture and oil. The insulation resistance between motor frame and windings shall be greater than one megohm.
c. Motor bearings shall be of the ball or roller type, arranged for grease lubrication and fitted with grease gun connections and drain plugs or fittedwith sealed-for-life bearings. The bearings shall incorporate dust- tight lubricant seals.

d. Motor shall be provided with an electronic soft start feature and thermal overload protection for each phase.

e. Connect motor and pump with multiple V-belt.

1) Belts and sheaves shall be sized for duty involved and designed toprevent any metallic contact between motor and pump shaft.

2) Furnish and install isolation units of rubber in shear to preventtransmission of pump and motor vibration to building.

3) Furnish and install expanded metal sheave guard that can be easilyremoved for servicing and inspection.

23. Elevator Controller

a. An Allen Bradley (or CTA Engineering approved equal) PLC-based controller shall be provided, governing starting and stopping as well as preventing damage to the motor from overload or excessive current. The controller system shall automatically cut off the motor current and bring thecar to rest in the event any of the safety devices become activated.

1) The system shall coordinate the functioning of elevator drive unit relative to actual location and status of the elevator. The system shall interface with the door control and all required safety circuits,switches, and devices. The controller shall be mounted in a NEMA4X stainless steel, air-conditioned cabinet within the controller room.

2) The diagnostic system shall be an integral part of the controller andprovide user-friendly interaction between the service person and the controller system.

3) The controller shall be capable of operating with an operating temperature range of 32 deg. F to 140 deg. F within a non-drip environmentand no more than ninety (90%) percent relative humidity. However,the air conditioner on controller cabinet shall maintain the operating temperature in range of 50 deg. F to 80 deg. F.

b. An Allen Bradley CompactLogix 1769-L32E (or CTA Engineering approved equal) based PLC control system shall be provided

1) Control system shall be provided with Ethernet/IP, RS-485, DeviceNet, DH-485 and Modbus TCP protocols for communication with external devices such as data collecting controllers, HMIs anddata servers.

2) The PLC CPU module shall store the last 99 faults, accessible vialaptop connection, controller fault/status display and remote communications. The contractor shall provide CTA with a programming and monitoring unit, such as a laptop computer withthe newest version of Allen Bradley RS-Logix and any other software required to setup and program all electronic items in the control system, for each elevator, for the purpose of troubleshooting and remote monitoring modifications. The laptop should allow uploading, editing, and downloading any software that is being used on this

elevator for any operation

3) The elevator manufacturer for each elevator location shall providethe Authority with a laptop computer, Windows based with latest operating system, latest generation of Intel i7 or higher processor(with the program and software installed with required cables to plug into the PLC and all other accessories to use for diagnostic purposes of the elevator system. Manufacturer shall provide non-proprietary diagnostic software, Elevator program with all input/outputs descriptions showing each rung and other required software installed in the computer for use by the Authority's elevator technicians.

4) An Allen Bradley PanelView Plus 6, EZ Automation or CTAEngineering approved equal, fault/status display/interface shall beprovided in the controller cabinet. Control system timers and othersetup criteria shall be programmable through this unit. All fault, status and setup data shall be stored in the controller CPU moduleand accessible form the HMI. Submit all screens and menus for CTA review and approval.

5) In cases where the programming is done by the supplier, the supplier shall provide a copy of all working programs, including labels for all inputs and outputs, data tables and internal logic points, on Flash Drives/CD-R disks as well as a printed program listing. The programs and setup data shall require a password foraccess and modification. The password shall be provided to CTAEngineering as part of the Submittal

6) The main control of an elevator shall contain at least the followingdevices or electronic sensing: phase failure line voltage monitor, motor current and ground fault monitor

7) The controller cabinet shall contain a permanently mounted fault indicator panel with LED indicator lights. Tripped safety devices, door position, door reversal, car running status, and control systemstatus shall be indicated

8) All terminals shall have identification markings and all wires,including field wires, shall be provided with permanent heat- shrinksleeve cable markers. These wiring identifications shall be provided in the wiring diagram at each end of the circuit connections. Wiring shall meet the requirements of section 26 1750 Local Control Panels and 26 19 50 Identification.

9) The controller shall be equipped with the AC vector drive installedin-line before the hoist motor contactor and the hoist motor.

10) The AC vector drive shall be capable of accelerating and decelerating the hoist motor smoothly and gradually. Adjustable settings for acceleration and deceleration ramps shall be provided.

11) The controller shall have, at least, one dedicated ethernet port andone dedicated rs-485 serial port for interface to the Modbus TCP and DH485 monitoring network and programming access withoutdisconnecting any other

ports.

12) The Programmable Controller shall have at least one dedicated port to support the controller fault/status display

13) The controller PLC shall provide the following Remote Monitoringand diagnostic network support:

    a) All applicable faults, statuses, and data listed in Table 1,Elevator Fault Table, to be provided.
    b) Fault indications shall remain until reset in the controller.
    c) Status and analog data to be provided for the duration ofthe condition.
    d) Provide elevator run timers and trip counters. Provide doorcycle counters. All counters and timers to be accessible form the HMI
    e) Software in the controller PLC to format monitoring data responses to data collecting controller polling as specified in the specification.
    f) The monitoring data port in the controller to be setup for Modbus TCP protocol with the port network identificationnumber programmed for the particular elevator identification.
    g) All faults, statuses, and data to be held by the controller CPU and sent from the CPU when polled by the externaldata collecting device.
    h) All faults, statuses and data to be accessible form the HMIdevice.

14) Provide sufficient non-volatile CPU memory, for non-volatile retention of program memory, system status, and operating parameters

15) Diagnostics

    a) The processor shall have built-in diagnostics and self- test,such that each time power is cycled, the processor does acomplete CPU and RAM memory test. Additionally, the power-up test will momentarily light up all diagnostic LEDsto be sure they are working. A power up test will not be performed if the internal flag (bit) for Fireman's Service Phase I is latched. The processor shall be capable of reporting major and minor fault codes and processor status information back to the data collecting controller, providedthe fault is not a catastrophic hardware failure where the processor is unable to power up.
    b) The processor shall have a built-in watchdog timer to ensure that all processor program scans occur within thetime limit set by the watchdog timer.
    c) The processor shall have individual LED indicators that areclearly visible and labeled for easy identification. At a minimum, the following

indicators must be provided:

d) CPU is in RUN mode.
e) CPU is FAULTED.
f) CPU battery is LOW.
g) I/O points are FORCED and are not under program controlCOMMUNICATION channels are active.

16) Input/Output Modules

a) The Input/Output Modules shall be compatible with the PLC processor I/O structure. Each module shall be provided with a detachable terminal strip to connect wiringto the module. Each wire on the terminals shall be identifiedby the module terminal.
b) Discrete Input Modules: Suitable for the input voltage andcompatible with the Allen Bradley system.
c) Discrete Output Modules: Suitable for the voltage and load and compatible with the Allen Bradley system.
d) Analog Input Modules: Converts analog signals to proportional twelve-bit binary values. The module shall accept 4 to 20 mA signals. Provide modules compatible with the Allen-Bradley system.

17) I/O Mounting and Power Supply

a) The controller chassis shall have an additional three spare modules.
b) Power supplies shall provide power to the PLC processors, I/O and other function modules. The power supply shall besuitable for operation of 120V AC, single phase power. Power supply capacity shall be a minimum of 150% of the connected load.

18) Air Conditioning

a) Provide an independent air conditioning unit with drip- freeactive condensation evaporation system for each controller to maintain manufacturers recommended operating temperatures. The air conditioner shall be equipped with fully-programmable digital controller with temperature and pressure monitors for smarter air conditioning. The air conditioner shall have NEMA 4X enclosures and use 120 VAC or 24 VDC power source for calculated BTU/hour.

19) Selective Collective Operating: As defined by ASME A17.1 and shall be the pressure upon one or more car

buttons to correspondto landings in the order in which the landings are reached by the car,irrespective of the sequence in which the buttons are pressed, provided the hoistway door interlock and car door switch circuits are completed. During this operation, the car shall also answer calls from the landings, which are in the prevailing direction of travel. Each landing call shall be canceled when answered.

a) Momentary pressure on car button or landing buttonilluminates that button, which remains illuminated until callis answered. Illuminated buttons serve as visual indication that call has been registered and that car will stop at that landing.
b) Operation shall be automatic by means of the car and landing buttons. Stops registered by the momentary actuation of the car or landing buttons shall be made in theorder in which the landings are reached in each direction of travel after the buttons have been actuated.
c) UP landing calls answered while car is traveling in up direction and DOWN landing calls answered while car is traveling down, car reversing after uppermost or lower- most car or landing call has been answered and proceedto answer car calls and landing calls registered in the opposite direction of travel.
d) Should both an up and a down call be registered at an intermediate landing, only the call responding to the direction in which the car is traveling shall be canceled upon the stopping of the car at the landing.

20) Other Features:

a) Independent Operation: Provide TWO-position keyed switch (ChicagoLock 7500) marked “Independent Service, OFF and ON” in the lower portion of the car operating panelof all cars. The switch shall be spring- loaded type. Whenplaced in ON position, the car will be removed from the automatic operating system and will not respond to demands registered at the hall push buttons. It will respondonly to floor with doors open until another demand is registered in the car. Demands registered at the landing will remain registered until answered by another elevator. The car only responds to car calls and that the doors remain open after a stop until closed by continuous pressure on the door close button.
b) The controller shall be designed to operate automaticallyon standby power.
c) Hoistway Access Switches (ChicagoLock 7500) shall be provided at all landings. The hoistway access switch shallbe located on the centerline

of the right door jamb at the height 60” minimum and 72” maximum from the finished floor.

d) When the elevator is not in service for any reason, the elevator controller shall provide four (4) auxiliary contact closures and simultaneous contact opens to operate the Elevator/Not In Service graphic and to operate remote monitoring equipment.

e) The elevator controller shall accept a contact closure provided by the station Fire Alarm Control Panel (FACP).Receipt of the closure shall cause the car to return to theCustomer Assistant’s Kiosk level. The operation of the car shall conform to the requirements of Phase 1 EmergencyRecall Operation.

21) Machine Room Two Way Communication Device: Provide within each control machine room a two way communication device thatwill interface with any type of ADA compliant telephone. The device shall be mounted directly on or within hands distance proximity tothe elevator controller.

22) Any junction boxes installed in the machine room or hoistway shallbe accessible for Maintenance.

a) Drilling or opening the top-end of the enclosure is not acceptable.

b) Wire nuts or splicing without terminal strips is prohibited.

c) All openings shall be properly sized for the conduits.

F. Emergency Return

1. Provide a separate battery powered unit that senses loss of power and which shalloperate as follows:

a. Elevator automatically moves to the landing designated by Authority

b. Doors open automatically when car arrives at bottom landing and then close as required by Code.

c. Elevator shall remain inoperative until normal power is restored.

d. Battery lowering system should be provided with the transfer switch. Maincontroller should not be wired in series with the battery lowering system.

e. Testing: Furnish two lights and test button on outside of unit which when illuminated, indicates the emergency return system is activated and the battery charger is functioning. Provide constant pressure button which allows manual activation of the system for test purposes.

f. Auxiliary Contact: Provide 1 normally open type auxiliary contact in the existing main line disconnect switch. Install 2 #18 wires from auxiliary contact to the elevator controller. The auxiliary contact opens mechanically when the main line disconnect switch is placed in the OFF position whichallows the elevator to be shut-down without operation of the emergency return unit. The

auxiliary contact is in the closed position when main line disconnect switch is in the ON position.

2. The system shall differentiate between actual power failure and manual operationof disconnect switch.
3. Failure protection (operational/power) battery shall be a 12V minimum, sealed, lead-acid, or approved alternative. The separate box shall be used for battery andnot stored within the main controller.
4. Provide a manual lowering valve to allow the car to return to the lowest landing. The manual lowering shall be easily accessible and reachable
5. Provide all wiring, sensors, and associated connections to the main line power anddisconnect.

G. Elevator Hoistway Entrances and Doors

1. General: Except as otherwise indicated, provide type 304 stainless steel and laminated glass sliding, door-and-frame hoistway entrances; complete with track systems, hardware, safeties, sills and accessories. Match car enclosure doors forsize, number of door panels, glass size and alignment, and door panel movement.Provide frame-section size and profile to coordinate with hoistway wall constructionas indicated.
2. Materials and Fabrication: Provide selections indicated; manufacturer's standard,but not less than the following:

    a. Stainless Steel Door Panels and Frames: Flush stainless steel construction, 18 gauge doors, 14 gauge frames, AISI Type 304 No. 4 finish. Transom shall be 16 gauge.
    b. Provide material test reports for stainless steel materials used on entrances.
    c. Glass Panels: 9/16 inch thick laminated safety glass permanently markedin gasket system. No glass within 24 inches of floor level.
    d. Nickel Silver Sill with grooved surface 1/4 inch thickness, cast or extruded,mill finish and steel angle (ASTM A36 steel). Sill shall be through bolted toangle, allow for expansion to prevent sill from buckling. Provide nickel silver sills at all hoistway openings. Provide type 304 stainless steel sill angle support. Sills should be slotted to allow for water drainage. Provide ½" wide and 2" long slots every 12". Machine openings in sill support to macth thesill slots. Provide with sill heater
    e. All switches, door operators and other electrical equipment exposed in thehoistways shall be of washdown duty design such that water from floor cleaning operations, rain and snow do not affect equipment operation.

3. Entrance frames shall be of welded or bolted construction for complete one-pieceunit assembly. All frames shall be securely fastened to fixing angles mounted in the hoistway and shall be type 304 stainless steel.
4. All materials and finished surfaces exposed to public view shall be stainless steelwith embossed finish and/or glass panels as indicated on the Contract drawings. Glass panels (if provided) to be completely flush with door assembly. In a glass hoistway, the struts or any brackets should not be visible to the public.
5. Fascia and Dust Cover in the hoistway shall be stainless steel Type 304 and extendat least the full width of the door openings on each side. Toe guards shall be fastenedto the sill at the lowest landing.

6. Hoistway doors are to be stainless steel and provided with keyways as required foroperating mechanisms and door hangers. Provide glass panels that are completelyflush with door, as indicated in A17.1. Each door panel shall have stainless steel bottom guides that run in landing sill slots. Guides shall be replaceable without removing door panels. All doors shall have fixed fire Gibs.
7. Doors structural elements including door core shall be built from type 304 stainlesssteel.
8. Interlocks and Contacts

    a. The doors at each hoistway entrance shall be equipped with approved hoistway door interlocks of the hoistway unit system type tested as requiredby the Code. Interlocks shall prevent operation of the car away from a landing until the doors are locked in the closed position. Interlocks shall prevent doors from opening at any landing from the corridor side unless thecar is at rest at that landing, or is in the leveling zone and stopping at thatlanding.
    b. Provide key-operated hoistway door unlocking devices. A device shall conform to the requirements of the Code and shall permit authorized persons to open the hoistway doors from the landing when car is away fromlanding. The key for emergency use shall be mounted in a Knox- Box as required by NFPA Code

9. Provide raised floor/level designations in characters and Braille on each jamb at 60inches from floor to centerline. Characters shall be two inches high and inaccordance with ADA requirements

    a. Hoistway Entrance Door Jamb Tag Raised and Braille Characters: All elevator hoistway entrances shall have raised and Braille floor designations provided on both jambs, equal to Adams Series A-4500 modified 3 inch width by 4 inch height, stainless steel plate, brushed stainless finish characters with black background. The centerline of the characters shall be 60 inches above the finish floor. Characters shall be 2 inches high. Provide “Star” designation in addition to floor designation at landing of main egressindicated on the drawings

10. Struts and closer angles shall be hot-dipped galvanized structural steel angles of sufficient size to accommodate and support the hoistway door header plate. Angles shall be continuous and securely bolted to the sills and building beams or structureabove.
11. Hanger supports shall be 1/8-inch minimum thickness formed sections securely bolted to the strut angles.
12. Fascia Plates: Galvanized Steel cladding reinforced to ensure a flat, even surfacethroughout, and shall be securely fastened to hanger supports and sills above.
13. Dust Covers: Galvanized or Stainless Steel cladding which shall extend over the hanger support the width of the jamb opening plus the jamb flanges, at the top landing for which fascia plates are not supplied.
14. Hanger cover plate sections above the door openings shall be arranged for openingor removal from within the car.
15. Sill guards: Sill guards (galvanized steel cladding) shall be supplied for the lowestlanding. On glass hoistway, they shall extend the full width of the hoistway and tobottom of pit.
16. Door hangers and tracks shall be provided for each hoistway, sliding

door sheavetype, two-point suspension hangers and tracks, complete. Sheaves shall not be lessthan 2-1/4-inch diameter with ball bearings properly sealed to retain grease lubrication and shall be mounted on stands arranged for attaching to the doors bytwo cap screws. Hangers shall be equipped with adjustable ball bearing rollers totake the up-thrust of the doors.

17. The tracks shall be high-carbon steel or formed steel with nylon inserts, shaped topermit free movement of the sheaves.

H. Elevator Components

1. The elevator car and car components shall conform to the requirements of the Code, and shall operate without squeaks or metallic sounds. Entire car assembly, including car frame and platform, shall be free from warps, buckles, and squeaks and rattles.Joints shall be lightproof.

    a. Except as otherwise indicated, provide car enclosures, of the design and selections indicated on the drawings. Include ventilation, lighting, stainlesssteel, ceiling finish, stainless steel operable windows, stainless steel wall finish, access doors, doors, power door operators, nickel silver sills (threshold), trim, accessories, and floor finish.

2. Elevator Car shall be prewired at the factory. Cab shall be designed to accept all necessary wiring and conduit. Field wiring should be limited to the traveling cableterminations.

3. Frame and Platform

    a. Elevator car frame shall be of welded ASTM 123 galvanized steel channeluprights affixed to crosshead and plank channels with welded or bolted bracing members and gusset plates.
    b. The car platform shall be designed to accommodate one-piece loads weighing up to 25% of the APTA rated load.
    c. The car frame shall be constructed of structural steel members. The platform shall consist of a steel frame with necessary steel stringers all welded together. The frame and platform shall be braced and reinforced toprevent the transmission of strain to the elevator car. Steel framing shall conform to the requirements of ASTM A500, Grade B, modified to minimum yield strength if required. The variation in straightness of individual members and the frame as a whole shall not exceed 1/8 inch. Secondary straightening may be performed if necessary. The car enclosure shall be securely fastened to the car platform and so supported that it cannot loosen or become displaced during ordinary service, on the application of the carsafety or on buffer engagement.
    d. The platform shall be provided with a steel floor designed for specified loading and sealed watertight. The platform shall be isolated from the cylinder by suitable rubber pads or other equally effective platen isolation.
    e. All structural steel in the frame and platform shall be ASTM 123 hot- dippedgalvanized.

4. Materials and Fabrication: Provide selections as indicated for each enclosure surface; manufacturer’s standards, but not less than the following:

    a. Stainless Steel Return, Doors and Frames: 18 gauge doors, 14

gauge frames and return, AISI type 302/304 No. 4 finish.

b. Stainless Steel Wall Panels: Wall panels to allow for a recessed 4 inch high base consisting of same material as finished floor. Each side of elevator interior cab to be one piece of metal.

c. Stainless Steel Interior Elevator Door and Walls: As selected by the Authority, use patterned Type 304 Stainless Steel, satin finish, 18 gauge thickness, Pattern No. 5WL/LTH by Rigidized Metals Corp. or approved equal.

d. Nickel silver sills, extruded, ASTM B 151 (alloy UNS No. C74500), with grooved surface, 1/4 inch thickness, mill finish with drains and sill heater.

e. Operable Windows (if shown): 18 gauge stainless steel frames, finish AISItype 302/304 No. 4 finish. Continuous piano hinges. Key locks at top andbottom. Provide with micro switches interlocked with controls

f. Glass Panels: 9/16-inch-thick laminated safety glass permanently markedin gasket system. No glass within 24 inches of floor level.

g. Fabricate stainless steel car door frame integrally with front wall of car.

h. Fabricate car with recesses and cutouts for signal equipment.

i. Surround Lighting: LED light fixtures having ballasts rated for reliable lampstarting of -20 degrees Fahrenheit and lens panels of translucent polycarbonate complying with flammability requirements, unless otherwise indicated on drawings. Provide emergency cab lighting per ANSI-A17.1. One light fixture in each cab shall be equipped to provide emergency illumination when required as well as normal power illumination. This fixtureshall be located over the cab control station. See Electrical Drawings for lighting fixture type, power supply and drivers, light temperature and intensity (minimum 20 foot-candles).

5. Provide inspection certificate in each cab, mounted under acrylic cover with framemade of polished stainless steel No. 8 finish.

6. Elevator cab and hoistway shall allow refuge space on top of the cab for personnelaccording to the applicable ASME/ANSI or other code. Provide the minimum spacerequired from the top of the cab to the lowest point of the equipment at the top of the hoistway.

7. Elevator cab top to be provided with stainless steel railings as required by ASME17.1

8. Emergency exit: Car shall have a top emergency exit conforming to the requirementof the ASME Code, and the applicable jurisdictional requirements. The door shallopen toward the top of elevator and shall have a latching mechanism to keep it inplace.

9. Toe Guard Aprons: a. The toe guard apron (cladding) at entrance side of elevatorcab shall be not less than 16 U.S. Standard Gauge (USSG) type 304 stainless steel, and shall extend at least three inches beyond entrance jambs at each side. Toe guard shall have a straight vertical face, extending below the level of finished car floor, of not less than the depth of leveling zone plus three inches. The bottom of guard shall extend three (3”) inches below the vertical face and be beveled at a 15-degree angle from the vertical. The toe guard shall be secured to car platform construction and be reinforced and braced to withstand a constant force of 150 pounds on its face without permanent deformation or deflection exceeding one quarter (1/4”) inches.

10. Fascia Plates: Type 304 Stainless steel fascia plates shall be provided as

requiredby Code, extending full opening width, from the sill of one opening to the hanger support below

11. Hanger Support: The hanger support shall be formed steel to provide for the operating equipment.
12. Elevator Floor: Elevator cab platform sub-floor to be supported on and welded to metal channels integral with the cab structure. Elevator cab platform sub-floor to consist of one piece of 1/4 inch type 304 stainless steel plate. A plywood subfloor is not acceptable. Thickness of plate, size and spacing of channels as required for design loads. Set height of platform to allow installation of the finish flooring and to meet andbe flush with the top of the elevator door sill.

    a. For new finish floor in existing elevators: Prior to installation of new finish floor, remove existing finish floor and base in entirety down to metal subfloor. Abrade metal subfloor to remove loose rust, remains of previousfinishes, flaking paint and dirt.
    b. MasterTop SRS Four Coat System Finish Floor:

        1) Roughen the metal subfloor by blocking, grinding or other suitablemeans to achieve a rough, bright, metal surface. Vacuum up anyloose dust produced by surface preparation techniques. Substrateto be left clean and dry.
        2) Provide and install MasterTop SRS 40TC-102AP Primer strictly according to manufacturer's recommendations and instructions for preparation of the substrate, environmental conditions, mixing of the material, applying the material and curing the material after installation. Primer to be formulated to bond to the metal surface when applied. Unless specified or required otherwise, apply primerat approximately 100 sq. ft. per batch.3. Provide and install MasterTop SRS 100 PAS Coving to match the floor system strictlyaccording to manufacturer's recommendations and instructions for preparation of the substrate, environmental conditions, mixing of the material, applying the material and curing the material after installation. Cove shall form a tight, permanent attachment and complete seal to the elevator vertical wall substrate. The finish wall panel installation shall be detailed to extend beyond the vertical cove surface and form a "drip" type detail to shed any moisture away from the cove seal to the elevator wall surface.
        3) If recommended by the manufacturer for the specific application, provide and install MasterTop SRS 61 BC/SL pigmented self- leveling topping or scratch coat strictly according to manufacturer's recommendations and instructions for preparation of the substrate,environmental conditions, mixing of the material, applying the material and curing the material after installation. Color as selected by the Authority from manufacturer's standard colors. . Apply at aneven depth. "Porcupine Roll" to release any trapped air. Unless specified or required otherwise, apply overlay coat at approximately 40 sq. ft. per batch at 1/8-inch thickness.
        4) Provide and install colored flakes or aggregate if

selected and approved by the Authority by broadcasting, completely and evenlycovering the overlay coat, to provide a skid and abrasion resistantfloor. Apply strictly according to manufacturer's recommendationsand instructions. After overlay coat cures, remove excess flakes by sweeping with a medium stiff broom and vacuuming.

5) Provide and install two flood coats of MasterTop SRS 71TC or Mastertop SRS 53TC methylmethacrylate resin top coat strictly according to manufacturer's recommendations and instructions for preparation of the substrate, environmental conditions, mixing of the material, applying the material and curing the material after installation. Unless specified or required otherwise, apply first topcoat at approximately 80-100 sq. ft. per batch. After first coat cures,apply second coat at approximately 100-120 sq. ft. per batch.

6) Flooring system shall be MasterTop 1841 SRS CF specialty resinsystem as manufactured by BASF Corporation or a similar systemsubmitted to the Authority for review and written approval.

7) The resin flooring and cove base system shall be non-porous, self-leveling, flexible and designed to withstand chemicals; withstand moisture infiltration; withstand vibration, loading and impacts without cracking; tightly and permanently adhere and bondto the substrates (elevator subfloor, sill and cab walls) without separating and without allowing infiltration; not delaminate crack or separate; to create a non-slip floor finish; avoid shrinkage; be abrasion resistant; be not affected by extreme variations in temperature and to be capable of withstanding heavy duty usagewithout deterioration.

8) The floor system shall have the following properties:

   a) Tensile shear adhesion to steel minimum 2,200psi.
   b) Compressive strength minimum 10,500psi.
   c) Flexural strength minimum 4,600psi.
   d) Have heat resistance up to minimum 300 degrees and beself- extinguishing.

9) Color and pattern to be as selected by the Authority from manufacturer's standards.

10) Allow floor to cure as recommended by manufacturer of the floor material between coats and upon completion of the floor system.

11) Installation shall be performed by the floor material manufactureror by an installer certified by the manufacturer to perform the workand experienced with the material.

13. Car Ventilation: Air handling capacity shall provide one air change per minute based on net interior car volume but not less than 350 CFM. Provide one hour of emergencyventilation. Car Ventilation should meet the ASME 17.1 requirements.

   a. Ventilating fans shall be securely mounted in place.
   b. Ventilation openings shall comply with the ASME and local codes,

and shallbe suitably sized and distributed to provide uniform airflow within the car.

c. Provide vents on each side wall of elevator cabs. Vent openings shall be 4 inches high, bottom of vent to be located 7 feet-0 inches above cab floor.

d. Connect continuous ventilation fan to emergency power system. Provide battery backup for fan operation of at least 1 hour in the event of power loss.

e. The exhaust fan shall be controlled from the car operating panel. Confirm key type with Authority.

14. Handrails: Provide Type 304 stainless steel handrails, on side walls and back wall(unless otherwise indicated to be installed on side walls only; either continuous orone hand rail per wall.

15. Lighting Fixtures

    a. Car lighting shall provide a minimum of 15-foot candles measured at any point on the cab floor and shall of the LED type. Car lighting shall be providedwith emergency battery backup upon failure or interruption of normal car lighting. Emergency lighting unit shall provide required lighting for aminimum of four (4) hours. The Battery Charger shall be capable of restoringbattery to full charge within sixteen (16) hours after resumption of normal power.

16. Car Doors and Door Equipment

    a. Car doors and door frames shall be suitably reinforced and provided witha laminated type 304 stainless steel #4 finish. Doors shall protect the full width and height of car entrance opening when in the fully closed position.
    Car door frame shall be integral with front wall of cab

    b. Doors structural elements including door core shall be built from type 304stainless steel.

    c. Hanger cover plate sections above the door opening shall be removable from the hoistway. Doors shall be guided at the bottom by composition gibs engaging threshold grooves with minimum clearance.

    d. Door operation automatic at each landing with door opening being initiated as car arrives at landing and closing taking place after expiration of specifiedtime interval, with electric contact to prevent starting elevator away from landing unless car door is in its fully closed position.

        1) Time door closing to start five (5) seconds minimum fromnotification that the car is answering a landing call.
        2) Time doors shall remain open five (5) seconds minimum.
        3) Time shall be adjustable to twenty (20) seconds.
        4) The interval of time that the doors remain open at intermediate landings shall be less for a stop made in response to a landing call. The door open time at a dispatching terminal shall be longer thanthe time for a stop in response to an intermediate landing call.
        5) Nudging Feature: After car doors are prevented from closing for apredetermined adjustable time period,

through activation of door reversal device, a loud buzzer shall sound and doors shall begin toclose at reduced rate of speed. Doors shall continue to close unless door light-ray protective device is activated, which shall cause doors to reopen. Process shall repeat continuously until obstruction is removed from entrance.

6) A loud buzzer shall sound if the “door open” button is held for a longperiod of time.

7) All door timers shall be adjustable from the controller display panel.

e. Door Operator Equipment

1) Provide a water resistant heavy-duty GAL MOVFR or CTA Engineering approved equal door operator with encoderless VVVFdrive. Closed-loop door operator designed to operate the car and hoistway doors simultaneously at the speed specified. The door shall open automatically when car stops at the landing to discharge passengers or to answer valid calls and close automatically after predetermined time interval has elapsed. The doors shall be capable of smooth and quiet operation without slam or shock. Thedoor operator shall have the following features:

a) A one half (1/2-HP) horsepower motor and heavy duty sprocket, chain, belt, and sheaves. Motor shall be washdown duty suitable for wet and corrosiveenvironments.
b) Closed-loop regulated speed performance.
c) Hand-held keypad programming.
d) Adjustments can be stored in the keypad and downloadedto another operator.
e) Adjustable door obstruction reversal.
f) Optical cams with LED indicators.
g) Test switches for open, close, nudging, and speed-zoneset up.
h) Universal inputs for open, close, and nudging.
i) Reversing switch to back up the door reversal device.
j) Designed for interior and exterior applications.

f. Provide a non-contact door reversal device with light immunity: The DoorReopening Device shall cause both the car and hoistway doors to reverse,should they detect an obstruction in the elevator entrance. The device electrical wiring shall be supplied with quick-disconnect terminals to facilitate replacement. The infrared curtain detector shall include the following:

1) A protective infrared detector field extending from 1 1/2” above thecar sill to a height of 68”.
2) A fail-safe control system to prevent the doors from closing in case of power loss to the detector.
3) A one-piece full door height protective lens cover designed to be completely waterproof and to withstand impact, abrasion, and vandalism.

17. Hoistway Operating Devices

a. Normal and final terminal stopping devices shall be provided for elevator conforming to the ASME Code requirements.
b. Final terminal stopping devices, located in hoistway or on the car and operated by cams, shall be fitted with rollers having a rubber or other approved composition tread to provide silent operation when actuated bythe cam.
c. Normal terminal stopping device may be mounted in hoistway, on top of thecar, or in the machine room.

18. Signal Devices and Fixtures

a. Car Operating Panel (COP) and Hall Stations

1) Provide one (1) main panel in the front and one (1) auxiliary panel.
2) General: Provide signal fixtures and control devices for each elevator. COP and Hall Stations shall be provided with vandal resistant push buttons designed to bottom out against the panel plate and not the contacts, key switches, Buttons should be of theilluminated type that light-up when activated and remain lit until callor other function has been fulfilled. All signal fixture and control device faceplates shall be of Type 316L, nominal 0.135 inch thick stainless steel with No. 4 finish, unless otherwise shown on the Contract Drawings
3) Panels and components shall be Adams Elevator EquipmentCompany “Survivor/Plus” design or approved equal by the Authority. Fabricate equipment exposed surfaces of type 316L stainless steel with manufacturer’s standard directional polish to match #4 finish.
4) Car operating Panel and Box: Provide flush-mounted panel and box containing call button for each landing served, and containingother buttons, switches and controls required for specified car operation and control at each specific elevator. All Cab Call StationPanel components shall be vandal resistant. Mount panels and components as indicated, or scheduled, at height complying withADA requirements. Provide operating device symbols with tactile/Braille, raised and Braille markings as required by code, CTA andADA requirements. Control buttons shall be designated by raisedand Braille characters, size shall be minimum 5/8 inch high. Service panel door lock shall receive 6 pin Best cylinder. Other keyed switches shall be standard keys keyed alike.
5) Car operating panel and box should be NEMA 4X
6) Provide new vandal resistant illuminated buttons, size shall be a minimum of 3/4 inch in the smallest size, raised or flush.
7) Provide the words “NO SMOKING CITY ORDINANCE” by engraving in stainless steel and fill with red enamel paint. Engravewith 5/8” high Helvetica medium uppercase letters. Show locationand spacing of words

on elevator shop drawings.

8) Car operating panels shall contain Braille plates adjacent to eachcall button. Contractor to coordinate proper landing call outs basedon maximum characters as indicated on Contract drawings. Buttons for DOOR-OPEN, DOOR-CLOSE, ALARM, EMERGENCY PHONE call functions are to be supplied. Buttons are to be vandal resistant and of the positive stop type

9) Car Operation Panel shall have a locked service cabinet for keyedswitches and GFI duplex outlet as indicated on the Contract drawings. The service cabinet key shall be CXT-1. Confirm key type with Authority.

   a) Service cabinet: Provide and coordinate the followingfunctions with Cab Call. Station Panel and box, components, location and communications;

      (1) Keyed light ray switch.
      (2) Keyed light switch.
      (3) Keyed fan switch.
      (4) Keyed inspection switch (cylinder).
      (5) Telephone jack.
      (6) No glass panel in door.
      (7) Lock in door to receive 6 pin Best cylinder

10) Emergency Stop Key Switch and Bell: Key switch shall be Best Lock Corp. No. CXT 1. Emergency Stop Key Switch shall operatefunction designed to cut off current supply to motor, apply brake andbring the car to rest independent of the regular operating devices.Turning key switch stops car and activates communications instrument to allow passenger to talk to Customer Assistant Shelter and Control Center. Emergency Stop Key Switch shall provide 2 contact closures and simultaneous contact opens to operateremote monitoring equipment. Turn key switch to reactivate elevator indicator.

11) Furnish and install a system to provide for 2-way communicationsbetween the Car Operating Panel in each Passenger Elevator cabor each Hall Call Station and the remote CTA Control Center in accordance with ADA.

   a) Alarm Call Button and Two-way Communication Instrument and Function: Alarm Call Button and Two- wayCommunications Function shall activate communicationsinstrument to allow passenger to talk to Customer Assistant Shelter and Control Center. Alarm Call Button shall provide 2 contact closures and simultaneous contactopens to operate remote monitoring equipment. Provide red jewel button.

12) Hall Station: The Riser of hall stations of the push-button, call acknowledging, stainless steel, tamper resistant type shall be mounted at all elevator landings. Highest landing shall have a single DOWN button. The lowest landing shall have a single UP button. Incorporate ADA compliant

telephone with each hall station. A Braille Indicator Plate shall be provided. The Faceplate finish shall be Type 316L stainless steel #4 finish The Hall Station shallbe flush to the surface and shall not be projected out.

a) Hall Call Station: Provide panel and box equal to Adams "Survivor/Plus" with flat face plate and illuminated vandalresistant halo round buttons with visual signal to indicatewhen call is registered and when call is answered, but provide single button where only one direction is possible.Provide Tactile/Braille Tags equal to Adams Series A-45l, modified with words and arrow symbol as indicated on the Drawings. Provide all components in accordance with ADAStandards.

(1) Provide "CTA ASSISTANCE" engraved at speaker and vandal resistant button as indicatedon the Drawings, with Tactile/Braille Phone Symbol Tag equal to Adams Series A-451. Provide red jewel button.

(2) In conjunction with hall lantern device, provide an audible signal in accordance with ADA Standards to indicate that a car is arriving in response to a hall call, sound once for the "UP"direction and twice for the "DOWN" direction.

(3) Elevator key lockout switch control closes doorsif they are open; disconnects power; leaves cablighting on; operates only when car is at same level as switch.

(4) Access Key Switch operates cab from hall station.

(5) Provide Best cylinders.

b. Hall Lanterns

1) Tamper resistant hall lanterns shall be equipped with illuminated (LED type) UP and DOWN signal arrows, but provide single arrowwhere only one direction is possible. Provided units projecting fromfaceplate for ease of angular viewing. Match materials, finishes and mounting method with hall stations.

2) Hall Lantern: Provide new Hall Lanterns and box with visible and audible signal in accordance with ADA Standards, equal to Adams"Survivor/Plus". New units shall match materials, finishes and mounting method similar to Hall Call Stations.

3) Signal shall be visible from the vicinity of the Hall Call Station.

4) Audible signal shall sound once for the "UP" direction and twice forthe "DOWN" direction.

5) Visual elements shall be at least 2-1/2 inches in the smallest dimension, mounted so that their centerline is at least 72 inches above the floor.

c. Hoistway Entrance Door Jamb Tag Raised and Braille Characters: All elevator hoistway entrances shall have raised and Braille floor designations provided on both jambs, equal to Adams Series A-4500 modified 3 incheswidth by 4 inches height, stainless steel plate, brushed stainless finish characters with black background. The centerline of the characters shall be 60 inches above the finish floor. Characters shall be 2 inches high. Provide“Star” designation in addition to floor designation at landing of main egressindicated on the drawings.

d. Fireman’s Key Box: Provide and install a fireman’s key box, size and design as required and approved by the fire department. Position the box at the level with the CA booth or as directed by the fire department.

e. Elevator In Service/ Not in Service sign

1) Provide illuminated/backlit sign at each entrance indicating whether the elevator is in service or not in service.
2) Provide LED backlit sign of the design and dimensions as indicated on the drawings.

f. Bell Alarm System: The Bell Alarm System for each elevator shall be properly located within building and audible outside hoistway when activated by the EMERGENCY ALARM call button on each car control building/station. When emergency stop switch is activated inside fireservice box, the bell alarm system should not be activated

g. Firefighters' Service System: The Firefighters' Service System shall be provided in compliance with code requirements.

h. Car Position Indicator: Provide illuminated-signal vandal resistant jewel CarPosition Indicator equal to Adams “Survivor/Plus” design or approved equal by the Authority. Locate above car door opening or above Cab Call StationPanel, location in Cab Call Station Panel is not acceptable. Provide an audible signal in connection with an illuminated signal in accordance withADA Standards as the car passes or stops at a floor served. Characters shall be minimum of 1/2 inch high.

i. Elevator fire detection sensor: Provide space and mounting holes for smoke and fire detection sensors to be furnished and installed as required by building, electrical, elevator and local codes. Install wiring from the sensorlocation in the car to interface terminal cabinet in the machine room, for connection from the sensors to the smoke and fire detection system. Coordinate with installers to allow installation of sensors and operational checkout of the system.

j. Furnish and install a system to provide for 2-way communications betweenthe Cab Call Station Panel in each Passenger Elevator cab or each Hall Call Station and the remote CTA Control Center in accordance with ADA. Provide communications instrument with the following features:

1) Each instrument shall be fabricated and installed in such a mannerthat the instrument will appear to be an integral part (as opposedto an obvious "add-on") of the elevator cab control panel or each hall call station. Properly

identify communication instrument with the same type of symbols as the cab operating station and hall callstation.

2) Each instrument shall be a heavy-duty hands-free speaker phone,FCC registered, DTMF signaling, telephone line powered. Each instrument shall provide automatic dialing of a preprogrammed telephone number consisting of from one (1) to twelve (12) digits, plus control digits for pause. The amount of time for pause shall becumulative. Each time the pause digit is pressed, the amount of time shall increase for each pause sequence. Each instrument shall provide for pre-recorded message playback, which may be activated by the remote telephone by pressing one (1) or two (2) DTMF buttons. The instrument shall be equipped with non-volatilememory (no power or battery back-up required) to store theautomated telephone number and the recorded message. Each instrument shall be capable of being programmed remotely, usinga standard telephone instrument. Programming shall be passwordprotected.

3) Each instrument shall be capable of auto answer allowing incomingcalls to be received. (Pre-recorded message from 2.04, SIGNAL EQUIPMENT, B.2. shall be available with incoming calls). Each instrument shall be equipped with vandal-resistant LED. (Light Emitting Diode) which shall indicate when a call has been connected (both automatic outgoing or incoming). Each unit shall disconnect automatically after a pre-set time duration. Time shallbe programmable by remote telephone instruments and shall be password protected.

4) All instrument shall terminate in the associated elevator equipment room onto the binding posts of terminal blocks provided by the Elevator Contractor. The terminal blocks shall be model RPT12 as manufactured by Reliable Electric/Utility Products or approved equal. The Communications Contractor shall complete the termination of the instruments by splicing onto the jacketed stub.

2.05 LUBRICATION

A. Provide grease fittings at all bearings requiring periodic lubrication including automatic feedcompression type grease cups. Lubrication points shall be visible and easily accessible.

2.06 INTERCOMMUNICATION SYSTEM AND OPERATION

A. The work shall include the furnishing and installation of a system to provide for 2-way communications between the cab control panel in each Passenger Elevator cab or each Hall Call Station and the Customer Assistant's Kiosk and the remote CTA Control Center in accordance with ADA. The phones on the outside of the elevator should call the customerassistant booth and the phone inside the elevator should call the CTA control center. The callto the control center should also be recognized as an elevator call. Provide communications instrument with the following features:

1. Each instrument shall be fabricated and installed in such a manner that

the instrument will appear to be an integral part (as opposed to an obvious “add-on”) of the elevator cab control panel or each hall call station. Properly identify communication instrument with the same type of symbols as the car operating station and hall call station.

2. Each instrument shall be a heavy-duty hands-free speakerphone, FCC registered, dual tone multi-frequency signaling, telephone line powered. Each instrument shall provide automatic dialing of preprogrammed telephone number(s) consisting of from 1 to 12 digits, plus control digits for pause. The amount of time for pause shallbe cumulative. Each time the pause digit is pressed, the amount of time shall increase for each pause sequence. Each instrument shall provide for pre-recordedmessage playback, which may be activated by the remote telephone by pressing one or two DTMF buttons. The instrument shall be equipped with non-volatile memory (no power or battery back-up required) to store the automated telephonenumber and the recorded message. Each instrument shall be capable of being programmed remotely, using a standard telephone instrument. Programming shallbe password protected.
3. Each instrument shall be capable of auto answer allowing incoming calls to be received. (Prerecorded message from INTERCOMMUNICATION SYSTEM AND OPERATION shall be available with incoming calls). Each instrument shall be equipped with vandal- resistant LED. (Light Emitting Diode) which shall indicate when a call has been connected (both automatic outgoing or incoming). Each unitshall disconnect automatically after a pre-set time duration. Time shall be programmable by remote telephone instruments and shall be password protected.
4. All instruments shall terminate in the associated elevator equipment room onto thebinding posts of terminal blocks provided by the Elevator Contractor. The terminalblocks shall be model RPT12 as manufactured by Reliable Electric/Utility Productsor approved equal. The Communications Contractor shall complete the terminationof the instruments by splicing onto the jacketed stub.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to commencing elevator installation, examine hoistways, hoistway openings, pits, and machine rooms, as constructed; verify all critical dimensions and examine supporting structure and all other conditions under which elevator work is to be installed. Notify the Authority in writing of any dimensional discrepancies or other conditions detrimental to theproper installation or performance of elevator work. Do not proceed with elevator installation until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

1. Dimensional tolerance of hoistway from shop drawings: -0 inches +2 inches. Do notbegin work until dimensions are within tolerances.
2. Verify projections greater than 2 inches are beveled not less than 75 degrees fromhorizontal.
3. Verify landings have been prepared for entrance sill installation.
4. Verify elevator pit has been constructed in accordance with requirements, is dry andreinforcement to sustain vertical forces, as indicated in approved submittal.
5. Verify that sumps or sump pumps located within pit will not interfere with installedelevator equipment.

6. Verify control space has been constructed in accordance with requirements, with access coordinated with elevator shop drawings, including sleeves andpenetrations.
7. Verify installation of GFCI protected 15-amp in pit and adjacent to each signal controlcabinet in control space.

3.02 PREPARATION

A. Coordinate installation of anchors, bearing plates, brackets and other related accessories.

B. Coordinate construction of entrance walls with installation of door frames and sills. Maintainfront wall opening until elevator equipment has been installed.

1. Ensure adequate support for entrance attachment points at all landings.

C. Coordinate wall openings for hall push buttons, signal fixtures and sleeves. Each elevatorrequires sleeves within the hoistway wall.

D. Coordinate emergency power transfer switch and power change pending signals as requiredfor termination at the primary elevator signal control cabinet in each group.

E. Coordinate interface of elevators and fire alarm system and smoke detectors.

F. Coordinate interface of dedicated telephone line, communication equipment, and securitysystem.

G. Coordinate work with other trades, including electrical.

3.03 INSTALLATION OF ELEVATOR SYSTEM

A. General: Comply with manufacturer’s instructions and specifications for work required during installation.

B. Install plunger-cylinder units plumb and accurately centered for elevator car position andtravel; anchor securely in place, supported at the pit floor.

C. Welded Construction: Provide welded connections for installation of elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of won parts. Comply with AWS standards for workmanship and for qualifications of welding operators.

D. Coordination: Coordinate elevator work with work of other trades for proper time and sequence to avoid construction delays. Use established benchmarks, lines, and levels to ensure dimensional coordination of the Work.

E. Sound Isolation: Mount rotating and vibrating elevator equipment and components on vibration-absorption mounts designed to effectively prevent transmission of vibrations to structure and thereby, eliminate sources of structure-borne noise from elevator system.

F. Install piping above the floor, where possible. Where not possible, cover underground piping with permanent protective wrapping before backfilling.

G. Lubricate operating parts of systems, including ropes, if any, as specified by

manufacturers.

H. Alignment: Coordinate installation of hoistway entrances with installation of elevator guiderails for accurate alignment of entrances with cars. Where possible, delay installation of sills and frames until car is operable in shaft. Reduce clearances to minimum, safe, workable dimension at each landing.

I. Tolerance: Leveling 1/4 inch, up or down, regardless of load and direction of travel. Guiderail alignment within 1/8 inch in 12 feet not to exceed 1/4 inch overall, plumb and parallel.

J. Set sills flush with finished floor surface at landings, use non-shrink, non-metallic grout, minimum 3,000 psi if required. Coordinate with other trades to facilitate and ensure propergrouting of sills.

3.04 CONSTRUCTION OF ELEVATOR MACHINE ROOM

A. Construction of the elevator machine room to be completed prior to installation of the elevator. Construct according to approved drawings and shop drawings, approved submittals, building code and elevator manufacturer's requirements.

B. Provide and install room of fire rated construction; fire rated flush door and frame with approved hardware and closer. Provide firestopping at penetrations.

C. Insulate room for noise and temperature.

D. Provide electrical power, lighting, switches, outlets, fire and smoke detectors and fire protection as required by code.

E. Provide a floor drain connected to drain system.

F. Provide ventilation, heating and air conditioning and thermostat.

3.05 ADJUSTMENTS

A. Perform final adjustments and necessary service prior to substantial completion.

B. All adjustments and changes to the elevator software shall be documented. Contractor shall provide the software revision log. Contractor shall provide final version of the elevator program using media compatible with the elevator controllers.

3.06 FIELD QUALITY CONTROL

A. Acceptance Testing: Upon substantial completion of each elevator installation, and beforepermitting use of elevator (either temporary or permanent), perform acceptance tests as required and recommended by ASME A-17.1 and A17.2 Code and by governing regulationsor agencies. Submit all acceptance test certificates and forms to CTA for review and approval.

1. Reference ASME 17.1 Appendix X for required acceptance tests and inspections
2. Contractor shall submit the process plan outlining the acceptance testing includingall required checklists, written description of each test and inspection and all instruments and equipment required to perform the acceptance testing and inspections.

B. Operating Tests: Load each elevator to its rated capacity and operate continuously for 30minutes over its full travel distance, stopping at each level and proceeding immediately tothe next. Record temperature rise of pump motor (except submerged pumps) during 30- minute test period. Record failures of elevator to perform as required.

C. Advise the Authority, the Authority's Elevator Maintenance Department and inspection department of governing agencies at least seven (7) business days in advance of dates and times tests are to be performed on elevators

3.07 PROTECTION AND CLEANING

A. Provide suitable protective coverings, barriers, devices, signs, or such other methods or procedures to protect elevator work from damage or deterioration. Maintain protective measures throughout installation period.

B. Upon acceptance by the Authority or when directed, remove protection and clean exposedand finished surfaces.

C. During installations; and until elevator systems are fully operative, Contractor shall make necessary provisions to protect systems from damage, deterioration, injury to public and environmental conditions

3.08 OPEARTION AND MAINTENANCE TRAINING

A. Training

1. The Contractor shall develop and provide operation, troubleshooting and maintenance training in accordance with the General Requirements. The followingtraining requirements shall be met:

   a. Three (3) days of classroom plus two (2) days hands on training on the fieldshall be provided for 10 students per class. Six (6) training session for a totalof sixty (60) students is required.
   b. Time and place of training will be determined by the Authority, but must becompleted no later than thirty (30) days prior to the Final Completion.
   c. Training shall be organized to make optimum use of the required maintenance and operation manuals including training for replacement ofall parts contained in the Parts Inventory list.
   d. At the completion of the first training session, a narrated and properly edited training video shall be submitted for the authority on DVD or flash drive. Thevideo shall be taken by the professional camera operator with quality imageand sound track and will be used for the future trainings. The video shall cover operation of the elevator, function of the devices, maintenance, adjustment procedures and troubleshooting. The following items shall be included as minimum requirements:

      1) Step by step adjustment procedure on the followings:

         a) Door operators, DCL, DOL, full door opening, and so on
         b) Valve adjustment
         c) Car Leveling and adjustment of leveling sensors and vans
         d) Door: Door interlock, proper pressure, and restrictors.

e) Pump motor: Belt tension and alignment

2) General overview of major items:

a) Packing
b) Piston
c) Shut off valve
d) Controller
e) Controller display
f) Hydraulic pump
g) Hydraulic tank
h) Door sills
i) Guide rails

3) Daily operation and sequence of operation
4) Replacement and Installation of components:

a) Hydraulic packing
b) Door photo eye
c) Hydraulic valve
d) Door clutch
e) Door pickup rollers

5) Proper guide roller adjustment
6) Verification of safety circuit
7) Maintenance procedure and Frequency of maintenance
8) Proper access of pit and top of car for inspection
9) Proper test of fire service operation
10) Proper lubrication of components
11) Troubleshooting techniques
12) How to use proper communication device, machine room and cartop.

e. Provide one (1) additional copy of all required submittals to the CTAEngineer for Authority use.

f. Provide two (2) copies in DVD format of training materials along with visualsand handouts to the Engineer for the Authority use.

1) Video shall be narrative.
2) Video shall be separated by major components Sections
3) Equipment Identification shall be as a part of the section title.

g. A separate training manual shall be submitted for approval prior thescheduling of the training. The O&M manual shall not be used as a training manual.

2. Scope of Work

a. All training, as described below, shall take place prior to Final Acceptanceof equipment or materials by the Authority. Operations and maintenance training may take place as a combined class by agreement of the CTA Engineering. The minimum number of CTA employees to be trained will beno fewer than ten (10) total with a maximum of ten (10) per class. Those persons will be identified by CTA. The contractor shall video tape

all trainingsessions and provide CTA with edited copy of the recording as stated above.

b. Operations training shall be tailored specifically to the furnished andinstalled equipment, and designed to teach the day-to-day operation of allequipment. The training shall be sufficient to bring personnel to a level of operating proficiency such that routine vendor support is not needed.

c. Maintenance Training shall be tailored specifically to the furnished and installed equipment, and designed to develop the knowledge and skills required to maintain all item(s) delivered.

d. Maintenance training shall be subdivided into two (2) major levels as follows:

1) System Level Maintenance Training, covering:

a) Theory of operation of the system and its major components.
b) System configuration.
c) Preventative maintenance, consisting of written procedures and schedules for the periodic maintenance of all equipment.
d) Written and validated inspection procedures and a system-level trouble-shooting guide (to the lowest field- replaceable unit).

2) Shop Level Maintenance Training, covering

a) Detailed theory of operation to module, board, and/ordevice level.
b) Component level troubleshooting and component replacement and adjustment.
c) Testing and alignment procedures of repaired units

3. Deliverables

a. The following course materials shall be delivered by the Contractor,according to the following specifications:

1) An Instructor's Guide containing all the information and direction necessary for the instructor to make an effective presentation. It shall include adequate guidelines to conduct a comprehensive training program. Individual lessons within the course shall be organized as separable blocks (or modules) which may be taughtas a unit. The Instructor's Guide shall contain, as a minimum:

a) Discussion of student prerequisites (if any).
b) Program overview.
c) A statement of overall program goals.
d) Lesson plans (a session-by-session outline containing thefollowing):

(1) Student learning objectives, stated in measurable term
(2) Overview of each lesson.

b. A Student Manual including all materials for the student to interact in the learning situation. It shall contain, as a minimum

1) Program overview and introduction.
2) Statement of overall program goals.
3) Learning objectives, stated in measurable terms that specifically describe desired behaviors or knowledge to be gained.
4) A fully developed prose treatment (not outline format) of content presentation, developed in the same modular format as the Instructor's Guide.
5) Illustrations, charts, photos, and other graphics of actual system components as needed to enhance content presentation.
6) The training manuals shall be prepared and submitted for approvalto CTA Engineering prior to training. The training manuals shall include procedures for adjustment and replacement of all electricaland mechanical components, and a troubleshooting guide.

c. Audio-visual Aids consisting of a narrated video of not less than ninety (90) minutes duration to include, but not limited to, the following:

1) General overview of major features.
2) Daily operations.
3) Maintenance procedures such as (lubrication, adjustments, criticalmeasurements, etc.
4) Frequency of maintenance procedures.
5) Parts replacement safety devices, lighting, etc.
6) Verification of safety circuits and methods of accessing andpreserving computerized functional data if required.
7) Step-by-step adjustment procedures and installation of components.
8) Handouts, transparencies, and/or slides as necessary to ensureclear and comprehensive presentations.
9) The training video shall be taken from actual equipment installedunder this contract by the professional camera operator.

d. Supplemental Materials consisting of a functional mock-up or a functionalrepresentation is required of any equipment that requires theoreticaldiscussion. This may be in the form of an animated schematic, a model ofthe equipment, an actual device, an interactive video training device, or anAuthority approved substitute. All mock-ups shall become the property of the Authority for eventual turn over to CTA Engineering.

e. The final copies shall be delivered to the Authority as follows:

1) One complete set of training materials that is completelycamera-ready. Camera-ready copy is defined as typewritten or typeset originals or high-quality copies such that further copies can be made from them

with no noticeable decrease in copy quality.

2) Five copies of all student and instructor materials, to be used for archival purposes

3) A set of complete student materials including training manuals foreach participant enrolled in training classes. The O&M manual, training manuals and special tools shall be approved by theEngineer and delivered to the Authority for eventual turn over to CTA Engineering

4) The contractor shall video record all training sessions and provideCTA engineering with edited DVD copy of the recording to be usedas training guide for other CTA employees. Five copies of all student and instructor materials, to be used for archival purposes.

f. Flash Drives

1) Each flash drive shall include electronic copies of:
2) Operating Manual.
3) Maintenance Manual.
4) Annotated .dwg and .pdf wiring diagram.
5) Parts listing with manufacturer's part number and corresponding WMATA part number.
6) Annotated and original Logix (ACD) file.
7) Original display program for panel.
8) Maintenance Control Program (MCP).
9) Each flash drive shall provide operating, trouble-shooting and maintenance instructions, parts listing; recommended parts inventory listing, purchase source listing for major and critical components, emergency instructions, and similar information.Maintenance instructions shall include recommended lubrication frequency, and periodic maintenance requirements and schedules. Parts list and purchase source listing shall include electrical and control equipment. Manuals shall also include approved drawingsand catalog cuts, folded if necessary. Manuals shall include information on maintenance/replacement cycles and design life expectations.

3.09 TESTING AND INSPECTIONS

A. Acceptance Tests:

1. The Contractor shall submit an operational test plan to the Authority for approval.When each elevator, furnished, installed, and tested, is ready to be placed in interimservice, the Contractor, at no additional cost to the Authority, shall performoperational tests described below. The Authority shall be notified at least 48 hoursprior to each scheduled test so that arrangements can be made for the presence ofappropriate personnel to witness the tests. Acceptance Tests and inspections willbe based upon the elevator meeting the requirements of the Specification and as evidenced by the operational test shall be witnessed by CTA representative.
2. All acceptance testing shall at minimum include items required by code. Copies ofthe acceptance test report should be submitted to CTA for approval

B. Elevator Tests

1. When the elevator work is fully completed, the Contractor shall demonstrate to thesatisfaction of the Authority and Authorities Having Jurisdiction that the proper operation of every part of the equipment complies with all applicable requirementsincluding the ASME Code.

   a. The inspection procedure outlined in the ASME A17.2 will form a part of thefinal inspection.
   b. No shop test of elevator motor and no certified test sheets will be required.
   c. The heating, insulation, and resistance of the motors will be determinedunder actual conditions after installation

2. The Elevator Contractor shall furnish all test instruments and materials, required atthe time of final inspection, to determine compliance of the work with the Contractrequirements. Materials and instruments furnished shall include standard 50-pound test weights, megohmmeter, voltmeter, and ammeter, Centigrade calibrated thermometers, spirit level, and stop watch. At the time of final inspection, tests shallinclude, but not be limited to, the following:

   a. After installation, each elevator shall be tested without load by the Contractor. The elevator shall be subjected to a test for a period of eight (8)hours continuous run. During the test run, the car shall be stopped at top andbottom levels, in both directions of travel with a standing period of ten (10)seconds at each landing.

3. Full-Load Run Test

   a. The elevator shall be subjected to a test for a period of one-hourscontinuous run, with full specified rated load in the car. During the test run,the car shall be stopped at top and bottom levels, in both directions of travel with a standing period of ten (10) seconds at each landing.

4. Speed Test

   a. The actual speed of the elevator car shall be determined in both directionsof travel, with full specified rated load and with no load in the elevator car.
   b. Speed tests shall be made before and after the full-load run test.
   c. For hydraulic elevators, speed shall be determined with a temporarily mounted tachometer on the guide rail or stop.
   d. Car speed when ascending shall be not more than ten (10%) percent abovenot more than 10 percent below the specified car speed.
   e. Car speed when descending shall be not more than twenty-five (25%) percent above not more than ten (10%) percent below the specified car speed.

5. Car Leveling Test

   a. Elevator car leveling devices shall be tested for ¼-inch accuracy of landingat all floors with no load in car and with full load in car, in both directions of travel.
   b. One re-level operation is permitted when full load is in the car.

c. Accuracy of floor leveling shall be determined both before and after the full-load run test.

6. Insulation Resistance Test

a. The complete wiring system of elevator shall be free from short circuits andaccidental grounds. The insulation resistance of the system shall be morethan one megohm when tested by using a 500V megohmmeter. The elevator structure, equipment, and raceway shall be tested for continuity toground

b. The elevator systems, including the emergency power return system shall be fully tested for all operating conditions.

c. Emergency power return system to be tested under the conditions of a total power loss to the elevator system. In order to verify that the emergency return system is fully operational, this test shall be conducted in the manner of shutting off the main breaker to the elevator power panel. This test shallbe conducted in the presence of the Authority.

C. Contractor shall obtain and pay for all necessary permits and perform such tests as may berequired for acceptance and approval of elevators by Jurisdictional agencies.

1. Contractor shall notify the proper inspectors to witness required testing.

3.10 WARRANTY INSPECTIONS AND TESTS

A. In addition to any warranty provisions covered by these specifications, the Contractor shallperform periodic inspections and tests of the elevators and all associated systems and controls. All required inspections and tests shall be performed as outlined in the latest versionof ASME A17.1 (Table N-1, Hydraulic Elevators).

B. As part of the inspections, the Contractor shall, at no cost to the Authority, completely inspect and adjust machinery, and replace any parts showing undue wear, or tendencies toward malfunction, or any items indicating a need for modifications or design change. All adjustments and changes to the elevator software shall be documented. Contractor shall provide the software revision log. Contractor shall provide final version of the elevator program using media compatible with the elevator controllers. This shall be furnished as partof the guarantee obligation by the Contractor.

C. The Contractor shall prepare and submit to the Authority a written report indicating the results of all inspections and tests outlined in the latest version of ASME A17.1 (Table N- 1, Hydraulic Elevators).

D. The Contractor shall also submit to the Authority a written report stating the condition of theequipment, outlining any modifications to the maintenance specifications or operational procedures and respond in writing to questions raised by the Authority,

E. The inspections and tests shall be performed by the Contractor’s service representative. Allcosts involved with each of these inspections and tests, such as travel, accommodations,international charges, fees, tools, equipment and part costs, shall be paid in full by the Contractor.

F. The Contractor shall notify the Authority in writing at least two (2) weeks prior of

the intentto conduct the elevator warranty inspections and tests.

G. The inspections shall be conducted Monday to Friday during non-rush hour periods. The warranty inspections shall take place during the twelve (12) month period starting from thedate of substantial completion by the Authority of each elevator installation. The Authority'srepresentative will accompany the Contractor on the inspections.

3.11 CLOSEOUT SUBMITTALS

A. Provide all closeout submittals as specified in Division One section requirements.

B. Maintenance Manuals: Submit two (2) bound manuals for each station, for each elevator orgroup of elevators, with operating and maintenance instructions, parts listing, recommended parts inventory listing, purchase source listing for major and critical components, emergencyinstructions, and similar information. Include all diagnostic, maintenance and repair information available to manufacturer's and installer's maintenance personnel. Include a maintenance and lubrication schedule and directions. Include a copy of the elevator warranty, maintenance agreement, and maintenance schedule.

1. Wiring Schematics: Submit wiring schematics and interconnections for the elevator control and drive system. Also, submit intercom system connection and controls.

C. Certificates and Permits: Provide the Authority with copies of all inspection/acceptance certificates and operating permits as required by governing authorities to allow normal, unrestricted use of elevators. One permanent frame for the certificate or operating permit shall be mounted in the car (or alternate location in the Customer Assistant Shelter as approved by the City of Chicago) and a duplicate shall be provided in the cab frame.

D. Diagnostic Tools: Deliver to the Authority's Elevator Maintenance Department the laptop computer, cables and other accessories with diagnostic software and other required software installed for the Authority's use; as specified herein and approved by the Authority.

ELEVATOR SCHEDULE - HYDRAULIC PASSENGER UNITS
(To be edited specific to each project)

Elevator Type:	Hydraulic
Elevator Quantities:	As indicated on drawings.
Capacity:	4,500 pounds
Rated Speed:	100 feet per minute
Travel Distance:	As indicated on Drawings.
Openings:	As indicated on Drawings.
Stops: Normal and Emergency Operation:	2
Machine:	Cantilever holeless single-acting or telescopingbeside- the-car single or double cylinder, displacement pump, A.C. motor.
Power Supplied:	208 volts A.C., 3 phase, 60 hertz.
Control System:	Solid- state-microcomputer.
Auxiliary Operations:	Emergency power operation, all levels.
Signal Equipment:	As specified.
Car Enclosures:	5’-0” wide x 7’-4” deep (inside) or asindicated on drawings and minimum required by ADA.
Height:	8’-0” minimum ceiling height inside cab.
Door Type:	3’-6” x 7’-2” single.
Finish:	Stainless steel interior, glazed if shown,perimeter lighting soffit, troweled type flooring.
Hoistway Entrances:	3’-6” x 7’-2” single, two speed side opening slideglazed stainless steel door and stainless steel frame, power operator.
Additional Requirements:	Heat trace sills, cab and hoistway, cabtroweled type flooring, hydraulic unit oil heater.

Elevator Fault Table					
WORD	BIT	DATA TYPE	DESCRIPTION	"0" STATE	"1" STATE
TBD	TBD	FAULT	24 VDC POWER SUPPLY	FAULT	NORMAL
TBD	TBD	FAULT	SAFETY CIRCUIT GOOD	FAULT	NORMAL
TBD	TBD	FAULT	TOP FINAL LIMIT TRIPPE	FAULT	NORMAL
TBD	TBD	FAULT	BOTTOM FINAL LIMIT TRIPPED	FAULT	NORMAL
TBD	TBD	FAULT	DRIVE FAULTED	FAULT	NORMAL
TBD	TBD	FAULT	OVERLOAD TRIPPED	FAULT	NORMAL
TBD	TBD	FAULT	STOP BUTTON ACTIVATE	FAULT	NORMAL
TBD	TBD	ALARM	IN-CAR ALARM BUTTON PRESSED	ALARM	NORMAL
TBD	TBD	FAULT	MOTOR LIMIT TIMER TRIPPED	FAULT	NORMAL
TBD	TBD	FAULT	VALVE LIMIT TIMER TRIPPED	FAULT	NORMAL
TBD	TBD	FAULT	INSPECTION OPERATION ON	ON	OFF
TBD	TBD	FAULT	INDEPENDENT SERVICE ON	ON	OFF
TBD	TBD	FAULT	VISCOSITY CONTROL ON	ON	OFF
TBD	TBD	FAULT	CONTROLLER TEST SWITCH ON	ON	OFF
TBD	TBD	FAULT	FIRE SERVICE PHASE 1 ON	ON	OFF
TBD	TBD	FAULT	FIRE SERVICE PHASE 2 ON	ON	OFF
TBD	TBD	FAULT	SMOKE SENSOR @ MAIN ON	ON	OFF
TBD	TBD	FAULT	SMOKE SENSOR @ OTHERS ON	ON	OFF
TBD	TBD	STATUS	EMERGENCY POWER OPERATION	ON	OFF
TBD	TBD	STATUS	OVERRIDE ON	ON	OFF
TBD	TBD	STATUS	CAR IS RUNNING UP	NOT-RUNNING	RUNNING
TBD	TBD	STATUS	CAR IS RUNNING DOWN	NOT-RUNNING	RUNNING
TBD	TBD	STATUS	BRAKE LIFTED	LIFTED	NORMAL
TBD	TBD	STATUS	CAR IS IN DOOR ZONE	NOT IN ZONE	IN ZONE
TBD	TBD	STATUS	INTERLOCKS ARE MADE	OPEN	NORMAL
TBD	TBD	STATUS	FRONT DOOR GATE SWITCH MAD	OPEN	NORMAL
TBD	TBD	STATUS	FRONT DOOR FULLY CLOSED	OPEN	CLOSED
TBD	TBD	STATUS	FRONT DOOR FULLY OPEN	CLOSED	OPEN
TBD	TBD	STATUS	FRONT DOOR REVERSAL ACTIVATED	OFF	ACTIVE
TBD	TBD	STATUS	FRONT DOOR PROTECTION ACTIVATED	OFF	ACTIVE
TBD	TBD	STATUS	REAR DOOR GATE SWITCH MADE	OPEN	NORMAL
TBD	TBD	STATUS	REAR DOOR FULLY CLOSED	OPEN	CLOSED
TBD	TBD	STATUS	REAR DOOR FULLY OPEN	CLOSED	OPEN
TBD	TBD	STATUS	REAR DOOR REVERSAL ACTIVATED	OFF	ACTIVE
TBD	TBD	STATUS	REAR DOOR PROTECTIONACTIVATED	OFF	ACTIVE
TBD	TBD	FAULT	DOOR REVERSAL DEVICE FAILURE	FAULT	NORMAL
TBD	TBD	FAULT	ROPE BRAKE SET	FAULT	NORMAL
TBD	TBD	FAULT	LEVELING SYSTEM FAILURE	FAULT	NORMAL
TBD	TBD	FAULT	WATER INTRUSION ALARM ACTIVE	FAULT	NORMAL
TBD	TBD	FAULT	PLC PROCESSOR BATTERY LOW	FAULT	NORMAL
TBD	TBD	FAULT	PLC COMM. ACTIVE	FAULT	NORMAL
TBD	TBD	FAULT	PLC LOCAL/REMOTE	REMTE	LOCAL
TBD	TBD	FAULT	PLC RUN/PROG	PROG	RUNNING
TBD	TBD	FAULT	MASTER FAULT	FAULT	NORMAL
TBD	TBD	STATUS	SERVICE STATUS	OUT OF SERVICE	IN SERVICE
TBD	TBD	STATUS	CAR POSITION 1	NOT AT POSITION	AT POSITION
TBD	TBD	STATUS	CAR POSITION 2	NOT AT POSITION	AT POSITION
TBD	TBD	STATUS	CAR POSITION 3	NOT AT POSITION	AT POSITION
ANALOG DATA					
WORD	DATA TYPE	UNITS	DESCRIPTION	SCALE	RANGE
TBD	INTEGER	AMP	DRIVE MOTOR AMPS	X10	
TBD	INTEGER	KWH	PER DAY KWH	X1	
TBD	INTEGER		PER DAY UP COUNT	X1	
TBD	INTEGER		PER DAY DOWN COUNT	X1	
TBD	INTEGER		PER DAY FRONT DOOR CYCLES	X1	
TBD	INTEGER		PER DAY REAR DOOR CYCLES	X1	
TBD	INTEGER		TOTAL TRIP COUNT	X1	
TBD	INTEGER	HOURS	TOTAL RUNTIME	X1	

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 14 24 00, Hydraulic Elevators shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 14 24 00, Hydraulic Elevators shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION

SECTION 14 24 00.S
HYDRAULIC ELEVATORS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes all labor, materials and equipment required to provide and install the holeless hydraulic passenger elevator(s) as shown on the drawings, specified herein, and as otherwise required for a complete functional installation.

B. Elevator schedules at the end of this section indicate required performances, controls, capacities, dimensions, features and finishes for each elevator required for this project.

C. Elevator components, controls and machinery must be non-proprietary.

D. Related Sections:

1. Division 03 Sections, Concrete.
2. Division 04 Sections, Masonry.
3. Division 05 Sections, Metals and Structural Steel.
4. Division 07 Sections, Damp-proofing, Sealants.
5. Division 08 Sections, Glazing.
6. Division 09 Sections, Paint.
7. Division 21 Sections, Fire Suppression.
8. Division 22 Sections, Plumbing.
9. Division 23 Sections, Mechanical.
10. Division 25 Sections, Automation.
11. Division 26 Sections, Electrical.
12. Division 27 Sections, Communications.
13. Division 28 Sections, Safety.
14. Division 31 Sections, Earthwork.

D. Related Work: Contractor is ultimately responsible for providing and constructing a complete functional elevator system according to the drawings, specifications and code. Contractor to coordinate elevator installation with the elevator manufacturer, the elevator subcontractor and all other subcontractors responsible for the work at the station and platform in order to maintain the schedule, avoid conflicts and to ensure the orderly sequence of the work. Provide sleeves, inserts, and anchoring devices in a timely fashion to maintain the construction schedule as required for installation under the Contract. Coordinate installation of the hydraulic elevators with the hoistway shaft construction including foundation and elevator pit construction and machine room construction.

E. Work that must be supplied under other sections include foundation work, elevator pit, structure and enclosure for hoistway, metal (and glass) panel system, temporary lighting for hoistway, hoistway ventilation, guide rail support, lifeline attachments, elevator cab cameras and communication, pit lighting, control space lighting, access doors, sump pit

and sump pump in elevator pit and other work as required for a complete operational system.

F. Work that must be provided under other sections also include the construction of a machine room as required for the elevator(s) and include the following, as required: Door, frame, hardware, ventilation, heat, air conditioning, lighting, outlet, switch, electrical service, smoke detector, floor drain, and other items.

G. It is the Contractor's responsibility to coordinate the structural design of the hoistway and coordinate the electrical, mechanical, communication and other requirements with the elevator manufacturer for the particular elevator to be used.

H. Pit drainage: Contractor shall coordinate location of sumps, pumps, pipe and related wiring with elevator installer.

I. Provide and install OSHA compliant metal pit ladder; adhere to any applicable codes.

J. Coordination Meetings: Coordination meetings shall be held bi-weekly during the elevator construction period with all responsible parties to facilitate the coordination and execution of the work.

1.03 REFERENCES

A. Comply with all applicable codes and regulations of the authorities having jurisdiction. AISI: American Iron and Steel Institute.

B. ASME A17.1, A17.2,, A17.5; current required edition; Safety Code for Elevators and Escalators.

C. ASME A17.3, Safety Code for Existing Elevators and Escalators.

D. ASTM A36: Standard Specification for Carbon Structural Steel.

E. ASTM B151: Specification for Copper-Nickel-Zinc Alloy (Nickel Silver) and Copper-Nickel Rod and Bar.

F. ASTM A123 – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

G. ASTM A153 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

H. ASTM A240 REV B – Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications

I. ASTM A264 – Standard Specification for Stainless Chromium-Nickel Steel-Clad Plate

J. ASTM A276 – Standard Specification for Stainless Steel Bars and Shapes

K. ASTM A500 – Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes

L. ASTM A653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or ZincIron Alloy-Coated (Galv-annealed) by the Hot-Dip Process

M. ASTM B3 – Standard Specification for Soft or Annealed Copper Wire

N. ASTM B8 – Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard,or Soft

O. ASTM D471 – Standard Test Method for Rubber Property-Effect of Liquids

P. AWS D1.1/D1.1M ERTA – Structural Welding Code - Steel.

Q. ICC A117.1 – Accessible and Usable Buildings and Facilities

R. IEEE 1202 CORR 1 – Flame-Propagation Testing of Wire and Cable Corrigendum 1

S. NEMA C80.1 – Electrical Rigid Steel Conduit

T. NEMA 250 – Enclosures for Electrical Equipment (1000 Volts Maximum)

U. NEMA KS 1 – Heavy-Duty Enclosed and Dead-Front Switches (600 Volts Maximum)

V. NEMA MG 1 – Motors and Generators

W. NEMA PB 1 - Panelboards

X. NEMA WC 70 – Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy

Y. NFPA 13 – Standard for the Installation of Sprinkler Systems

Z. NFPA 70 – National Electrical Code

AA. NFPA 72 – National Fire Alarm and Signaling Code

BB. NFPA 80: Standard for Fire Doors, Fire Windows.

CC. NFPA 130 – Standard for Fixed Guideway Transit and Passenger Rail Systems

DD. UL 6 – Electrical Rigid Metal Conduit - Steel

EE. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations

FF. UL 62 - Flexible Cords and Cables

GG. UL 98 - Enclosed and Dead-Front Switches

HH. UL 360 - Standard for Safety Liquid-Tight Flexible Metal Conduit

II. UL 486A-486B - Wire Connectors

JJ. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures

KK. UL 514A - Metallic Outlet Boxes

LL. CTA Design Criteria

MM. Any additional requirements imposed by local agencies and/or codes having jurisdiction shall be incorporated into elevator installation.

NN. In the event of a conflict between codes, regulations or standards, the most stringent requirement as determined by the Contractor and approved by the Authority shall take precedence unless specifically addressed herein.

OO. Chicago Building Code.

PP. FCC: Federal Communications Commission.

QQ. AFBMA Standard 9 and 11

RR. Americans with Disabilities Act (ADA), Accessibility

SS. Guidelines for Buildings and Facilities (ADAAG).

TT. American Public Transportation Association (APTA): Heavy Duty Elevator Design.

UU. IBC: International Building Code.

1.04 DEFINITIONS

A. Hydraulic Elevators: Elevators in which cars are hoisted either directly or indirectly by action of a hydraulic plunger and cylinder (jack); with other components of the Work, including fluid storage tank, pump, piping, valves, car enclosures, hoistway entrances, operation systems, signal equipment, guide rails, electrical wiring, roping (roped hydraulic applications), buffers, and devices for operations, safety, security, required performance at rated speed and capacity, and for complete elevator installation.

B. Defective Elevator Work: Operation or control system failures; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; the need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.

C. Heavy Duty Elevator: An elevator designed specifically for the harsh environment and duty load cycles common to transportation system usage.

D. Elevator: A hoisting and lowering mechanism, equipped with a car or platform, which moves in guide rails or racks and serves two or more landings.

E. Elevator, Passenger: An elevator used primarily to carry persons other than the operator and persons necessary for loading and unloading.

F. Elevator, Hydraulic: A power elevator in which the energy applied, by means of a liquid under pressure, in a hydraulic jack.

G. OEM: Original Equipment Manufacturer.

H. Dwell Time: The period of time the elevator is at a landing while the doors open, passengers transfer and doors close.

I. Elevator Substantial Completion: The point at which the elevator is ready for use, whether the site is finished or not. This is where the jurisdictional inspection usually takes place.

J. Elevator Final Acceptance: The point at which the owner accepts the elevator project as being complete including all submittal requirements. This may be a different point in time than substantial completion.

K. Interim Maintenance: Maintenance from the point of substantial completion, but prior to Service.

L. Beneficial Use: When the elevator is placed into service, may be prior to the site being ready for public use.

M. Revenue Service: The station or facility opening date.

N. Notice to Proceed (NTP): Within this document shall mean the date which the elevator installer is notified to proceed with the project.

O. Override Switch: A switch located in a kiosk panel, which disables the Hall Call Buttons.

P. SDS: Safety Data Sheet.

Q. BOM: Bill of Material.

R. SMNT: Systems Maintenance (WMATA).

S. WMATA: Washington Metropolitan Area Transit Authority.

T. Elevator MCP: Maintenance Control Program as defined in the ASME A17.1 Code.

U. ICC: International Code Council – Identified in Section 1.03 References of the 14245 Geared Traction Passenger Elevator Specifications.

V. NIST: National Institute of Standards and Technology.

W. NESC: National Electrical Safety Code

X. NEII: National Elevator Industry, Inc.

Y. SPI: Society of the Plastics Industry

Z. NAAMM: National Association of Architectural Metal Manufacturers.

1.05 PROJECT AND SITE CONDITIONS

A. Contractor shall be responsible for coordination of the elevator subcontractor and all trades and making sure that the elevator system including machines rooms, control rooms and hoistways conforms to all applicable codes and standards.

B. Elevator Manufacturer shall certify in writing that hoistway, pit and machine room layout and dimensions including all auxiliary equipment as indicated on Drawings, and electrical service, as shown and specified are adequate for elevator system being provided.

C. The Contractor shall restrict operations to facilitate rail and passenger traffic during rush hours at stations open to rail traffic. Provide temporary barricades to protect installations from weather, personnel and passengers during installation.

D. Elevators shall not be used for construction purposes or Contractors use of transporting materials or equipment during construction.

E. Protection: During installations, and until elevator systems are fully operative, contractor shall make necessary provisions to protect systems from damage, deterioration, injury to pedestrians, the general public and environmental conditions. F. Coordination Requirements:

1. Alterations: Contractor shall coordinate any alterations required to accommodate elevators with the Owner.
2. Floor finish in cab: Contractor shall install cab flooring as specified.
3. Lock and key requirements: Contractor shall coordinate with the Owner.
4. Pit Drainage: Contractor shall coordinate location of sump pits, pumps, pipes and related wiring with elevator installer.
5. Rigging Plan: Contractor shall supply a rigging plan that is approved by the Owner.
6. Safety Training: Contractor shall attend appropriate safety training programs provided by the Owner at no extra cost.
7. Methodology: The contractor shall meet with the Owner and provide a written method of installation for approval.
8. Electrical: The installer shall coordinate with the contractor and appropriate trade in relation to CCTV, communications, smoke detectors, shunt trip breakers, CCTV, power and cab lighting requirements.
9. Construction schedule: Installer shall coordinate deliveries, installation and testing with the Contractor.
10. Shop drawings to indicate the individual responsibilities for each component of the elevation system. Noting “by others” is not allowed.

1.06 DESIGN CRITERIA

A. Provide elevators designed for transit system usage, capable of being in operation 24 hours per day, 7 days per week.

B. Exterior Installation: Provide units designed to operate while exposed to natural elements such as sunlight, rain, snow, ice, dust, and temperatures ranging from -20 degrees to +125 degrees Fahrenheit.

C. Interior Shaft and Cab Installation: Provide units designed to operate while exposed to temperatures ranging from –20 degrees Fahrenheit to +125 degrees Fahrenheit.

1. Push button operation within the cab shall operate fully within this temperature range.
2. The vertical travel distance of the cab shall be uninterrupted within this temperature range.

D. Elevator systems shall be designed with provisions for thermal expansion and contraction of the complete assembly.

E. Temperature Control: The ambient temperature of the elevator equipment rooms, shaft, etc. must be maintained at a temperature range recommended by the manufacturer. Contractor to provide auxiliary heat, air conditioning and/or ventilation, including equipment, fans, dampers, controls and electrical power, as required to maintain that range. Provide product data and shop drawings of mechanical equipment for Authority's approval. Provide data and calculations indicating the possible design temperature extremes based on location, environmental conditions and other factors. Coordinate work with other trades.

1.07 SUBMITTALS

A. Submit the following according to the Conditions of the Contract and Division One Specification Sections.

B. Submit elevator manufacturer's project specific QA/QC plan.

C. Submit coordinated BIM model for review and approval. Provide clash detection log proving no conflicts.

D. Product Data:

1. The summation of product information shall be submitted, in tabular form, of all parts incorporated in the entire group of elevators supplied under this Contract. Hard copies and electronic copies on the Flash Drive shall be submitted
2. Submit manufacturer's product literature for each principal component or product of each elevator, including certified test reports on required testing. Indicate capacities, dimensions, design, layout, finishes, accessories, available options, and similar information. Provide information on performance and operating characteristics, features of control system, signals, and operating system. Indicate any variations from specified requirements.
3. Manufacturer's design data, material specifications, drawings, installation and maintenance instructions including preventive, predictive and general maintenance, and other data pertinent to the components used in the elevator systems, including, but not limited to, detailed repair data for all components, including disassembly, inspection/gauging/torque requirements, reassembly, testing and other related information. Submittals to cover all mechanical components, operating panels and indicators and electronic equipment to control and monitor elevator control functions. Exploded view drawings shall be included to facilitate repair and maintenance functions.
4. Lubricants, sealers, paints, and any other potentially hazardous substances are subject to review and approval by the Authority. The Contractor to submit the necessary Safety Data Sheets
5. The following information to be provided

    a. Nomenclature of part.
    b. Elevator Contractor's part number.
    c. Nomenclature of next higher assembly in which used.
    d. Manufacturer and part number.
    e. Model number(s) of elevator(s) on which used.
    f. Total quantity in entire group of elevators.
    g. Current unit price to the Authority.

h. Recommended spare parts list showing parts with prices for each part. The parts listing to be provided on or before 90 days prior to scheduled completion.

i. Loads on supporting members, reaction points, and deflections under varying loads.

i. Loads imposed on the structure shall be coordinated with the Authority and not exceed agreed limits. This requirement to be verified, documented, and stamped by a registered professional engineer.

ii. Supporting calculations to be provided for record file.

E. Shop Drawings:

1. Shop Drawings including dimensioned drawings for each elevator showing plans, elevations, sections and large-scale details indicating service at each landing, clearances, coordination with building structure and relationships with other construction, and details of car enclosures and hoistway entrances. Indicate required hoistway and pit dimensions, showing guide rails, buffers, and other components in hoistway. Indicate maximum rail bracket spacing. Include elevator diagrams to indicate elevator service to each level. Provide shop drawings showing location and layout of all elevator equipment, signals, control panels, call stations, indicator lights, graphics, and similar items. Indicate any variations from specified requirements plus maximum dynamic and static loads imposed on building structure at points of support. Indicate hoist beam requirements. Indicate access and ventilation for elevator machinery rooms and hoistways; indicate location, sizes, and details of access doors and hoistway door and frames.
2. Elevator Manufacturer to provide a letter certifying that hoistway, pit and machine room layout and dimensions including all auxiliary equipment as indicated on Drawings, and electrical service, as shown and specified are adequate for elevator system being provided.
3. The Contractor to provide detailed drawings that shows the dimensions and tolerance, specification that may include the material specification, hardness or electrical rating for each component that is being used. In regards to assemblies they must provide a top level drawing with BOM and quantities with detailed material specifications and drawings with dimensional tolerances. The contractor also to provide as-built CAD models of all elevator components
4. The name of the manufacturer and type or style designation shall be listed on the each page of the equipment shop drawings. Drawings submitted shall include, but not be limited to, the following
5. Fully dimensioned layout in plan and elevation, showing the arrangement of equipment and all pertinent details of each specified elevator unit, including as appropriate

a. All equipment located in machine rooms.
b. Location of circuit breaker, switchboard panel or disconnect switch, light switch, and feeder.
c. Extension points in machine room. These electrical components to not be blocked.
d. Location in hoistway of outlets for connection of traveling cables for car light, fire detectors, communication, and control system.
e. Car, hydraulic cylinder and plunger, supporting beams, guide rails, buffers, and other components located in the hoistway.

f. Maximum guide rail bracket spacing. Guide rail brackets shall be provided at every horizontal structural member and to be of sufficient strength to meet the ASME Code.
g. Reactions at points of supports.
h. Weight of principal parts.
i. Top and bottom clearance and over-travel of car.
j. Complete wiring diagram of the elevator system and subsystems. Complete data regarding electrical characteristics and connection requirements.
k. Refuge space on top of car and pit.
l. Cab design, dimensions, and layout.
m. Color/material schedule and selection chart for cab and entrance features.
n. Hoistway Ventilation - Thermostatically Controlled, positive mechanical ventilation system.
o. Hydraulic Jack Details
p. Machine/Pump Room area, pit, and hoistway layout.
q. Hydraulic piping layout indicating layout, type, size, and schedule of piping from machine room to elevator pit(s) indicating orientation of valve(s), and location of shut-off valve(s), and shall include calculations of working pressures.
r. Drawings of the hoistway entrances and doors showing their method of operation, details of construction, and fastenings to the structural members of the station structure.
s. Drawings of the car for each design specified, showing dimensions, details of construction, fastenings to platform, car-lighting, ventilation, air conditioning (if applicable), communication, and location of equipment.
t. Cuts or drawings showing details of all signal and operating devices, identifying graphics, and detailed design with diagram and schematic of kiosk annunciator panel.

6. Hydraulic drive:

a. Cylinders and plunger.
b. Power unit, including volume, rate of flow, working pressure, rpm of pump, and horsepower, voltage, frequency, service factor, and rpm of the motor.
c. Piping, fittings, and couplings.
d. Valves.
e. Storage tank.
f. Muffler.
g. Hydraulic Jack Details Drawings.
h. Fluid flow diagram showing all valves, operating devices, and controls.
i. Complete assembly detail of machine/pump, hydraulic tank mounting, with all load calculations

7. Elevator controller, including manufacturer's technical data and catalog cuts, and interface hardware and software requirements.
8. Power door operator.
9. Door interlocks and electrical contacts including test reports showing that hoistway door interlocks, car door contacts, and car top emergency contacts meet the requirements of the ASME Code and certification by the NIST or other approved laboratory.

10. Car ventilation fan.
11. Car Air Conditioning (if applicable).
12. Car lighting.
13. Cabling.
14. Buffer, including stroke and, certified maximum striking speed for car.
15. Communication and intrusion system design details covering electrical, mechanical, and architectural aspects.
16. Design and architectural details, including light ray unit locations, of the electrical protective device for car doors.
17. Where the use of adjoining dissimilar metals is required, descriptions of protective measures to be employed to avoid corrosive damage.
18. Certification from independent testing laboratory that glazing gaskets meet the specified requirements.
19. Hall and car fixtures at each landing including the Car Operating Panel (COP).
20. Interface wiring diagrams with other systems showing terminal board location and identification.
21. Expected heat dissipation of elevator equipment in machine room and control areas (i.e. BTU's/hr.) based on 240 round cycles per hour.
22. Complete wiring diagram of the elevator system and subsystems. Complete data regarding electrical characteristics and connection requirements.
23. Complete assembly detail of machine/pump, hydraulic tank mounting, with all load calculations.
24. Lubricants, sealers, paints and any other potentially hazardous substances are subject to review and approval by the Authority. The Elevator Contractor shall submit the necessary Safety Data Sheets

F. Elevator Machine Room:

1. Provide shop drawings for elevator machine room including plans, elevations, sections and details for construction. Show locations of equipment and panels.
2. Provide product data for all components of construction for the machine room including wall, floor and ceiling finishes; door and frames; hardware; heating, cooling and ventilation; floor drain; lighting, electrical power and safety; communication; fire protection and other components and equipment.

G. Provide specification compliance checklist. Checklist should include all sections of this specification. Indicate whether the requirement can or cannot be met. Indicate all deviations from the specifications including the explanation why the requirement cannot be met.

H. Wiring diagram detailing locations and wiring for power, signal and control systems and differentiating clearly between manufacturer-installed wiring and field-installed wiring. Indicate maximum and average power demands.

1. All circuits to be organized and numbered.
2. Provide electrical characteristics and connection requirements.
3. Provide the expected heat dissipation of elevator equipment space, elevator shaft and controller space BTU based on maximum possible full load starts per hour.

I. Samples of exposed finishes of car enclosures, hoistway entrances, and signal equipment. Provide 6 inch to 8 inch square samples of sheet materials and 10 inch to 12

inch lengths of running trim members. Submit color samples of car floor finish material for selection by the Authority. Provide samples, as requested by the Authority, of other elevator components including, but not exclusive of, call buttons, indicator lights, glazing, etc.

J. Operation and Maintenance Manuals:

1. Six sets and electronic copy of the approved manuals, elevator installation, operation instructions, troubleshooting techniques and related equipment drawings and software (all publication must be in English) – two (2) copies of which to be delivered to the Engineer representing the Authority at least sixty (60) days prior to the final acceptance. Each binder shall have the Binder Cover and Spine Insert which contain the Station Name and Unit ID.
2. Submit an electronic copy of the Manual for the review and approval, after installation and at least ninety (90) days prior to the final acceptance. The Information shall be saved/presented as follows:
3. Graphic images in ".dwg" AutoCad, and ".pdf" formats. All revisions shall be made by using computer software. Hand written changes are not acceptable.
4. Text in Microsoft Word .doc, ".pdf" or approved equal format.
5. Electronic copies of the Operation and maintenance manuals shall be searchable, indexed , with each section bookmarked and linked to the table of content
6. The manuals shall include the following:

    a. Complete operation and maintenance Instructions of the elevator equipment included complete illustrated, exploded views of all assemblies, and a complete illustrated, exploded view for identification all system parts
    b. Complete nomenclature of replaceable parts, part numbers, current cost, and warehouse location. If product source is another vendor, Contractor shall include name and address of the other vendor
    c. Furnish a summation, in tabular form, of all parts incorporated in the elevators supplied under the Contract. Include but not be limited to the following:.

        i. Nomenclature of part. ii. Contractor's part number. iii. Nomenclature of next higher assembly in which used.
        iv. Manufacturer and part number.
        v. Model number of elevator on which used.
        vi. Total quantity.
        vii. Current unit price to the Authority.
        viii. Serial numbers of all serialized assemblies, subassemblies, motors, and other major components supplied and installed
        ix. Include an exact copy of the elevator data plate, rope dcata plate and crosshead data plate and any other tags or plates required by the ASME 17.1 with each Operation and Maintenance manual. Data plate should comply with ASME 17.1 requirements.

K. Elevator Maintenance Control Program (MCP)

1. Provide a separate Maintenance Control Program (MCP) for each unit as required by A17.1 Code.

2. Submit an electronic copy of the MCP to CTA Engineering for their review and approval.
3. Provide one (1) copy of the approved MCP at each elevator machine room.
4. Three (3) sets of hard copies and electronic version of the approved MCP to be submitted to the CTA.
5. The MCP to include, but not be limited to, the Code required maintenance tasks, maintenance procedures, examination and tests procedures.
6. The MCP to specify examinations, tests, cleaning, lubrication, and adjustments to applicable components at regular intervals.
7. The MCP is to only contain information related to equipment installed under this contract. Generic information that does not pertain to the equipment installed to not be included.
8. Scanned documents are not allowed.
9. The instructions to be permanently legible with characters a minimum of 0.125 in. in height.
10. All covers to be resistant to oil, moisture, and wear commensurate with their intended use. Diagrams and illustrations are not to be loose or in pockets. All printed material are to be capable of being reproduced on dry copying machines.
11. Each unit to be treated as a whole and not as a grouping of disassociated parts. The material in the MCP to be organized and indexed by the elevator classifications. Each binder to have a Binder Cover and Spine Insert which contain the Station Name and Unit ID.

L. Submit for Authority's review and approval diagnostic tools to be provided by the elevator manufacturer including, but not limited to, laptop computer Windows based with latest operating system with non-proprietary program and software installed, product data and specifications, Elevator program with all input/outputs descriptions showing each rung, all cables and accessories and software.

M. Certificates and Permits: Provide the Authority with copies of all inspection/acceptance certificates and operating permits as required by governing authorities to allow normal, unrestricted use of elevators. One permanent frame for the certificate or operating permit to be mounted in the car (or alternate location in the Customer Assistant Shelter as approved by the City of Chicago) and a duplicate to be provided in the cab frame.

N. Wiring Schematics: Submit wiring schematics and interconnections for the elevator control and drive system. Also, submit intercom system connection and controls.

O. Contractor shall submit control wiring diagrams. Control diagrams shall be ladder type. All control diagram rungs/ lines should be numbered. All control points and equipment points i.e relays should be tagged.

P. Contractor should submit control panel layout showing location of all equipment installed in the control panel including relays, circuit boards, transformers, power supplies, wiring trays etc.

Q. Contractor shall submit control wiring diagrams. Control diagrams shall be ladder type. All control diagram rungs/ lines should be numbered. All control points and equipment points i.e relays should be tagged.

R. Contractor should submit control panel layout showing location of all equipment installed in the control panel including relays, circuit boards, transformers, power supplies, wiring trays etc.

S. Documentation certifying the experience requirements of the manufacturer, certifying the experience of the installer, and a list of completed projects.

T. Upon completion, as-built drawings are to be submitted including architectural, structural, electrical, mechanical and plumbing. Also provide as-built drawings for schematic control wiring and electrical wiring diagrams and electronic and hard copies of ladder diagrams, logic, program with all input/outputs descriptions showing each rung, software, cables and laptop computer windows based with the latest operating system with the nonproprietary program and software installed.

U. Pre-acceptance test forms

1. ASME A17.1, Safety Code for Elevators and Escalators, Appendix X.
2. ASME A17.2, Guide for Inspection of Elevators, Escalators and Moving Sidewalks, Appendix B.

V. Plans, details and materials for providing and constructing temporary solid barricades for protecting the elevator work area, personnel and passengers. .

W. Temperature Control: Contractor to provide data and calculations indicating the possible design temperature extremes based on location, environmental conditions and other factors and how the temperature variations will be controlled. Provide product data and shop drawings for required temperature control equipment and installation including auxiliary heat, air conditioning and/or ventilation equipment, fans, dampers and controls.

X. Submit a copy of the warranty for CTA's review and approval.

1.08 QUALITY ASSURANCE

A. Manufacturer qualifications:

1. The Manufacturer shall provide documents stating that their firm has successfully produced elevators for transit system applications for a minimum of ten (10) years and regularly engaged for the past five (5) years in the manufacture of major components for hydraulic passenger elevators. As a standard of quality, the elevator equipment design and installation shall comply with the Code.
2. Elevator manufacturing plants and manufacturing processes shall operate a quality management system that complies with the requirements of the ISO 9001. The scope of the certification shall include design, manufacturing, and installation of the elevator components and systems.

B. Installer Qualifications:

1. The Installer shall be the original manufacturer of elevator equipment or manufacturer's authorized agent who is trained and approved for installation of units required for this Project.
2. The Contractor shall obtain and pay for all permits and licenses and perform all required inspections.
3. Engage the elevator manufacturer or an Installer approved by the elevator manufacturer and who has completed the elevator installations similar in material, design, and extent to that indicated for this Project and with a minimum of ten (10) years experience installing elevators and has a record of successful

in-service performance. Documentation shall be submitted to support this requirement.

4. Elevator installer shall operate a quality management system that complies with the requirements of the ISO 9001. The scope of the certification shall include design, manufacturing, and installation of the elevator components and systems

C. Welding

1. Welding to be performed in accordance with the requirements of AWS or CWB. Welders must produce evidence of the current certification by AWS or CWB.

D. Labeling:

1. Every elevator controller shall be clearly marked permanently on the controller with rated load and speed, manufacturer serial number, and the designated Owner identification.
2. Every elevator shall be clearly marked with rated load, speed, manufacture serial number, and the designated Authority identification

E. Regulatory Requirements: In addition to local governing codes and regulations, test and comply with applicable requirements of the following:

1. ASME/ANSI A17.1, Safety Code for Elevators and Escalators (hereafter referred to as the “Code”)

   a. Seismic Risk Zone: Project is located in Zone O.
   b. Earthquake Emergency Operation: Comply with requirements in ASME A17.1.

2. National Electrical Code.
3. Institute of Electrical and Electronic Engineers (IEEE) standards.
4. National Fire Protection Association (NFPA 70, 80)
5. American National Standards Institute “American National Standard for building and facilities – providing Accessibility and Usability for Physically Handicapped People” ANSI A 117.1 and the ADA Title 49 CFR TRANSPORTATION, Part 37.9 STANDARDS FOR ACCESSIBLE TRANSPORTATION FACILITIES, Appendix A, Section 4.10 ELEVATORS to the exclusion that they do not conflict with each other.
6. Chicago Building Code: Conform to all applicable codes for manufacture and installation of elevator system.
7. Provide and pay for all tests and permits.
8. Requirements of Regulatory Agencies

   a. Contractor shall notify the proper inspectors to witness required testing
   b. Contractor shall obtain and pay for all necessary permits, and perform such tests as may be required for acceptance and approval of elevators by jurisdictional agencies.

1.09 SPARE PARTS AND STOCK

A. Provide adequate spare parts on-site to ensure minimal downtime of the elevators during the warranty period. Spare parts shall include the list below at a minimum.

B. Parts must be coded for tracking purposes for replenishment

C. Parts may be used by the Contractor for maintenance but shall be restocked within two weeks of their use at no additional cost to CTA.

1. Spare Parts and Maintenance Material: The Contractor shall provide to CTA's designated location, the following spare parts. The parts shall become CTA's property. The parts shall be delivered prior to Substantial Completion.

a. Two (2) safety/governor assemblies
b. Four (4) hoistway door rollers
c. Two (2) car door rollers
d. Four (4) hoistway door gibs
e. Four (4) cab door gibs
f. Two (2) electronic door detectors
g. One (1) set of replacement lights for the elevator cab
h. One (1) box of each type of fuses
i. Two (2) complete door interlock assemblies
j. Two (2) door operator motors
k. Two (2) complete pushbutton assemblies for car operating station and hall stations
l. Four (4) complete set of brake pads
m. Two (2) microprocessor controllers

D. Factory Visit

1. The Contractor shall coordinate factory visits for up to three of the Owner's representatives to visit the factory where the elevator control panels are being manufactured. The Contractor shall not ship the control panels without the written approval of the Owner after conclusion of the factory visit
2. The Contractor shall coordinate factory visits for up to three of the Owner's representatives to visit the factory where the elevator is being manufactured. The Contractor shall not ship the elevator without the written approval of the Owner after conclusion of the factory visit.
3. Fabrication Hold Points will be established during the course of the project.

1.10 DELIVERY, STORAGE AND HANDLING

A. If the construction site is not prepared to receive the elevator equipment at the agreed ship date, the equipment shall be stored in a secure, dry, protected, and easily accessible storage area.

1.11 WARRANTY

A. Warranties: Provide warranty, signed by the Contractor, elevator installer, and elevator manufacturer; guaranteeing to correct failures in the elevator system; replace, repair, or restore defective components, materials and workmanship of elevator work or equipment which occur during the warranty period.

1. Warranty period shall be for twenty four (24) months starting on the date of Beneficial Use for the project.

B. The elevator warranty shall not deprive the Authority of other rights the Authority may have under other provisions of the Contract Documents and shall be in addition to other warranties made by the Contractor under requirements of the Contract Documents.

C. Warranty to start after the 30 day test period which will consist of continuous operation of the elevator without any interruptions caused by the warrantable defects.

PART 2 - PRODUCTS

2.01 ELEVATOR SYSTEM

A. General

1. Elevators furnished under this Contract shall be of the heavy duty automatic hydraulic-type with direct –acting dual jack and holeless.
2. All parts shall be built to standard dimensions, tolerances, and clearances so that similar machines and devices supplied under contract are completely interchangeable.
3. Elevator components, controls and machinery must be non-proprietary to facilitate the Authority's future maintenance of the equipment.

B. Fasteners

1. Fasteners shall be compatible with materials being fastened.
2. Fasteners shall be furnished with self-locking nuts or retaining rings (spring washers, toothed disks).
3. Fasteners shall be equal to, or of greater corrosion resistance than the most corrosion-resistant metals being fastened.
4. The mechanical fastening used throughout the equipment on parts subject to wear and requiring replacement shall be keyed and seat, nut, screw, or other removable and replaceable type not requiring physical deformation or field positioning. The use of rivets or similar devices will not be acceptable as mechanical fastenings for such parts

C. Doors of elevators shall be of the horizontal sliding type, single speed, and center opening. The doors shall be arranged for low-speed electric power operation

D. SYSTEM PERFORMANCE REQUIREMENTS

1. The elevator schedules indicate required performances, controls, capacities, and electrical requirements for each elevator or group of elevator systems.
2. The elevators shall be designed for continuous operation seven (7) days per week, twenty four (24) hours per day.
3. Elevators shall be designed, installed, and tested to operate with full-specified performance while exposed to the climatic and environmental conditions specified. In addition, during installation and until the beginning of scheduled maintenance service, the elevators will be subject to more extreme environmental conditions. The Contractor shall furnish protection necessary to prevent damage to or deterioration of the elevators during this period.

    a. Elevators shall be designed to operate in dry bulb temperature range of 10°F to 140°F and operate while exposed to the natural elements of weather, including sunlight, rain, snow, slush, and salt. Also all Elevators

shall be designed for all conditions of relative humidity, de-icing chemicals, debris, airborne dust, and corrosive elements.

b. The elevators shall have a special winter operation. The elevators shall be designed to operate in the event the outside temperature falls below a pre-established minimum value. The Elevator Contractor shall furnish and install the necessary timers and thermostat to accommodate the desired function

4. Operation Under Fire or Other Emergency Conditions: The Elevator shall be equipped to function in accordance with the requirements of ASME A 17.1 and applicable local codes
5. Sound Level

   a. No elevator car or elevator power unit shall generate noise in excess of NC45 sound level. Measurement of noise shall be made at a point thirty six (36") inches from the hoistway, machine room entrances, and ventilation openings either free running or under load. For multiple elevator installation, the noise measurements shall be made with only one (1) elevator unit in operation, but with the entire installation complete and in operating condition. An ambient level is not to exceed forty-nine (49) decibels shall be maintained prior to units being turned on

6. Car Performance:

   a. Car speed plus or minus 5% of contract speed under any loading condition or direction of travel.
   b. Car Capacity: Safely lower, stop and hold (per code) up to 125% of rated load.

7. System Performance:

   a. Vertical Vibration (maximum): 15-17 mg.
   b. Horizontal Vibration (maximum): 10-12 mg.
   c. Jerk Rate (maximum): 3.3 – 5.25 ft/sec2.
   d. Acceleration (maximum) 1.6 – 2.6 ft/sec2.
   e. In Car Noise: = 55 dB(A).
   f. Leveling Accuracy: plus or minus 3 mm.
   g. Starts per hour (maximum): 240.

8. Accessibility Requirement: Comply with Section 407 of the US Architectural Transportation Barriers Compliance Board's ADA-AB4 Accessibility Guidelines with ICC A117.1
9. Reliability:

   a. Each elevator shall be capable of operating at full load under any of the normal modes of operation at a level of availability of not less than ninety eight (98%) percent over a period of 365 days.
   b. Availability (A) is defined as the percent of normal operational time during which the equipment is available for use. Or

$$A = \frac{MTBF}{MTBF + MTTR}$$

Where:
MTBF = Mean time between failure in days
= Operating time, t (in days) / Number of failures in time t
MTTR = Average time in days required to restore an elevator to operation after a report of a failure.

E. Capacity, Speed, Travel, and Platform Size:

1. All parts of the elevator equipment shall be of such design, size, and material as to satisfactorily function under all conditions of loading and operation within its rated load and speed, all with a proper factor of safety, maximum mechanical, electrical efficiency, and minimum wear on parts
2. Hydraulic elevators shall have sufficient capacity to lift the rated load at 150 feet per minute, with a tolerance of plus or minus 8.0 percent
3. Provide means to adjust the inspection speed. Speed shall be adjustable between 25 feet per minute to a maximum of 150 feet per minute.
4. The Elevator shall be of size, arrangement, and capacity and shall comply with design criteria and as shown on the Contract Drawings, and in accordance with the requirements of the ANSI/ASME A17.1. The rated load shall be exclusive of the weight of the complete car and shall be determined in accordance with ASME
Code requirements for passenger-elevators required to carry freight, Class C3 (ASME A17.1 Section 2.16) or 4500 lbs., whichever is greater
5. The top enclosure shall be reinforced to support two men and be capable of sustaining, without damage or permanent deformation, a load of three hundred (300) pounds on any area foot square and one hundred 100 pounds applied at any point. An emergency exit shall be installed in the car top in conformance with the Code
6. Travel, location terminal floors, number of stops and openings, and overall car platform size shall be as shown on the Contract Drawings.
7. Car travel shall not exceed thirty (30) feet with Holeless-type hydraulic elevator.

F. Closed Circuit Television (CCTV)

1. Make provision for and provide a Closed-Circuit Television (CCTV) camera, in the elevator car(s) with the ability to monitor the CCTV from the Kiosk annunciator panel. Submit drawings for approval before fabrication.
2. Provide electrical connections, through shielded traveling cables between the camera and the communications terminal block in the machine room or pit.

G. Painting
1. The pit, pit walls, and machine room floor shall be painted. All machine room equipment shall be given two coats of approved machinery paint. All new iron work shall be given one coat of rust- inhibiting paint.
2. Metal parts visible to the public may be field painted where specifically shown or authorized the Authority.

H. Workmanship

1. Joints shall be welded their full length and dressed smooth and flush on exposed surfaces. Spot welding shall be used where practicable in preference to screw or rivet fasteners.

2. Sheet metal materials shall be accurately rolled and leveled, and have smooth finish and uniform color. Joints shall be formed to a tight fit, with abutting edges flush, and shall be securely welded or riveted together in such a manner as to give strength equivalent to the solid sheet. Riveted construction shall have heavy reinforcement on the back, and no rivets shall show on exposed surfaces. Welds shall be solid and dressed flush, and shall have holes for screws or bolts that are drilled and countersunk.
3. Wrought work shall have joints milled to a tight even fit and, where possible, shall be made without screws. Square turns and comers shall be sharp. Curves and loops shall be true and without visible joints. Abutting members shall be welded, riveted, or both. Similar bars shall be halved at intersections and wide bars shall be punched for the small bars to pass through.
4. The finished work shall be strong, rigid, and neat in appearance. Plane surfaces shall be smooth and free from warp or buckle. Molded members shall be clean cut, straight, and true. Miters shall be well formed and in true alignment. Fastenings shall be concealed from the face side of the material.

I. Corrosion Protection

1. The Contractor shall design the elevator assembly in such a manner as to avoid corrosion and galvanic action due to physical contact between dissimilar metals or due to other causes

2.02 MANUFACTURERS

A. Fujitec America, Inc.

B. Kone Elevator Co.

C. Mid-American Elevator Company, Inc.

D. Otis Elevator Co.

E. Schindler Elevator Co.

F. ThyssenKrupp Elevator Co.

2.03 ELEVATOR MACHINE ROOM

A. Contractor to provide an elevator machine room of size and location according to approved shop drawings that have been coordinated with the elevator manufacturer's requirements, all applicable codes and the requirements of all subcontractors. Machine room to be sized for all the equipment, motors, panels and controls for the specific elevator(s) as well as allow sufficient space for maintenance of the equipment by personnel.
1. Machine room to be of fire rated non-combustible construction per code. Floor of machine room to be structurally capable of supporting the weight and vibration of the equipment.
2. Machine room to be heated and cooled to maintain the temperature required for proper operation of the equipment.as well as ventilated for maintenance personnel occupancy.

B. Machine room to be constructed according with materials that have been submitted and approved by the Authority.

C. General Requirements:

1. Machine room shall be 224 sq. ft. minimum for a single elevator.
2. Machine Room Emergency Lighting: Maintained Emergency lighting fittings shall be provided in each elevator machine room.
3. There shall be a minimum of one maintained lighting fixture.
4. Clearance around equipment in each machine room shall comply with provisions of all applicable codes. Clear distance for the maintenance purposes shall be at least eighteen (18") inches. In no case shall this clearance supersede minimum Code requirements.
5. Equipment in elevator machine room shall be so arranged that replaceable items can be removed for repair or replacement either by overhead hoist and dolly, or other conventional means, without dismantling or removing other equipment components in the same machine room.
6. Machine rooms must be air conditioned and heated to maintain an ambient temperature of 50 F to 80 F degrees and a relative humidity between 35% and 50%. The Air Conditioner shall be a Split System. The heating system for the machine room is also a built in system. A forced removal should be done by moving the air from the room to the outside of the building to another part of the building to keep an air exchange through the equipment room. Intake and exhaust vents should not be located close to each other.
7. Any component attached to the controller shall have a minimum clearance of eighteen (18") inches from the side(s) of the component requiring access for maintenance and free air circulation.
8. One (1) set of approved electrical and hydraulic diagrams of elevator shall be mounted in an aluminum channel frame with Lucite cover and waterproof fiberglass backing and installed adjacent to the appropriate drive machine.
9. Provide Mats of insulating rubber or other suitable floor insulation in the front of the Controllers.

    a. The Resistance range shall be 1x104<1x106 and shall meet ANSI/ESD requirements.
    b. The rubber mat shall be the width of the controller plus twelve (12") inches.
    c. The length of rubber mat shall be a minimum of twenty four (24") inches

10. Provide parts storage cabinet or shelf. Coordinate size with Authority.
11. Provide file cabinet with at least two drawers for elevator documentation, manuals and schematics

2.04 MATERIALS AND COMPONENTS

A. General: Provide manufacturer's standard pre-engineered elevator systems that comply with or fulfill the requirements of the elevator schedule. Where components are not otherwise indicated, provide standard components published by manufacturer as included in standard pre-engineered elevator systems and as required for a complete system. All unpainted, unfinished non-wearing surfaces of elevator and equipment, exterior cab and hoistway, shall be painted three coats alkyd enamel (prime and 2 finish coats) manufacturers standard color as selected by the Authority.

1. All equipment and controls shall be of industrial quality and operate under warranty exposed to all possible weather and temperature extremes.
2. Hydraulic Machines and Elevator Equipment: Provide holeless single-acting, beside-the-car, or holeless telescoping, beside-the-car, or holeless single-acting, roped hydraulic plunger-cylinder units, or holeless cantilever, with electric pumptank-control system equipment in machine room as indicated.
3. Hydraulic Power Unit: The power unit (oil pumping and control mechanism) shall include an oil hydraulic pump, electric motor, oil control unit, oil reservoir, oil strainer in the suction line, structural steel outer base with tank supports (tank must be mounted above floor level), inner base for mounting motor pump assembly combined in a compact and neatly designed self-contained unit.

    a. The pump shall be designed and manufactured for oil-hydraulic elevator service. It shall be of the positive displacement screw type, designed for steady discharge with minimum pulsations.
    b. The pump shall be of proper size and shall deliver oil into the cylinder in sufficient quantity and pressure to lift the elevator car with specified load at specified speed. During downward trip of elevator, the oil shall be returned to the tank by gravity
    c. The motor shall be of standard manufacture, alternating current, 208 volt multiphase squirrel cage induction type, designed for oil-hydraulic elevator service. It shall have a duty rating to comply with the speed and load herein specified.
    d. The oil control unit shall consist of an up valve, down valve, down leveling valve, check valve, high pressure relief valve, tank shut-off valve and a manually operated lowering valve. All adjustments shall be accessible and be made without removing the assembly from the oil line. Provide pump and dual lines.
    e. Oil reservoir shall be a rectangular reinforced tank. It shall include a cover, oil level gauge, drain plug, and initial oil supply. Oil shall be biodegradable.
    f. A strainer that can be readily cleaned shall be provided to prevent foreign materials from the oil reservoir from entering the pumps and oil control system.
    g. When low temperature conditions exist and the car is in a no-demand situation, the motor shall be automatically turned on and the valve set to bypass for maintaining the correct oil viscosity. Provide heater unit for oil including thermostatic control to maintain proper oil viscosity.
    h. Hydraulic Silencers: Provide hydraulic silencer containing pulsation absorbing material in a blowout-proof housing at pump.
    i. The power unit shall be equipped with a vibration isolation device suitable for use with and approved by the power unit manufacturer. The vibration isolation shall effectively prevent the transmission of power unit vibration to the machine room structure.

4. Piping, Fittings, and Couplings

    a. Piping, fittings, and couplings shall be furnished and installed between the storage tank, pump, muffler, valves, and cylinder complete with necessary supports.
    b. All connections between the discharge sides of the pump check valve, muffler, cylinder, and owering valves shall be of rigid steel with screw, flanged, welded, or approved mechanical couplings

c. Pipe supports shall be provided within twelve (12”) inches of every change of direction in piping.

i. Supports shall not be more than ten (10’) feet apart.
ii. Secure vertical runs properly with iron clamps at sufficiently close intervals to carry weight of pipe and contents and provide supports under pipe to floor.
iii. Furnish and install all piping from remote machine room to hoistway, including necessary supports and/or hangers

d. Size of pipe and couplings between cylinder and pumping unit shall be such that fluid pressure loss is limited to ten (10) pounds.

e. Mechanical couplings, when used, shall be of a self-centering type that provide for some degree of deflection, contraction, and expansion.

i. Couplings that provide for partial or full separation of the two sections of piping being connected are acceptable, provided all other specified requirements are met.
ii. Couplings shall be rated for a pressure at least three times the working pressure of the elevator and shall be so designed that failure of the flexible sealing element or gasket shall not permit the separation of the parts connected.
iii. Flexible sealing elements or gaskets shall be of a type and material suitable for use with the hydraulic fluid furnished.

f. Where piping, fittings, and couplings supplied by the Contractor are contained within sleeves, conduit, trenches, troughs, or other passage means provided by others to allow for the connection of the power unit with the cylinder and plunger, the Contractor shall provide appropriate devices which shall effectively prevent the transmission of vibration to the surrounding structure

g. The Contractor shall install all piping, fittings, and couplings used to connect the power drive to the cylinder and plunger in such a way that these may be removed and replaced at a future date. When Victaulic is used, there shall be access for inspection and maintenance Destruction of portions of these items in the process of removal is acceptable but efforts shall be made in the designs to minimize the necessity to destroy items.

5. Valves

a. Valves shall be of the unitized manifold type with no more than four (4) solenoids and arranged so that all adjustments are individually adjustable without the need for sequential readjustment. Valves shall be designed to ensure that oil flow will be controlled in a positive and gradual manner, thereby ensuring smooth starts, operation, and stops of the elevator car.

b. Valves shall be designed for quiet operation and shall be mounted above the storage tank in a manner that allows leakage to drain back to the tank.

c. A safety check valve shall be provided which will function to hold the elevator car with rated load at any point when the pump stops or the maintained pressure drops below the minimum operating pressure required holding the car in place.

d. A manually-operated lowering valve shall be provided, which shall permit the manual lowering of the elevator car in the event of power failure. The location of the lowering valve and access to it shall be described in white stenciled lettering on the front panel of the pump unit. The lowering valve operating means shall be easily and readily accessible and unobstructed by the valve wiring, conduits or other equipment. A tank shut-off valve shall be provided to permit isolating the oil in the tank during maintenance operations. The location and orientation of the valve shall allow for safe operation of the handle throughout its range of travel.

e. All additional pump relief valves and other auxiliary valves required by the ASME Code or necessary to provide smooth, safe, and satisfactory operation of the elevator shall be furnished and installed.

f. Any relief valves having exposed pressure adjustment shall have their adjustment sealed after being set to the correct pressure.

g. Manual shut-off valves shall be provided in the hydraulic oil line in the elevator pit and in the elevator machine room. In any portion of its travel, the machine room shutoff valve handle shall not intrude in the walk space or work space or obstruct access to other equipment.

6. Storage Tank

a. The storage tank shall be constructed of steel and shall be provided with a steel cover, protected vent opening, overflow connection and a valve drain connection. The tank shall act as a storage tank only. Suitable gauge glasses shall be provided if the top of the tank is over 4 feet above the floor. An initial supply of oil sufficient for proper operation of the elevator shall be provided. The tank shall have a capacity equal to the volume of oil required to lift the elevator to the top terminal plus a reserve of not less than ten (10) gallons.

b. The oil storage tank cover shall be arranged for easy unobstructed access. Clearance of twenty four (24”) inches vertical and eighteen (18”) inches horizontal from tank cover shall be maintained for ease of service.

c. The permissible minimum liquid level shall be clearly indicated. The manufacturer's recommendation of type of oil to be used shall be included in the written instruction for the care, adjustment, and maintenance of the equipment. The flash point of oil used shall be not less than 400 degrees F.

d. Provide an oil filtering system that removes contaminants that can clog valves and settle in the bottom of the tank.

e. Blowout-proof foil-hydraulic muffler of an approved make shall be furnished and installed in the oil line near the power unit to reduce noise to a minimum.

7. Oil Temperature Control

a. Tank Heater: Hydraulic oil viscosity/temperature control shall be provided by the application of an internally mounted, thermostatically controlled, tank heater. The oil temperature shall be maintained at a maximum 110 degrees Fahrenheit with the use of a 120V AC powered tank heater. The unit shall be permanently mounted, integral with oil reservoir, and with a lighted switch/indicator to visually confirm unit is powered. The tank heater shall include the switch for disconnection of

power during maintenance/repair operations. The unit shall be hard wired to electrical source per ASME A17.1.

b. Hydraulic Oil Cooler: Provide a thermostatically controlled hydraulic oil cooler to maintain hydraulic oil at the OEM's recommended optimum operating temperature. The hydraulic oil cooler shall be provided with the following:

c. An Electrical Box for direct wiring to 115VAC, 30 Amp separate circuit.

d. All fittings and hardware needed for adjacent-mount installation and remote wall mount installation.

e. Heat Tracing: Hydraulic piping shall be electric heat traced for maintaining correct oil viscosity

i. Heat tracing controller shall be mounted in the elevator control room.

ii. Heat trace controller shall indicate the system proper operation and system failure

8. Hydraulic Jack Assembly: The jack unit shall consist of:

a. A cylinder constructed of steel pipe of sufficient thickness and suitable for the operating pressure as prescribed by the latest revision of the ASME/ANSI A17.3. Code. The top of the cylinder shall be equipped with a cylinder head with a drip ring to collect any oil seepage as well as an internal guide ring and self-adjusting packing.

b. A plunger constructed of selected steel tubing or pipe of proper diameter machined true and smooth with a fine polished finish. A stop ring electrically welded to the plunger to positively prevent the plunger from leaving the jack unit casing. Plunger shall have a double bottom construction.

c. The cylinder head shall be equipped with an adjustable packing gland designed to effectively prevent leakage of oil. A scavenger pump shall be provided to return oil to the system. It shall be located so as not to obstruct the path between the pit entrance and he cylinder.

d. The packing gland shall be constructed to permit easy repacking.

e. The cylinder shall be provided with a means to release air or other gas and shall have a drip ring below the packing gland to collect all oil leakage.

f. The cylinder shall be isolated from rails, pit channel, building structure, and other sources of possible corrosive or galvanic damage by dielectric insulation of the cylinders.

g. The cylinder shall be coated with corrosion-rust resistant primer and painted with a dark gray industrial epoxy or other approved paint

h. Gaskets and pads for dielectric insulation shall be neoprene or approved alternative. Insulating sleeves, washers, and oil line coupling shall be provided where specified or shown

i. The plunger shall have a solid-state control/sensor component detect sudden downward movement of the elevator and immediately grasp the plunger, preventing the elevator from falling. It shall activate automatically and shall not damage the plunger, even with repeated settings. It shall be activated by an overspeed in the downward direction, or by lack of voltage to the DOWN coil when the car is traveling in the down direction.

j. A pipe rupture valve as near as possible to each cyclinder as a safety device in case of failure in the cyclinder supply line or when the down speed exceeds the field adjustable limit; bringing the car to a smooth and safe stop. With the valve, the deceleration rate shall be less than 1g and be non-adjustable.

k. Pipe Rupture Valve to be “R10” as manufactured by Electro-Mech. Industries or approved equal.

l. An internal plastic laminate guide bearing.

m. Manufacturers: Provide hydraulic jack assemblies of one of the following:

i. Leistritz Corporation, 165 Chestnut Street, Allendale, New Jersey, Tel.(201) 934-8262.

ii. VERTX, 1125 Schilling Bolevard East, Suite 101, Collierville, Tennessee 38017, Tel. (866) 448-3789

iii. M/S ALGI (Alfred Giehl) GmbH & Co. KG D-65399 ELTVILLE AM RHEIN, Tel. +49 (0) 6123-608-0 Fax -608 150.

9. Guide Rails: The car guides shall be accurately machined standard section planed steel tee guide rails with tongue and grooved joints, weighting not less than specified in the ANSI Code. The rail sections shall be joined together in accordance with the requirements of the Code. The guides shall be erected plumb within 1/8 inch. They shall be properly located and supported so as not to become distorted by eccentric loading. They shall be suitably bottomed in the pit and shall extend the full height of the hoistway. All connections and fastenings to track structure shall be isolated from earth ground by neoprene pads and sleeves.

10. Roller Guide Shoes: Roller guide shoes shall be furnished, securely bolted to the car frame at the top and the bottom. Each roller guide shall consist of a set of three sound-reducing wheels to run on the three finished rail surfaces. The wheel shall be mounted in precision type ball bearings and held in contact with the rail surface by means of adjustable cushioning devices.

11. Buffers: Substantial spring buffers shall be installed under the cab and counterweight. Buffers in the pit shall be mounted on continuous channels which are fastened to the guide rails. Spring buffers or their equivalent to be permitted to be used where the rated speed is not in excess of 1 m/s (200 ft/min).

12. Inserts: Furnish required concrete inserts and similar anchorage devices for the installation of guide rails, machinery, and other components of elevator work where installation of devices is indicated as work of another specification section or contract

B. OPERATION

1. Operation shall be automatic. Automatic operation by means of car and landing buttons. Stops registered by momentary actuation of car buttons to be made irrespective of number of buttons actuated or of sequence in which buttons are actuated.

2. Operating panel in the car containing bank of buttons numbered to correspond to landing served position indicators. EMERGENCY CALL button, keyed EMERGENCY STOP button, DOOR OPEN/DOOR CLOSE buttons, independent maintenance key switch, and key-operated light and fan switches, with legends as specified. Identification as specified for emergency telephone. An Emergency call button connected to bell that serves as emergency signal. Panel finish shall be Stainless Steel.

3. Landing: Single push button fixture shall be provided at each terminal landing. Button fixture having push buttons with UP and DOWN legends at intermediate landing shall be provided. Button identification as specified for Person(s) with disabilities per latest ADA regulation (ADA. rule 4.10.3) shall be provided.
4. Momentary pressure on the car button or landing button illuminates that button, which remains illuminated until call is answered. Illuminated buttons serve as visual indication that call has been registered and that car will stop at that landing. The Push Buttons shall be round, have a Metalized Halo and center jewel. The metalized halo shall be from different color and approved by CTA Engineer
5. Stops, registered by momentary actuation of landing buttons. All stops subject to respective car or landing button being actuated sufficiently in advance of arrival of car at that landing to enable stop to be made. Direction of travel for idle car established by first car or landing button actuated.
6. UP landing calls answered while car is traveling in up direction and DOWN landing calls answered while car is traveling down, car reversing after uppermost or lowermost car or landing call has been answered and proceeded to answer car calls and landing calls registered in opposite direction of travel.
7. Elevators to park at the secure landing level selected by the Engineer
8. Push button units to be PB-46 NEMA-4 Series or approved equal with button identification as specified by latest ADA regulation shall be provided.
9. Emergency stop shall be key-operated rather than push-pull arrangement with key removal only in off position.
10. All elevator car control panel operating devices shall be designated by Braille and by raised standard alphabet characters for letters, Arabic characters for numerals, and standard symbols as required by the Code and ADAAG.
11. Lettering shall have a highly visible coloring, such as white, that is permanently affixed.
12. Independent Service: Provide a key switch in the car operating panel which, when actuated, shall cancel previously registered car calls, disconnect the elevator from the hall buttons and allow operation from the car buttons only. Car door shall remain open unless closed fully by the door close button
13. Two- Stop Collective Simplex Automatic Operation: The Two-Stop Collective Simplex Automatic Operation shall be used and checked for the following:

    a. The System shall be designed so that when the car is standing at either terminal landing, pressure on car button for the other terminal shall automatically dispatch car to that landing. Pressure of landing button at either terminal landing shall call car automatically to that landing. If a landing call is registered while the car is making its trip that call shall remain registered until the car responds to that call. If no car calls are registered, the car shall start automatically and respond to hall calls. Provide time limit relay arranged to hold car at landing at which it has stopped for predetermined time after car stops. After all car landing calls have been answered the car shall remain parked at landing where last used with car and hoistway doors closed until another call is registered. Pressing the landing button at floor at which car is parked shall automatically open car and hoistway doors. In all normal operations, the starting of the car shall be contingent upon establishment of hoistway door interlock and car door circuits.
    b. Automatic Dispatching Operation: All two-stop elevators shall include “Step-in-and Go” feature. Calls for the opposite landing will be automatically set when the elevator opens its doors for a hall call. This

feature shall be provided for all elevators that have public access for two stops (i.e., any elevators with key- operated service landings will be included).

14. Position Indicators

    a. Landing Indicator: In accordance with ADA requirements. Two-element direction-of travel indicator mounted above call station or hoistway entrance as shown including one red and one white indicator. Direction of car's operation shown by illumination of red indicator for DOWN and white indicator for UP.
    b. Car Indicator: In accordance with ADA requirements. Mounted in vertical row in car-operating panel to show position of car in hoistway by illumination of indicators corresponding to landing at which the car is stopped or passing. Finish for exposed-to-view metal components: Stainless Steel.
    c. In Car signals: Audible signal indicating car's direction of travel, signal sounding once for UP direction and twice for DOWN direction
    d. Landing signals: Audible signal at each hoistway entrance indicating car's direction of travel, signal sounding once for UP direction and twice for DOWN direction.

15. Lighting

    a. Machine Room Emergency Lighting: Emergency lighting shall be provided in each elevator machine room.
    b. There shall be a minimum of one lighting fixture.
    c. Car interior: LED fixture, 120V operation, with clear prismatic glass diffuser, flush mounted in ceiling, cool white bulbs. Illumination level shall be 15-foot candles minimum at car operating panel.
    d. Car top and underside of car floor: Medium base porcelain lamp receptacles, with wire lamp guards.
    e. Car Emergency Lighting:

        i. Fixture: Recess mounted, with stainless steel frame, location as shown.
        ii. Diffuser: Prismatic polycarbonate plastic. iii. Lamps: Two (2), size 16 51

16. Remote power supply

    a. Power pack: Sealed gel cell battery with integral regulating charger and an alarm bell.
    b. Capable of operating bell for one (1) hour minimum, light at car-operating panel at 0.2 low candles minimum for four (4) hours minimum and ventilation fan for o (1) hour minimum.
    c. Location: The remote power supply shall be located in top-of- car or COP with easy access provided.

17. Inspection Operation: Key switch in car to nullify car and landing buttons permitting operation of elevator from top of car for inspection purposes:

a. Top of Car Inspection Station: The Inspection Station contains continuous pressure UP and DOWN buttons, emergency stop button and toggle switch to activate inspection devices. The device shall also have an 110v ac outlet for extension cord and provided with a light and guard.

18. Leveling: Automatic 2-way leveling. Leveling device to stop car within 1/8 inch of landing level regardless of load or direction of travel. Landing level maintained within leveling zone irrespective of hoistway doors being open or closed.

    a. Automatic Leveling: The power unit shall be designed and coordinated with the control so that the car shall slow down and stop automatically at the floor after transition from contract speed. Car level shall be maintained automatically within 1/8 inch (3.2 mm) of the landing by an anti-creep leveling device regardless of any deviation that may be caused by the loading or unloading of the car.
    b. Landing zone detection shall indicate to the control system the position of the car with respect to the floor level.

19. Pit Emergency Stop Switch: An emergency stop switch shall be provided in the elevator pit, designed to bring the car to rest independent of the regular operating devices.
20. Low Oil Protective Device: A low oil protective control circuit shall be provided to automatically stop the car should the oil level become insufficient to permit the car to respond to an upper floor call. The system shall automatically bring the car down to the lowest landing and open the doors. It shall then shut down until the condition has been rectified, after reaching the lower terminal
21. Hoistway Access Switch: A constant pressure key switch shall be provided at the top and bottom terminal floor. Activation of the access switch shall move the car away from the terminal floor at reduced speed with car door and hoistway door in the open position for inspection and maintenance.
22. Provide intermittent automatic operation, once every 3-4 hours, through the whole full run of the cab. Cycling shall be the full 24 hours each day throughout the year to lubricate the shaft and the seals.
23. When the elevator is not in use or the on/off key switch is in the off position, the cab shall return to the Customer Assistant's Kiosk level or level designated by Authority.
24. Emergency Return: For each elevator provide battery emergency return device interfaced with the elevator control equipment. In the event of either a power failure or a single phase condition the elevator automatically returns to the floor designated by the Authority, where doors open to allow any passengers to exit. After expiration of the door open interval, doors close and the elevator shuts down until normal power of the 3 phase condition is restored. Doors shall be opened by pressing the door open button from within the car. All other loads such as cab lighting, alarms, and fans shall be connected to the station emergency or standby power system. The elevator recall function shall be programmable.

C. EMERGENCY SERVICE

1. Controls to return elevator to designated floor by means of key-operated switch outside street or ground floor hoistway entrance in compliance with ASME A17.1.
2. In car control during emergency operation by means of key switch in compliance with ASME A17.1.

3. Terminals on elevators controllers for connection of circuit from heat and smoke sensing devices, with wiring from sensing devices to elevator controller

D. Telephone Facilities

1. Provide all audio/visual communication, signaling, and monitoring in accordance with ADA. “Hands-free”phone integral with control panel, mounted in accordance with ADA requirements; having inscription EMERGENCY TELEPHONE as specified for Person with disabilities; finish exposed-to-view components to match stainless steel control panel; and color of letters to contrast with panel.

   a. Provide emergency communicators in accordance with ADA requirements to include auxiliary push button to summon help and visual feedback indicating that the call has been responded to.

2. Provide wiring and jacks for a portable self-contained battery-powered maintenance telephone system. Jacks shall be located on car top, inside car, and in machine room. Furnish three (3) telephone instruments for use of maintenance personnel.

E. Electrical Equipment:

1. Electric equipment for elevator shall be designed, selected, and fabricated in accordance with NEC, NEMA, IEEE Standards, applicable jurisdictional codes, and additional specified requirements. All equipment including motors, controllers, service cabinets, circuit breakers, switches, panelboards, indicators, lighting, wiring, conduit, boxes, and other appurtenances for proper installation and operation of the elevator shall be furnished and installed by the Contractor.
2. All electrical components shall satisfy the City of Chicago Code.
3. Cable and wire for external circuits between the various items of elevator equipment, exclusive of the traveling cable, shall comply with the requirements specified below. The talk pair of the voice communications intercom system shall be shielded with 0.008-inch, minimum, copper shield.

   a. General Requirements for Single-Conductor and Multiple-Conductor Cable:

      i. Type and size: As shown or as required by code.
      ii. Rated voltage: 600 volts.
      iii. Conductors:

         a) ASTM B3 or ASTM B8 annealed copper.
         b) Size 10 AWG and smaller: Solid or Class B or Class C stranded.
         c) Size 8 AWG and larger: Class B stranded.
         d) Other constructions as specified.

      iv. Standards: Except as modified, wires and cable complying with the following:

         a) Cross-linked polyethylene (XLPE) insulated cable: NEMA WC 70.
         b) Other cable: NEMA WC 70.

v. Nonmetallic jacket for single-conductor cable and individual conductors of multiple-conductor cable and as overall covering on multiple-conductor cable:

a) Choro-sulfonated polyethylene or cross-linked polyolefin.
b) Cross-linked polyolefin complying with the following physical requirements.

vi. Properties tested in accordance with NEMA WC 70 if ethylenepropylene rubber (EPR) insulation is used or with NEMA WC 70 if cross-linked polyethylene insulation is used. Jacket material free of PVC and PVC-based compounds.

a) Tensile strength, minimum pounds per square inch: 1,800.
b) Elongation at rupture, minimum percent: 150.
c) Aging requirement: After 168 hours in air oven test at 100EC, plus or minus one degree C:
d) Tensile strength, minimum percentage of unaged value: 100.
e) Elongation at rupture, minimum percentage of unaged value: 80.
f) Oil immersion: 18 hours at 121EC, plus or minus one degree C, ASTM D471, Table 1, No. 2 oil:

1) Tensile strength, minimum percentage of unaged value: 80.
2) iElongation at rupture, minimum percentage of unaged value: 80.
3) Jacket materials other than cross-linked polyolefin complying with NEMA WC 70. Jacket material free of PVC and PVC-based compounds

g) Flame Retardancy: Single-conductor and multipleconductor cable demonstrating flame retardancy in accordance with the following

1) Single-conductor cable and individual conductors of multiple-conductor cable passing vertical flame test in accordance with UL 1591 or NEMA WC 70. Cable size for testing: 14 AWG.
2) Single-conductor and individual conductors of multiple-conductor cable passing vertical tray flame test using ribbon gas burner in accordance with IEEE 1202.
3) Multiple conductor cable passing vertical tray flame test, using ribbon gas burner in accordance with IEEE 1202

h) Applied voltage testing:

1) Single-conductor cable and individual conductors of multiple-conductor cable to be given applied ac voltage dielectric strength test, i.e., six-hour water-immersion test.
2) For single conductors of multiple-conductor cable, conduct tests prior to assembly as multiple-conductor cable.

b. Test procedures:

i. Polyethylene insulated conductors in accordance with NEMA WC 70.
ii. Other conductors in accordance with NEMA WC 70.

c. Single-Conductor Cable:

i. Insulated with ethylene-propylene-rubber with non-metallic jacket or unjacketed filled cross-linked polyethylene. UL-labeled Type RHW or XHHW.
ii. Color coding: In accordance with paragraphs 200-6, 200-7 and 210-5 of the NEC.

d. Multiple-Conductor Cable:

i. Individual conductors:

a) Number of conductors: As shown or as required by code.
b) Construction: Complying with one of the following:

1) Insulated with ethylene-propylene-rubber, with or without nonmetallic jacket as specified.
2) Insulated with composite compound of ethylenepropylene-rubber and polyethylene, UL Class EPCV, without outer jacket.
3) Insulated with filled cross-linked polyethylene without jacket.

e. Phase and neutral conductors: Individually insulated.
f. Neutral conductors: Same size as phase conductors.
g. Bare ground conductors: Sized in accordance with the NEC, unless otherwise shown.
h. UL-listed as Type RHW or XHHW.

4. Conductors assembled with non-wicking, flame-retardant filler to form cable of circular cross Section
5. Metallic-sheath: Provide one of the following

a. Continuous smooth aluminum sheath in accordance with NEMA WC 70.
b. Continuous corrugated aluminum sheath in accordance with NEMA WC 70.
c. Interlocked aluminum tape armor.

d. Multiple-conductor cable provided with overall nonmetallic jacket as specified
e. Cable UL-listed as follows: Metallic-sheathed cable: Type MC, suitable for wet and dry locations

6. Color coding:

a. Power cables: In accordance with paragraphs 200-6, 200-7 and 210-5 of the NEC.
b. Control cables: In accordance with NEMA WC 7

7. Fixture Wire: UL 62, with the following additional requirements:

a. Type: Suit temperature rating of lighting fixture, minimum 194EF.
b. Conductor: Stranded copper conductor 16 AWG or larger as shown.
c. Bare Conductor: ASTM B3 or B8, annealed copper conductor; 8 AWG and larger, class B stranded

8. High temperature wire for ballast resistors

a. Ballast resistors should be wired using high temperature wiring rated at 200 degree Celsius minimum.

9. Traveling Cable
a. The elevator car traveling cable shall be type ETT conforming to the requirements of the NEC with minimum conductor sizes as specified in the NEC. Individual conductors in the cable shall have a distinctive color code for identification. Traveling cable exceeding 100 feet in length shall have steel supporting fillers. Traveling cable 100 feet or less in length shall have steel or non-metallic fillers.
b. Cables shall be free from any possible contact with hoistway structure, car or other equipment. Furnish and install shields or pads to protect the cables.
c. Two (2) coaxial cables shielded for the CCTV system.
d. Four (4) twisted shielded pairs for security and telephone systems. Cables shall be 100% interchangeable and shall be compatible with the Nitek EL 1500CW Coax IP Extender or an approved equal.
e. Cables shall include ten percent (10%) spare wires between each controller, selector, and hoistway junction box, all spares to be properly tagged or otherwise identified with clear and indelible markings.
f. Traveling cable shall be Draka Superflex® Traveling Cable or an approved equal.
g. Traveling cable routing:

i. Traveling cable should be run to the top of the elevator car through the properly sized conduit mounted on the outside of the elevator car.
ii. Traveling cable may be routed through the wiring chase designed specifically for that purpose and build into the elevator car.
iii. Traveling cable should not be routed though the car pushbutton station enclosures.

10. Wiring identification and labeling

    a. Each wire and each cable shall be labeled at terminals and at all accessible points in equipment, panelboards, control panels, motor control centers, manholes, handholes, and pull boxes. Labels shall be self-sticking wire markers.
    b. Each cable run shall be assigned a circuit number and shall be recorded on a cable schedule showing from, to, purpose, number of conductors and length. Each wire shall be labeled according to the submitted shop drawings and wiring diagrams
    c. Cable/wire markers shall be the wrap-around self-adhesive type, with factory or mechanical printed numbers, letters and symbols which shall be used to identify all feeders, mains and branch circuit conductors.
    d. All conductors shall be tagged on both ends at the time wires are pulled in and tested and markers shall not be removed for any reason.
    e. Phase identification letters, in readily visible locations, shall be stamped into the main bus bars of switchboards and panelboards
    f. Cable/wire markers shall be installed on both ends of all conductors, both for internal and external cables. The cable/wire markers for external connections shall comply with Section 26 19 50 Identification. The cable/wire markers for internal wires and cables shall be self-adhesive, self-laminating mechanically printed with a clear protective laminating over wrap or mechanically printed with a clear protective laminating over wrap or sleeve type tubing mechanically printed with permanent non smearing ink. Sleeve type wire markers shall be properly sized for the conductor they are being installed on.

11. Equipment grounding shall be furnished and installed. Ground conduits, supports, controller enclosures, motors, platform and car frames, and all other non-current conducting metal enclosures for electrical equipment in accordance with Code. The ground wires shall be copper, green, insulated and sized as required.
12. Terminal connections for all conductors used for external wiring between various items of elevator equipment shall be solderless pressure wire connectors in accordance with Code. The Contractor may at his option make these terminal connections on No. 10 or smaller conductors with approved terminal eyelets set on the conductor with a special setting tool, or with an approved pressure type terminal block. Terminal blocks using pierce-through serrated washers are not acceptable.
13. Provide separate disconnect for cab lighting and wiring to cab. Provide a separate disconnect for sill heaters.
14. Car lighting and fan circuit for the elevators shall be located in circuit breaker panel in the controller space. Cab lighting, fan and alarms shall be connected to a reliable power panel. In case of a power outage, the reliable panel serving these loads shall be connected to the building emergency or standby power system.
15. Electric Heater for the elevator pit: Washdown duty corrosion resistant unit heater. The heating elements shall be corrosion resistant 300 stainless steel sheathed with 316 stainless steel fins for maximum heat dissipation. The elements are to be attached to junction box with leak resistant stainless steel fittings. Motor should be TEFC, epoxy coated for corrosion protection.
16. Conduits and fittings

a. All conduits used in elevator shaft and machine room shall be heavy wall rigid hot dipped galvanized steel except where specified or indicated otherwise.
b. All conduit fittings and connections shall be compression type. The use of set screw or indentations as a means of attachment is not permitted.
c. Size conduit per NEC for conductor type installed or for Type THW conductors, whichever is larger; 3/4-inch minimum size for conduit.
d. Conduits for small devices such as door switches, interlocks, etc. shall be permitted at ½ inch.
e. The total overall cross sectional area of the wires contained in any conduit shall not exceed 40 percent of the internal area of the conduit.
f. Arrange conduit to maintain headroom and present a neat appearance.
g. Route exposed conduit parallel and perpendicular to walls and adjacent piping.
h. Maintain minimum 6-inch clearance between conduit and piping.
i. Maintain 12-inch clearance between conduit and heat sources such as flues, steam pipes, and heating appliances.
j. Arrange conduit supports to prevent distortion of alignment by wire pulling operations. Fasten conduit using galvanized straps, lay-in adjustable hangers, clevis hangers, or bolted split stamped galvanized hangers.
k. Group conduit in parallel runs where practical and use conduit rack constructed of steel channel with conduit straps or clamps. Provide space for 25 percent additional conduit on racks.
l. Do not fasten conduit with wire or perforated pipe straps. Remove all wire used for temporary conduit support during construction, before conductors are pulled.
m. No conduit shall be attached to a cable tray
n. Approved strain boxes shall be installed for all vertical runs in accordance with Code.
o. Rigid conduit and fittings shall be UL-Listed rigid galvanized steel conforming to the requirements of UL 6 and NEMA C80.1. The minimum diameter shall be three-quarter (3/4”) inches for power circuits, one inch for fire and intrusion circuits, and two inches for audio and control circuits.
p. Liquid-tight flexible conduit shall conform to the requirements of UL 360 and consist of a flexible galvanized steel core containing a copper bonding conductor spiral-wound between convolutions and a neoprene or PVC jacket overall. Fittings for liquid-tight flexible conduit shall be watertight and shall conform to the requirements of UL 514
q. All conduits (rigid steel and liquid tight flexible) should be permanently secured with metallic clamps. Zip ties are not acceptable to use as permanent use.

17. All electrical connections outside of electrical panels or junction boxes shall be made using military spec connectors. Connectors shall be waterproof, environmental resisting with strain relief, vibration resistant, Mil-DTL-5015, MIL-DTL-26482, MIL-DTL-22992, MIL-DTL-38999, MIL-DTL-28840, MIL-DTL-83723

18. Electrical Boxes

a. Outlets, junction and pull boxes shall be galvanized sheet steel or galvanized malleable iron, cast iron, or ductile iron conforming to the

requirements of UL 50, UL 514 and NEC paragraph 370-C. Pull boxes shall have a screw cover with a liquid-tight gasket.

b. Junction boxes on car bottom and hoistway connecting the traveling cable shall contain approved terminal blocks for connection of traveling cable conductors. Terminal blocks shall have indelible identification numbers for each terminal connection.

c. All wire connection terminal blocks shall have the same identification number as labeled on the associated electrical wiring. All electrical wires shall use a labeling tube and heat shrink and match the terminal numbers.

d. During field installation of junction boxes or control boxes, the Contractor/Subcontractor shall not drill or cut into the top sides of the box for wiring.

e. All boxes shall be accessible without removal of other components.

f. All boxes in the machine room or pit shall be mounted on strut channels in order to prevent future corrosion and water damage. The strut channels shall be mounted on the wall and has a minimum of one and one-half (1-1/2”) inches thickness and eighteen (18”) inches above the floor.

g. All boxes (junction, pull-through etc.), conduits and any electrical devices shall be installed in height of twelve (12”) inches minimum from the elevator pit floor. There shall be no electrical conduits installed on the elevator pit floor.

h. All solid state and electrical components located on top of the car enclosure or in the hoistway shall be installed within NEMA 4X enclosures.

i. All connections to and from the cabinetry shall be flexible in order not to compromise the isolation system. Use flexible conduit for the final electrical connection, with all other conduit supports and clamps provided on a neoprene sponge insert. Cabinets shall be NEMA 4X.

19. Disconnect Switches for Car Lights and Mainline Power

a. Disconnect switches shall be the following: UL 98, NEMA KS 1, heavyduty, quick-make/quick-breakswitching mechanism with operating handle external to enclosure, with positions labeled ON and OFF, nondefeatable interlock to prevent opening of enclosure door when switch is ON. Enclosures shall be NEMA 250 Type 4X. Label disconnects switches in accordance with the NEC.

b. Mainline power disconnect switch shall be located in close proximity to the machine room entrance and shall be easily identifiable from other disconnects.

20. Circuit Breakers and Panelboards

a. Circuit breakers shall be the following: UL 489, molded-case, bolt-on quick-make/quick-break, mechanically trip-free switching mechanism, with thermal trip for inverse time delay overcurrent protection and magnetic trip for instantaneous short-circuit protection. The circuit breakers shall be designed to carry continuous rating in ambient temperature of 40ºC.

b. Panelboards shall be the following: UL 50, NEMA PB 1, latch and handle in accordance with UL 50, minimum side gutter size of four (4”) inches, a bus bar of 98-percent-conductivity copper with contact surfaces

silver-plated or tin-plated, rating of neutral and ground buses equal to phase bus rating, neutral bus mounted on insulated block, neutral and ground buses equipped with integral mechanical connectors, one (1") inch high engraved plastic nameplate with two (2") inch high letters on black and attached with stainless steel fasteners. Enclosures shall be NEMA 4x.

21. Pit Receptacles and Lights

    a. Electrical power receptacles shall be furnished and installed in the elevator hoistway, pit, and top of car as shown or required by code. Each receptacle shall be duplex, ground fault interrupter type, resettable at the receptacle; waterproof; grounded, and rated for 120V at 20A.
    b. Maintenance lighting shall be furnished and installed in the elevator hoistway as shown or required by code. Lighting shall be vapor-tight service lights with quick start type PL compact fluorescent lamp. Furnish and install light switches; waterproof; grounded. The light switches shall be so located as to be accessible from the pit access door.

22. Drive Unit Motor

    a. Motor shall be designed specifically for elevator service. The drive motor shall be of the alternating current, intermittent duty, 120 starts per hour, service factors, squirrel cage induction type design adapted to the severe requirements of elevator service. The Elevator Drive Unit Motor shall be single-speed. The motor shall be suitable for operation on a 208V, three-phase, and 60Hz supply and capable of developing the required starting torque. In lieu of 208V, Contractor may furnish and install a transformer for conversion of 208V to 480V.
    b. The Motor shall be rated in accordance with NEMA Standard MG 1 for 60-minute rating motors and shall have sufficient capacity to operate the elevator with specified rated load at specified rated speed without overheating. The insulation and the starting and running torque of the Motor shall be capable of permitting operation in accordance with NEMA MG 1. Standard factory motor test data and motor dimensions shall be submitted to the Contractor for approval. Each Motor nameplate shall include the motor HP rating, voltage; full-load amperes, locked rotor amperes, full-load speed, design temperature rise, and NEMA design rating of the Motor. Each Motor shall be provided with ring or other suitable lifting means. The Motor frame shall be tapped and drilled for a copper cable grounding connection.
    c. Insulation of windings shall be NEMA Class B, fully impregnated and baked to prevent the absorption of moisture and oil. The insulation resistance between motor frame and windings shall be greater than one megohm.
    d. Motor bearings shall be of the ball or roller type, arranged for grease lubrication and fitted with grease gun connections and drain plugs or fitted with sealed-for-life bearings. The bearings shall incorporate dusttight lubricant seals.
    e. Motor shall be provided with an electronic soft start feature and thermal overload protection for each phase.
    f. Connect motor and pump with multiple V-belt.

i. Belts and sheaves shall be sized for duty involved and designed to prevent any metallic contact between motor and pump shaft.
ii. Furnish and install isolation units of rubber in shear to prevent transmission of pump and motor vibration to building.
iii. Furnish and install expanded metal sheave guard that can be easily removed for servicing and inspection.

23. Elevator Controller

a. An Allen Bradley (or CTA Engineering approved equal) PLC-based controller shall be provided, governing starting and stopping as well as preventing damage to the motor from overload or excessive current. The controller system shall automatically cut off the motor current and bring the car to rest in the event any of the safety devices become activated.

i. The system shall coordinate the functioning of elevator drive unit relative to actual location and status of the elevator. The system shall interface with the door control and all required safety circuits, switches, and devices. The controller shall be mounted in a NEMA 4X stainless steel, air-conditioned cabinet within the controller room.
ii. The diagnostic system shall be an integral part of the controller and provide user-friendly interaction between the service person and the controller system.
iii. The controller shall be capable of operating with an operating temperature range of 32°F to 140°F within a non-drip environment and no more than ninety (90%) percent relative humidity. However, the air conditioner on controller cabinet shall maintain the operating temperature in range of 50°F to 80°F degrees Fahrenheit.

b. An Allen Bradley CompactLogix 1769-L32E (or CTA Engineering approved equal) based PLC control system shall be provided

i. Control system shall be provided with Ethernet/IP, RS-485, DeviceNet, DH-485 and Modbus TCP protocols for communication with external devices such as data collecting controllers, HMIs and data servers.
ii. The PLC CPU module shall store the last 99 faults, accessible via laptop connection, controller fault/status display and remote communications. The contractor shall provide CTA with a programming and monitoring unit, such as a laptop computer with the newest version of Allen Bradley RS-Logix and any other software required to setup and program all electronic items in the control system, for each elevator, for the purpose of troubleshooting and remote monitoring modifications. The laptop should allow uploading, editing, and downloading any software that is being used on this elevator for any operation
iii. The elevator manufacturer for each elevator location shall provide the Authority with a laptop computer, Windows based with latest operating system, latest generation of Intel i7 or higher processor (with the program and software installed with required cables to plug into the PLC and all other accessories to

use for diagnostic purposes of the elevator system. Manufacturer shall provide non-proprietary diagnostic software, Elevator program with all input/outputs descriptions showing each rung and other required software installed in the computer for use by the Authority's elevator technicians.

iv. An Allen Bradley PanelView Plus 6, EZ Automation or CTA Engineering approved equal, fault/status display/interface shall be provided in the controller cabinet. Control system timers and other setup criteria shall be programmable through this unit. All fault, status and setup data shall be stored in the controller CPU module and accessible form the HMI. Submit all screens and menus for CTA review and approval.

v. In cases where the programming is done by the supplier, the supplier shall provide a copy of all working programs, including labels for all inputs and outputs, data tables and internal logic points, on Flash Drives/CD-R disks as well as a printed program listing. The programs and setup data shall require a password for access and modification. The password shall be provided to CTA Engineering as part of the Submittal

vi. The main control of an elevator shall contain at least the following devices or electronic sensing: phase failure line voltage monitor, motor current and ground fault monitor

vii. The controller cabinet shall contain a permanently mounted fault indicator panel with LED indicator lights. Tripped safety devices, door position, door reversal, car running status, and control system status shall be indicated

viii. All terminals shall have identification markings and all wires, including field wires, shall be provided with permanent heatshrink sleeve cable markers. These wiring identifications shall be provided in the wiring diagram at each end of the circuit connections. Wiring shall meet the requirements of section 26 17 50 Local Control Panels and 26 19 50 Identification. ix. The controller shall be equipped with the AC vector drive installed in-line before the hoist motor contactor and the hoist motor.

x. The AC vector drive shall be capable of accelerating and decelerating the hoist motor smoothly and gradually. Adjustable settings for acceleration and deceleration ramps shall be provided.

xi. The controller shall have, at least, one dedicated ethernet port and one dedicated rs-485 serial port for interface to the Modbus TCP and DH485 monitoring network and programming access without disconnecting any other ports.

xii. The Programmable Controller shall have at least one dedicated port to support the controller fault/status display

xiii. The controller PLC shall provide the following Remote Monitoring and diagnostic network support:

a) All applicable faults, statuses, and data listed in Table 1, Elevator Fault Table, to be provided.
b) Fault indications shall remain until reset in the controller.
c) Status and analog data to be provided for the duration of the condition.

d) Provide elevator run timers and trip counters. Provide door cycle counters. All counters and timers to be accessible form the HMI

e) Software in the controller PLC to format monitoring data responses to data collecting controller polling as specified in the specification.

f) The monitoring data port in the controller to be setup for Modbus TCP protocol with the port network identification number programmed for the particular elevator identification.

g) All faults, statuses, and data to be held by the controller CPU and sent from the CPU when polled by the external data collecting device.

h) All faults, statuses and data to be accessible form the HMI device.

xiv. Provide sufficient non-volatile CPU memory, for non-volatile retention of program memory, system status, and operating parameters

xv. Diagnostics

a) The processor shall have built-in diagnostics and selftest, such that each time power is cycled, the processor does a complete CPU and RAM memory test. Additionally the power-up test will momentarily light up all diagnostic LEDs to be sure they are working. A power up test will not be performed if the internal flag (bit) for Fireman's Service Phase I is latched. The processor shall be capable of reporting major and minor fault codes and processor status information back to the data collecting controller, provided the fault is not a catastrophic hardware failure where the processor is unable to power up.

b) The processor shall have a built-in watchdog timer to ensure that all processor program scans occur within the time limit set by the watchdog timer.

c) The processor shall have individual LED indicators that are clearly visible and labeled for easy identification. At a minimum the following indicators must be provided:

d) CPU is in RUN mode.

e) CPU is FAULTED.

f) CPU battery is LOW.

g) I/O points are FORCED and are not under program control

h) COMMUNICATION channels are active.

xvi. Input/Output Modules

a) The Input/Output Modules shall be compatible with the PLC processor I/O structure. Each module shall be provided with a detachable terminal strip to connect wiring to the module. Each wire on the terminals shall be identified by the module terminal.

b) Discrete Input Modules: Suitable for the input voltage and compatible with the Allen Bradley system.
c) Discrete Output Modules: Suitable for the voltage and load and compatible with the Allen Bradley system.
d) Analog Input Modules: Converts analog signals to proportional twelve-bit binary values. The module shall accept 4 to 20 mA signals. Provide modules compatible with the Allen-Bradley system.

xvii. I/O Mounting and Power Supply

a) The controller chassis shall have an additional three spare modules.
b) Power supplies shall provide power to the PLC processors, I/O and other function modules. The power supply shall be suitable for operation of 120V AC, single phase power. Power supply capacity shall be a minimum of 150% of the connected load.

xviii. Air Conditioning

a) Provide an independent air conditioning unit with dripfree active condensation evaporation system for each controller to maintain manufacturers recommended operating temperatures. The air conditioner shall be equipped with fully-programmable digital controller with temperature and pressure monitors for smarter air conditioning. The air conditioner shall have NEMA 4X enclosures and use 120 VAC or 24 VDC power source for calculated BTU/hour.

xix. Selective Collective Operating: As defined by ASME A17.1 and shall be the pressure upon one or more car buttons to correspond to landings in the order in which the landings are reached by the car, irrespective of the sequence in which the buttons are pressed, provided the hoistway door interlock and car door switch circuits are completed. During this operation, the car shall also answer calls from the landings, which are in the prevailing direction of travel. Each landing call shall be canceled when answered.

a) Momentary pressure on car button or landing button illuminates that button, which remains illuminated until call is answered. Illuminated buttons serve as visual indication that call has been registered and that car will stop at that landing.
b) Operation shall be automatic by means of the car and landing buttons. Stops registered by the momentary actuation of the car or landing buttons shall be made in the order in which the landings are reached in each direction of travel after the buttons have been actuated.
c) UP landing calls answered while car is traveling in up direction and DOWN landing calls answered while car is

traveling down, car reversing after uppermost or lowermost car or landing call has been answered and proceed to answer car calls and landing calls registered in the opposite direction of travel.

d) Should both an up and a down call be registered at an intermediate landing, only the call responding to the direction in which the car is traveling shall be canceled upon the stopping of the car at the landing.

xx. Other Features:

a) Independent Operation: Provide TWO-position keyed switch (ChicagoLock 7500) marked “Independent Service, OFF and ON” in the lower portion of the car operating panel of all cars. The switch shall be springloaded type. When placed in ON position, the car will be removed from the automatic operating system and will not respond to demands registered at the hall push buttons. It will respond only to floor with doors open until another demand is registered in the car. Demands registered at the landing will remain registered until answered by another elevator. The car only responds to car calls and that the doors remain open after a stop until closed by continuous pressure on the door close button.

b) The controller shall be designed to operate automatically on standby power.

c) Hoistway Access Switches (ChicagoLock 7500) shall be provided at all landings. The hoistaway access switch shall be located on the centerline of the right door jamb at the height 60” minimum and 72” maximum from the finished floor.

d) When the elevator is not in service for any reason, the elevator controller shall provide four (4) auxiliary contact closures and simultaneous contact opens to operate the Elevator/Not In Service graphic and to operate remote monitoring equipment.

e) The elevator controller shall accept a contact closure provided by the station Fire Alarm Control Panel (FACP). Receipt of the closure shall cause the car to return to the Customer Assistant’s Kiosk level. The operation of the car shall conform to the requirements of Phase 1 Emergency Recall Operation.

xxi. Machine Room Two Way Communication Device: Provide within each control machine room a two way communication device that will interface with any type of ADA compliant telephone. The device shall be mounted directly on or within hands distance proximity to the elevator controller.

xxii. Any junction boxes installed in the machine room or hoistway shall be accessible for Maintenance.

a) Drilling or opening the top-end of the enclosure is not acceptable.
b) Wire nuts or splicing without terminal strips is prohibited.
c) All openings shall be properly sized for the conduits.

F. Emergency Return

1. Provide a separate battery powered unit that senses loss of power and which shall operate as follows:

   a. Elevator automatically moves to the landing designated by Authority
   b. .Doors open automatically when car arrives at bottom landing and then close as required by Code.
   c. Elevator shall remain inoperative until normal power is restored.
   d. Battery lowering system should be provided with the transfer switch. Main controller should not be wired in series with the battery lowering system.
   e. Testing: Furnish two lights and test button on outside of unit which when illuminated, indicates the emergency return system is activated and the battery charger is functioning. Provide constant pressure button which allows manual activation of the system for test purposes.
   f. Auxiliary Contact: Provide 1 normally open type auxiliary contact in the existing main line disconnect switch. Install 2 #18 wires from auxiliary contact to the elevator controller. The auxiliary contact opens mechanically when the main line disconnect switch is placed in the OFF position which allows the elevator to be shutdown without operation of the emergency return unit. The auxiliary contact is in the closed position when main line disconnect switch is in the ON position.

2. The system shall differentiate between actual power failure and manual operation of disconnect switch.
3. Failure protection (operational/power) battery shall be a 12V minimum, sealed, lead-acid, or approved alternative. The separate box shall be used for battery and not stored within the main controller.
4. Provide a manual lowering valve to allow the car to return to the lowest landing. The manual lowering shall be easily accessible and reachable
5. Provide all wiring, sensors, and associated connections to the main line power and disconnect.

G. Elevator Hoistway Entrances and Doors

1. General: Except as otherwise indicated, provide type 304 stainless steel and laminated glass sliding, door-and-frame hoistway entrances; complete with track systems, hardware, safeties, sills and accessories. Match car enclosure doors for size, number of door panels, glass size and alignment, and door panel movement. Provide frame-section size and profile to coordinate with hoistway wall construction as indicated.
2. Materials and Fabrication: Provide selections indicated; manufacturer’s standard, but not less than the following:

   a. Stainless Steel Door Panels and Frames: Flush stainless steel construction, 18 gauge doors, 14 gauge frames, AISI Type 304 No. 4 finish. Transom shall be 16 gauge.

b. Provide material test reports for stainless steel materials used on entrances.
c. Glass Panels: 9/16 inch thick laminated safety glass permanently marked in gasket system. No glass within 24 inches of floor level.
d. Nickel Silver Sill with grooved surface 1/4 inch thickness, cast or extruded, mill finish and steel angle (ASTM A36 steel). Sill shall be through bolted to angle, allow for expansion to prevent sill from buckling. Provide nickel silver sills at all hoistway openings. Provide type 304 stainless steel sill angle support. Sills should be slotted to allow for water drainage. Provide ½" wide and 2" long slots every 12". Machine openings in sill support to macth the sill slots. Provide with sill heater
e. All switches, door operators and other electrical equipment exposed in the hoistways shall be of washdown duty design such that water from floor cleaning operations, rain and snow do not affect equipment operation.

3. Entrance frames shall be of welded or bolted construction for complete one-piece unit assembly. All frames shall be securely fastened to fixing angles mounted in the hoistway and shall be type 304 stainless steel.
4. All materials and finished surfaces exposed to public view shall be stainless steel with embossed finish and/or glass panels as indicated on the Contract drawings. Glass panels (if provided) to be completely flush with door assembly. In a glass hoistway, the struts or any brackets should not be visible to the public.
5. Fascia and Dust Cover in the hoistway shall be stainless steel Type 304 and extend at least the full width of the door openings on each side. Toe guards shall be fastened to the sill at the lowest landing.
6. Hoistway doors are to be stainless steel and provided with keyways as required for operating mechanisms and door hangers. Provide glass panels that are completely flush with door, as indicated in A17.1. Each door panel shall have stainless steel bottom guides that run in landing sill slots. Guides shall be replaceable without removing door panels. All doors shall have fixed fire Gibs.
7. Doors structural elements including door core shall be built from type 304 stainless steel.
8. Interlocks and Contacts

    a. The doors at each hoistway entrance shall be equipped with approved hoistway door interlocks of the hoistway unit system type tested as required by the Code. Interlocks shall prevent operation of the car away from a landing until the doors are locked in the closed position. Interlocks shall prevent doors from opening at any landing from the corridor side unless the car is at rest at that landing, or is in the leveling zone and stopping at that landing.
    b. Provide key-operated hoistway door unlocking devices. A device shall conform to the requirements of the Code and shall permit authorized persons to open the hoistway doors from the landing when car is away from landing. The key for emergency use shall be mounted in a KnoxBox as required by NFPA Code

9. Provide raised floor/level designations in characters and Braille on each jamb at 60 inches from floor to centerline. Characters shall be two inches high and in accordance with ADA requirements

a. Hoistway Entrance Door Jamb Tag Raised and Braille Characters: All elevator hoistway entrances shall have raised and Braille floor designations provided on both jambs, equal to Adams Series A-4500 modified 3 inches width by 4 inches height, stainless steel plate, brushed stainless finish characters with black background. The centerline of the characters shall be 60 inches above the finish floor. Characters shall be 2 inches high. Provide “Star” designation in addition to floor designation at landing of main egress indicated on the drawings

10. Struts and closer angles shall be hot-dipped galvanized structural steel angles of sufficient size to accommodate and support the hoistway door header plate. Angles shall be continuous and securely bolted to the sills and building beams or structure above.
11. Hanger supports shall be 1/8-inch minimum thickness formed sections securely bolted to the strut angles.
12. Fascia Plates: Galvanized Steel cladding reinforced to ensure a flat, even surface throughout, and shall be securely fastened to hanger supports and sills above.
13. Dust Covers: Galvanized or Stainless Steel cladding which shall extend over the hanger support the width of the jamb opening plus the jamb flanges, at the top landing for which fascia plates are not supplied.
14. Hanger cover plate sections above the door openings shall be arranged for opening or removal from within the car.
15. Sill guards: Sill guards (galvanized steel cladding) shall be supplied for the lowest landing. On glass hoistway, they shall extend the full width of the hoistway and to bottom of pit.
16. Door hangers and tracks shall be provided for each hoistway, sliding door sheave type, two-point suspension hangers and tracks, complete. Sheaves shall not be less than 2-1/4 inch diameter with ball bearings properly sealed to retain grease lubrication and shall be mounted on stands arranged for attaching to the doors by two cap screws. Hangers shall be equipped with adjustable ball bearing rollers to take the up-thrust of the doors.
17. The tracks shall be high-carbon steel or formed steel with nylon inserts, shaped to permit free movement of the sheaves.

H. Elevator Components

1. The elevator car and car components shall conform to the requirements of the Code, and shall operate without squeaks or metallic sounds. Entire car assembly, including car frame and platform, shall be free from warps, buckles, and squeaks and rattles. Joints shall be lightproof.

    a. Except as otherwise indicated, provide car enclosures, of the design and selections indicated on the drawings. Include ventilation, lighting, stainless steel, ceiling finish, stainless steel operable windows, stainless steel wall finish, access doors, doors, power door operators, nickel silver sills (threshold), trim, accessories, and floor finish.

2. Elevator Car shall be prewired at the factory. Cab shall be designed to accept all necessary wiring and conduit. Field wiring should be limited to the traveling cable terminations.

3. Frame and Platform

a. Elevator car frame shall be of welded ASTM 123 galvanized steel channel uprights affixed to crosshead and plank channels with welded or bolted bracing members and gusset plates.
b. The car platform shall be designed to accommodate one-piece loads weighing up to 25% of the APTA rated load.
c. The car frame shall be constructed of structural steel members. The platform shall consist of a steel frame with necessary steel stringers all welded together. The frame and platform shall be braced and reinforced to prevent the transmission of strain to the elevator car. Steel framing shall conform to the requirements of ASTM A500, Grade B, modified to minimum yield strength if required. The variation in straightness of individual members and the frame as a whole shall not exceed 1/8 inch. Secondary straightening may be performed if necessary. The car enclosure shall be securely fastened to the car platform and so supported that it cannot loosen or become displaced during ordinary service, on the application of the car safety or on buffer engagement.
d. The platform shall be provided with a steel floor designed for specified loading and sealed watertight. The platform shall be isolated from the cylinder by suitable rubber pads or other equally effective platen isolation.
e. All structural steel in the frame and platform shall be ASTM 123 hotdipped galvanized.

4. Materials and Fabrication: Provide selections as indicated for each enclosure surface; manufacturer's standards, but not less than the following:

a. Stainless Steel Return, Doors and Frames: 18 gauge doors, 14 gauge frames and return, AISI type 302/304 No. 4 finish.
b. Stainless Steel Wall Panels: Wall panels to allow for a recessed 4 inch high base consisting of same material as finished floor. Each side of elevator interior cab to be one piece of metal.
c. Stainless Steel Interior Elevator Door and Walls: As selected by the Authority, use patterned Type 304 Stainless Steel, satin finish, 18 gauge thickness, Pattern No. 5WL/LTH by Rigidized Metals Corp. or approved equal.
d. Nickel silver sills, extruded, ASTM B 151 (alloy UNS No. C74500), with grooved surface, 1/4 inch thickness, mill finish with drains and sill heater.
e. Operable Windows (if shown): 18 gauge stainless steel frames, finish AISI type 302/304 No. 4 finish. Continuous piano hinges. Key locks at top and bottom. Provide with micro switches interlocked with controls
f. Glass Panels: 9/16 inch thick laminated safety glass permanently marked in gasket system. No glass within 24 inches of floor level.
g. Fabricate stainless steel car door frame integrally with front wall of car.
h. Fabricate car with recesses and cutouts for signal equipment.
i. Surround Lighting: LED light fixtures having ballasts rated for reliable lamp starting of -20 degrees Fahrenheit and lens panels of translucent polycarbonate complying with flammability requirements, unless otherwise indicated on drawings. Provide emergency cab lighting per ANSI-A17.1. One light fixture in each cab shall be equipped to provide emergency illumination when required as well as normal power illumination. This fixture shall be located over the cab control station. See Electrical Drawings for lighting fixture type, power supply and drivers, light temperature and intensity (minimum 20 foot-candles).

5. Provide inspection certificate in each cab, mounted under acrylic cover with frame made of polished stainless steel No. 8 finish.
6. Elevator cab and hoistway shall allow refuge space on top of the cab for personnel according to the applicable ASME/ANSI or other code. Provide the minimum space required from the top of the cab to the lowest point of the equipment at the top of the hoistway.
7. Elevator cab top to be provided with stainless steel railings as required by ASME 17.1
8. Emergency exit: Car shall have a top emergency exit conforming to the requirement of the ASME Code, and the applicable jurisdictional requirements. The door shall open toward the top of elevator and shall have a latching mechanism to keep it in place.
9. Toe Guard Aprons: a. The toe guard apron (cladding) at entrance side of elevator cab shall be not less than 16 U.S. Standard Gauge (USSG) type 304 stainless steel, and shall extend at least three inches beyond entrance jambs at each side. Toe guard shall have a straight vertical face, extending below the level of finished car floor, of not less than the depth of leveling zone plus three inches. The bottom of guard shall extend three (3”) inches below the vertical face and be beveled at a 15-degree angle from the vertical. The toe guard shall be secured to car platform construction and be reinforced and braced to withstand a constant force of 150 pounds on its face without permanent deformation or deflection exceeding one quarter (1/4”) inches.
10. Fascia Plates: Type 304 Stainless steel fascia plates shall be provided as required by Code, extending full opening width, from the sill of one opening to the hanger support below
11. Hanger Support: The hanger support shall be formed steel to provide for the operating equipment.
12. Elevator Floor: Elevator cab platform sub-floor to be supported on and welded to metal channels integral with the cab structure. Elevator cab platform sub-floor to consist of one piece ¼” type 304 stainless steel plate. A plywood subfloor is not acceptable. Thickness of plate, size and spacing of channels as required for design loads. Set height of platform to allow installation of the finish flooring and to meet and be flush with the top of the elevator door sill.

    a. For new finish floor in existing elevators: Prior to installation of new finish floor, remove existing finish floor and base in entirety down to metal subfloor. Abrade metal subfloor to remove loose rust, remains of previous finishes, flaking paint and dirt.
    b. TYPE OF FINISH FLOOR FOR THE ELEVATOR TO BE SELECTED BY THE AUTHORITY FROM THE FOLLOWING TWO ALTERNATIVES:
    c. Alternative No. 1: MasterTop SRS Four Coat System Finish Floor:

        i. Roughen the metal subfloor by blocking, grinding or other suitable means to achieve a rough, bright, metal surface. Vacuum up any loose dust produced by surface preparation techniques. Substrate to be left clean and dry.
        ii. Provide and install MasterTop SRS 40TC-102AP Primer strictly according to manufacturer’s recommendations and instructions for preparation of the substrate, environmental conditions, mixing of the material, applying the material and curing the material after installation. Primer to be formulated to bond to the metal surface when applied. Unless specified or required otherwise, apply primer at approximately 100 sq. ft. per batch.3. Provide

and install MasterTop SRS 100 PAS Coving to match the floor system strictly according to manufacturer's recommendations and instructions for preparation of the substrate, environmental conditions, mixing of the material, applying the material and curing the material after installation. Cove shall form a tight, permanent attachment and complete seal to the elevator vertical wall substrate. The finish wall panel installation shall be detailed to extend beyond the vertical cove surface and form a "drip" type detail to shed any moisture away from the cove seal to the elevator wall surface.

iii. If recommended by the manufacturer for the specific application, provide and install MasterTop SRS 61 BC/SL pigmented self-leveling topping or scratch coat strictly according to manufacturer's recommendations and instructions for preparation of the substrate, environmental conditions, mixing of the material, applying the material and curing the material after installation. Color as selected by the Authority from manufacturer's standard colors. . Apply at an even depth. "Porcupine Roll" to release any trapped air. Unless specified or required otherwise, apply overlay coat at approximately 40 sq. ft. per batch at 1/8" thickness.

iv. Provide and install colored flakes or aggregate if selected and approved by the Authority by broadcasting, completely and evenly covering the overlay coat, to provide a skid and abrasion resistant floor. Apply strictly according to manufacturer's recommendations and instructions. After overlay coat cures, remove excess flakes by sweeping with a medium stiff broom and vacuuming.

v. Provide and install two floodcoats of MasterTop SRS 71TC or Mastertop SRS 53TC methylmethacrylate resin top coat strictly according to manufacturer's recommendations and instructions for preparation of the substrate, environmental conditions, mixing of the material, applying the material and curing the material after installation. Unless specified or required otherwise, apply first top coat at approximately 80-100 sq. ft. per batch. After first coat cures, apply second coat at approximately 100-120 sq. ft. per batch.

vi. Flooring system shall be MasterTop 1841 SRS CF specialty resin system as manufactured by BASF Corporation or a similar system submitted to the Authority for review and written approval.

vii. The resin flooring and cove base system shall be non-porus, self-leveling, flexible and designed to withstand chemicals; withstand moisture infiltration; withstand vibration, loading and impacts without cracking; tightly and permanently adhere and bond to the substrates (elevator subfloor, sill and cab walls) without separating and without allowing infiltration; not delaminate crack or separate; to create a non-slip floor finish; avoid shrinkage; be abrasion resistant; be not affected by extreme variations in temperature and to be capable of withstanding heavy duty usage without deterioration. viii. The floor system shall have the following properties:

a) Tensile shear adhesion to steel minimum 2,200psi.
b) Compressive strength minimum 10,500psi.
c) Flexural strength minimum 4,600psi.
d) Have heat resistance up to minimum 300 degrees F. and be self- extinguishing.

ix. Color and pattern to be as selected by the Authority from manufacturer's standards.
x. Allow floor to cure as recommended by manufacturer of the floor material between coats and upon completion of the floor system.
xi. Installation shall be performed by the floor material manufacturer or by an installer certified by the manufacturer to perform the work and experienced with the material

d. Alternative No. 2: Metal Pan Floor:

i. Fabricate a continuous one piece metal pan floor and base combination formed from a single stainless steel sheet. The base of the pan shall be 4" high all around (except at elevator door sill). The corners and the transition between base and floor shall have a ½" radius. The walking surface shall have a diamond plate type embossed pattern to avoid slipping. Metal pan floor shall be entirely of one piece stainless steel with no seams, welds or connections.
ii. Verify the exact size of the elevator cab and floor so the pan fits precisely over the steel plate elevation floor, up the elevator wall structure and tightly to the elevator door sill.
iii. The metal pan, after set flat into place and prior to installation of the finished wall panels of the cab, shall be secured into place with recessed stainless steel screws set ½" from the top of the base.
iv. The finished wall panels shall then be installed over (overlapping) the base; covering the top 1" of the base and covering the screws. Seal the joint between the floor and the elevator metal sill with a clear silicone sealant.

13. Car Ventilation: Air handling capacity shall provide one air change per minute based on net interior car volume but not less than 350 CFM. Provide one hour of emergency ventilation. Car Ventilation should meet the ASME 17.1 requirements.

a. Ventilating fans shall be securely mounted in place.
b. Ventilation openings shall comply with the ASME and local codes, and shall be suitably sized and distributed to provide uniform airflow within the car.
c. Connect continuous ventilation fan to emergency power system. Provide battery backup for fan operation of at least 1 hour in the event of power loss.
d. The exhaust fan shall be controlled from the car operating panel. Confirm key type with Authority

14. Handrails: Provide Type 304 stainless steel handrails, on side walls and back wall (unless otherwise indicated to be installed on side walls only; either continuous or one hand rail per wall.
15. Lighting Fixtures

    a. Car lighting shall provide a minimum of 15-foot candles measured at any point on the cab floor and shall of the LED type. Car lighting shall be provided with emergency battery backup upon failure or interruption of normal car lighting. Emergency lighting unit shall provide required lighting for a minimum of four (4) hours. The Battery Charger shall be capable of restoring battery to full charge within sixteen (16) hours after resumption of normal power.

16. Car Doors and Door Equipment
    a. Car doors and door frames shall be suitably reinforced and provided with a laminated type 304 stainless steel #4 finish. Doors shall protect the full width and height of car entrance opening when in the fully closed position. Car door frame shall be integral with front wall of cab
    b. Doors structural elements including door core shall be built from type 304 stainless steel.
    c. Hanger cover plate sections above the door opening shall be removable from the hoistway. Doors shall be guided at the bottom by composition gibs engaging threshold grooves with minimum clearance.
    d. Door operation automatic at each landing with door opening being initiated as car arrives at landing and closing taking place after expiration of specified time interval, with electric contact to prevent starting elevator away from landing unless car door is in its fully closed position.

        i. Time door closing to start five (5) seconds minimum from notification that the car is answering a landing call.
        ii. Time doors shall remain open five (5) seconds minimum.
        iii. Time shall be adjustable to twenty (20) seconds.
        iv. The interval of time that the doors remain open at intermediate landings shall be less for a stop made in response to a landing call. The door open time at a dispatching terminal shall be longer than the time for a stop in response to an intermediate landing call.
        v. Nudging Feature: After car doors are prevented from closing for a predetermined adjustable time period, through activation of door reversal device, a loud buzzer shall sound and doors shall begin to close at reduced rate of speed. Doors shall continue to close unless door light-ray protective device is activated, which shall cause doors to reopen. Process shall repeat continuously until obstruction is removed from entrance.
        vi. A loud buzzer shall sound if the “door open” button is held for a long period of time.
        vii. All door timers shall be adjustable from the controller display panel.

    e. Door Operator Equipment

        i. Provide a water resistant heavy-duty GAL MOVFR or CTA

Engineering approved equal door operator with encoderless VVVF drive. Closed-loop door operator designed to operate the car and hoistway doors simultaneously at the speed specified. The door shall open automatically when car stops at the landing to discharge passengers or to answer valid calls and close automatically after predetermined time interval has elapsed. The doors shall be capable of smooth and quiet operation without slam or shock. The door operator shall have the following features:

a) A one half (½ HP) horsepower motor and heavy duty sprocket, chain, belt, and sheaves. Motor shall be washdown duty suitable for wet and corrosive environments.
b) Closed-loop regulated speed performance.
c) Hand-held keypad programming.
d) Adjustments can be stored in the keypad and downloaded to another operator.
e) Adjustable door obstruction reversal.
f) Optical cams with LED indicators.
g) Test switches for open, close, nudging, and speed-zone set up.
h) Universal inputs for open, close, and nudging.
i) Reversing switch to back up the door reversal device.
j) Designed for interior and exterior applications.

f. Provide a non-contact door reversal device with light immunity: The Door Reopening Device shall cause both the car and hoistway doors to reverse, should they detect an obstruction in the elevator entrance. The device electrical wiring shall be supplied with quick-disconnect terminals to facilitate replacement. The infrared curtain detector shall include the following:

i. A protective infrared detector field extending from 1 1/2” above the car sill to a height of 68”.
ii. A fail-safe control system to prevent the doors from closing in case of power loss to the detector.
iii. A one-piece full door height protective lens cover designed to be completely waterproof and to withstand impact, abrasion, and vandalism.

17. Hoistway Operating Devices

a. Normal and final terminal stopping devices shall be provided for elevator conforming to the ASME Code requirements.
b. Final terminal stopping devices, located in hoistway or on the car and operated by cams, shall be fitted with rollers having a rubber or other approved composition tread to provide silent operation when actuated by the cam.
c. Normal terminal stopping device may be mounted in hoistway, on top of the car, or in the machine room.

18. Signal Devices and Fixtures

a. Car Operating Panel (COP) and Hall Stations

i. Provide one (1) main panel in the front and one (1) auxiliary panel.

ii. General: Provide signal fixtures and control devices for each elevator. COP and Hall Stations shall be provided with vandal resistant push buttons designed to bottom out against the panel plate and not the contacts, key switches, Buttons should be of the illuminated type that light-up when activated and remain lit until call or other function has been fulfilled. All signal fixture and control device faceplates shall be of Type 316L, nominal 0.135 inch thick stainless steel with No. 4 finish, unless otherwise shown on the Contract Drawings

iii. Panels and components shall be Adams Elevator Equipment Company “Survivor/Plus” design or approved equal by the Authority. Fabricate equipment exposed surfaces of type 316L stainless steel with manufacturer’s standard directional polish to match #4 finish.

iv. Car operating Panel and Box: Provide flush-mounted panel and box containing call button for each landing served, and containing other buttons, switches and controls required for specified car operation and control at each specific elevator. All Cab Call Station Panel components shall be vandal resistant. Mount panels and components as indicated, or scheduled, at height complying with ADA requirements. Provide operating device symbols with tactile/ Braille, raised and Braille markings as required by code, CTA and ADA requirements. Control buttons shall be designated by raised and Braille characters, size shall be minimum 5/8 inch high. Service panel door lock shall receive 6 pin Best cylinder. Other keyed switches shall be standard keys keyed alike.

v. Car operating panel and box should be NEMA 4X

vi. Provide new vandal resistant illuminated buttons, size shall be a minimum of 3/4 inch in the smallest size, raised or flush.

vii. Provide the words “NO SMOKING CITY ORDINANCE” by engraving in stainless steel and fill with red enamel paint. Engrave with 5/8” high Helvetica medium uppercase letters. Show location and spacing of words on elevator shop drawings.

viii. Car operating panels shall contain Braille plates adjacent to each call button. Contractor to coordinate proper landing call outs based on maximum characters as indicated on Contract drawings. Buttons for DOOR-OPEN, DOOR-CLOSE, ALARM, EMERGENCY PHONE call functions are to be supplied. Buttons are to be vandal resistant and of the positive stop type

ix. Car Operation Panel shall have a locked service cabinet for keyed switches and GFI duplex outlet as indicated on the Contract drawings. The service cabinet key shall be CXT-1. Confirm key type with Authority.

a) Service cabinet: Provide and coordinate the following functions with Cab Call. Station Panel and box, components, location and communications;

1) Keyed light ray switch.
2) Keyed light switch.
3) Keyed fan switch.
4) Keyed inspection switch (cylinder).
5) Telephone jack.
6) No glass panel in door.
7) Lock in door to receive 6 pin Best cylinder

x. Emergency Stop Key Switch and Bell: Key switch shall be Best Lock Corp. No. CXT 1. Emergency Stop Key Switch shall operate function designed to cut off current supply to motor, apply brake and bring the car to rest independent of the regular operating devices. Turning key switch stops car and activates communications instrument to allow passenger to talk to Customer Assistant Shelter and Control Center. Emergency Stop Key Switch shall provide 2 contact closures and simultaneous contact opens to operate remote monitoring equipment. Turn key switch to reactivate elevator indicator.

xi. Furnish and install a system to provide for 2-way communications between the Car Operating Panel in each Passenger Elevator cab or each Hall Call Station and the remote CTA Control Center in accordance with ADA.

a) Alarm Call Button and Two-way Communication Instrument and Function: Alarm Call Button and Two-way Communications Function shall activate communications instrument to allow passenger to talk to Customer Assistant Shelter and Control Center. Alarm Call Button shall provide 2 contact closures and simultaneous contact opens to operate remote monitoring equipment. Provide red jewel button.

xii. Hall Station: The Riser of hall stations of the push-button, call acknowledging, stainless steel, tamper resistant type shall be mounted at all elevator landings. Highest landing shall have a single DOWN button. The lowest landing shall have a single UP button. Incorporate ADA compliant telephone with each hall station. A Braille Indicator Plate shall be provided. The Faceplate finish shall be Type 316L stainless steel #4 finish The Hall Station shall be flush to the surface and shall not be projected out.

a) Hall Call Station: Provide panel and box equal to Adams "Survivor/Plus" with flat face plate and illuminated vandal resistant halo round buttons with visual signal to indicate when call is registered and when call is answered, but provide single button where only one direction is possible. Provide Tactile/Braille Tags equal to Adams Series A-45l, modified with words and arrow symbol as indicated on the Drawings. Provide all components in accordance with ADA Standards.

1) Provide “CTA ASSISTANCE” engraved at speaker and vandal resistant button as indicated

on the Drawings, with Tactile/Braille Phone Symbol Tag equal to Adams Series A-451. Provide red jewel button.

2) In conjunction with hall lantern device, provide an audible signal in accordance with ADA Standards to indicate that a car is arriving in response to a hall call, sound once for the “UP” direction and twice for the “DOWN” direction.

3) Elevator key lockout switch control closes doors if they are open; disconnects power; leaves cab lighting on; operates only when car is at same level as switch.

4) Access Key Switch operates cab from hall station.

5) Provide Best cylinders.

b. Hall Lanterns

i. Tamper resistant hall lanterns shall be equipped with illuminated (LED type) UP and DOWN signal arrows, but provide single arrow where only one direction is possible. Provided units projecting from faceplate for ease of angular viewing. Match materials, finishes and mounting method with hall stations.

ii. Hall Lantern: Provide new Hall Lanterns and box with visible and audible signal in accordance with ADA Standards, equal to Adams “Survivor/Plus”. New units shall match materials, finishes and mounting method similar to Hall Call Stations.

iii. Signal shall be visible from the vicinity of the Hall Call Station.

iv. Audible signal shall sound once for the “UP” direction and twice for the “DOWN” direction.

v. Visual elements shall be at least 2-1/2 inches in the smallest dimension, mounted so that their centerline is at least 72 inches above the floor.

c. Hoistway Entrance Door Jamb Tag Raised and Braille Characters: All elevator hoistway entrances shall have raised and Braille floor designations provided on both jambs, equal to Adams Series A-4500 modified 3 inches width by 4 inches height, stainless steel plate, brushed stainless finish characters with black background. The centerline of the characters shall be 60 inches above the finish floor. Characters shall be 2 inches high. Provide “Star” designation in addition to floor designation at landing of main egress indicated on the drawings.

d. Fireman’s Key Box: Provide and install a fireman’s key box, size and design as required and approved by the fire department. Position the box at the level with the CA booth or as directed by the fire department.

e. Elevator In Service/ Not in Service sign

i. Provide illuminated/backlit sign at each entrance indicating whether the elevator is in service or not in service.

ii. Provide LED backlit sign of the design and dimensions as indicated on the drawings.

f. Bell Alarm System: The Bell Alarm System for each elevator shall be properly located within building and audible outside hoistway when activated by the EMERGENCY ALARM call button on each car control building/station. When emergency stop switch is activated inside fire service box, the bell alarm system should not be activated

g. Firefighters' Service System: The Firefighters' Service System shall be provided in compliance with code requirements.

h. Car Position Indicator: Provide illuminated-signal vandal resistant jewel Car Position Indicator equal to Adams “Survivor/Plus” design or approved equal by the Authority. Locate above car door opening or above Cab Call Station Panel, location in Cab Call Station Panel is not acceptable. Provide an audible signal in connection with an illuminated signal in accordance with ADA Standards as the car passes or stops at a floor served. Characters shall be minimum of 1/2 inch high.

i. Elevator fire detection sensor: Provide space and mounting holes for smoke and fire detection sensors to be furnished and installed as required by building, electrical, elevator and local codes. Install wiring from the sensor location in the car to interface terminal cabinet in the machine room, for connection from the sensors to the smoke and fire detection system. Coordinate with installers to allow installation of sensors and operational checkout of the system.

j. Furnish and install a system to provide for 2-way communications between the Cab Call Station Panel in each Passenger Elevator cab or each Hall Call Station and the remote CTA Control Center in accordance with ADA. Provide communications instrument with the following features:

   i. Each instrument shall be fabricated and installed in such a manner that the instrument will appear to be an integral part (as opposed to an obvious "add-on") of the elevator cab control panel or each hall call station. Properly identify communication instrument with the same type of symbols as the cab operating station and hall call station.

   ii. Each instrument shall be a heavy-duty hands-free speaker phone, FCC registered, DTMF signaling, telephone line powered. Each instrument shall provide automatic dialing of a preprogrammed telephone number consisting of from one (1) to twelve (12) digits, plus control digits for pause. The amount of time for pause shall be cumulative. Each time the pause digit is pressed, the amount of time shall increase for each pause sequence. Each instrument shall provide for pre-recorded message playback, which may be activated by the remote telephone by pressing one (1) or two (2) DTMF buttons. The instrument shall be equipped with non-volatile memory (no power or battery back-up required) to store the automated telephone number and the recorded message. Each instrument shall be capable of being programmed remotely, using a standard telephone instrument. Programming shall be password protected.

   iii. Each instrument shall be capable of auto answer allowing incoming calls to be received. (Pre-recorded message from 2.04, SIGNAL EQUIPMENT, B.2. shall be available with incoming

calls). Each instrument shall be equipped with vandal-resistant LED. (Light Emitting Diode) which shall indicate when a call has been connected (both automatic outgoing or incoming). Each unit shall disconnect automatically after a pre-set time duration. Time shall be programmable by remote telephone instruments and shall be password protected.

iv. All instrument shall terminate in the associated elevator equipment room onto the binding posts of terminal blocks provided by the Elevator Contractor. The terminal blocks shall be model RPT12 as manufactured by Reliable Electric/Utility Products or approved equal. The Communications Contractor shall complete the termination of the instruments by splicing onto the jacketed stub.

2.05 LUBRICATION

A. Provide grease fittings at all bearings requiring periodic lubrication including automatic feed compression type grease cups. Lubrication points shall be visible and easily accessible.

2.06 INTERCOMMUNICATION SYSTEM AND OPERATION

A. The work shall include the furnishing and installation of a system to provide for 2-way communications between the cab control panel in each Passenger Elevator cab or each Hall Call Station and the Customer Assistant's Kiosk and the remote CTA Control Center in accordance with ADA. The phones on the outside of the elevator should call the customer assistant booth and the phone inside the elevator should call the Cta control center. The call to the control center should also be recognized as an elevator call. Provide communications instrument with the following features:

B. Each instrument shall be fabricated and installed in such a manner that the instrument will appear to be an integral part (as opposed to an obvious "add-on") of the elevator cab control panel or each hall call station. Properly identify communication instrument with the same type of symbols as the car operating station and hall call station.

C. Each instrument shall be a heavy-duty hands-free speakerphone, FCC registered, dual tone multi-frequency signaling, telephone line powered. Each instrument shall provide automatic dialing of preprogrammed telephone number(s) consisting of from 1 to 12 digits, plus control digits for pause. The amount of time for pause shall be cumulative. Each time the pause digit is pressed, the amount of time shall increase for each pause sequence. Each instrument shall provide for pre-recorded message playback, which may be activated by the remote telephone by pressing one or two DTMF buttons. The instrument shall be equipped with non-volatile memory (no power or battery back-up required) to store the automated telephone number and the recorded message. Each instrument shall be capable of being programmed remotely, using a standard telephone instrument. Programming shall be password protected.

D. Each instrument shall be capable of auto answer allowing incoming calls to be received. (Prerecorded message from INTERCOMMUNICATION SYSTEM AND OPERATION shall be available with incoming calls). Each instrument shall be equipped with vandal resistant LED. (Light Emitting Diode) which shall indicate when a call has been connected (both automatic outgoing or incoming). Each unit shall disconnect

automatically after a pre-set time duration. Time shall be programmable by remote telephone instruments and shall be password protected.

E. All instruments shall terminate in the associated elevator equipment room onto the binding posts of terminal blocks provided by the Elevator Contractor. The terminal blocks shall be model RPT12 as manufactured by Reliable Electric/Utility Products or approved equal. The Communications Contractor shall complete the termination of the instruments by splicing onto the jacketed stub.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to commencing elevator installation, examine hoistways, hoistway openings, pits, and machine rooms, as constructed; verify all critical dimensions and examine supporting structure and all other conditions under which elevator work is to be installed. Notify the Authority in writing of any dimensional discrepancies or other conditions detrimental to the proper installation or performance of elevator work. Do not proceed with elevator installation until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

1. Dimensional tolerance of hoistway from shop drawings: -0 inches +2 inches. Do not begin work until dimensions are within tolerances.
2. Verify projections greater than 2 inches are beveled not less than 75 degrees from horizontal.
3. Verify landings have been prepared for entrance sill installation.
4. Verify elevator pit has been constructed in accordance with requirements, is dry and reinforcement to sustain vertical forces, as indicated in approved submittal.
5. Verify that sumps or sump pumps located within pit will not interfere with installed elevator equipment.
6. Verify control space has been constructed in accordance with requirements, with access coordinated with elevator shop drawings, including sleeves and penetrations.
7. Verify installation of GFCI protected 15-amp in pit and adjacent to each signal control cabinet in control space.

3.02 PREPARATION

A. Coordinate installation of anchors, bearing plates, brackets and other related accessories.

B. Coordinate construction of entrance walls with installation of door frames and sills. Maintain front wall opening until elevator equipment has been installed.

1. Ensure adequate support for entrance attachment points at all landings.

C. Coordinate wall openings for hall push buttons, signal fixtures and sleeves. Each elevator requires sleeves within the hoistway wall.

D. Coordinate emergency power transfer switch and power change pending signals as required for termination at the primary elevator signal control cabinet in each group.

E. Coordinate interface of elevators and fire alarm system and smoke detectors.

F. Coordinate interface of dedicated telephone line, communication equipment, and security system.

G. Coordinate work with other trades, including electrical.

3.03 INSTALLATION OF ELEVATOR SYSTEM

A. General: Comply with manufacturer's instructions and specifications for work required during installation.

B. Install plunger-cylinder units plumb and accurately centered for elevator car position and travel; anchor securely in place, supported at the pit floor.

C. Welded Construction: Provide welded connections for installation of elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of won parts. Comply with AWS standards for workmanship and for qualifications of welding operators.

D. Coordination: Coordinate elevator work with work of other trades for proper time and sequence to avoid construction delays. Use established benchmarks, lines, and levels to ensure dimensional coordination of the Work.

E. Sound Isolation: Mount rotating and vibrating elevator equipment and components on vibration-absorption mounts designed to effectively prevent transmission of vibrations to structure and thereby, eliminate sources of structure-borne noise from elevator system.

F. Install piping above the floor, where possible. Where not possible, cover underground piping with permanent protective wrapping before backfilling.

G. Lubricate operating parts of systems, including ropes, if any, as specified by manufacturers.

H. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with cars. Where possible, delay installation of sills and frames until car is operable in shaft. Reduce clearances to minimum, safe, workable dimension at each landing.

I. Tolerance: Leveling 1/4 inch, up or down, regardless of load and direction of travel. Guide rail alignment within 1/8 inch in 12 feet not to exceed 1/4 inch overall, plumb and parallel.

J. Set sills flush with finished floor surface at landings, use non-shrink, non-metallic grout, minimum 3,000 psi if required. Coordinate with other trades to facilitate and ensure proper grouting of sills.

3.04 CONSTRUCTION OF ELEVATOR MACHINE ROOM

A. Construction of the elevator machine room to be completed prior to installation of the elevator. Construct according to approved drawings and shop drawings, approved submittals, building code and elevator manufacturer's requirements.

B. Provide and install room of fire rated construction; fire rated flush door and frame with approved hardware and closer. Provide firestopping at penetrations.

C. Insulate room for noise and temperature.

D. Provide electrical power, lighting, switches, outlets, fire and smoke detectors and fire protection as required by code.

E. Provide a floor drain connected to drain system.

F. Provide ventilation, heating and air conditioning and thermostat.

3.05 ADJUSTMENTS

A. Perform final adjustments and necessary service prior to substantial completion.

B. All adjustments and changes to the elevator software shall be documented. Contractor shall provide the software revision log. Contractor shall provide final version of the elevator program using media compatible with the elevator controllers.

3.06 FIELD QUALITY CONTROL

A. Acceptance Testing: Upon substantial completion of each elevator installation, and before permitting use of elevator (either temporary or permanent), perform acceptance tests as required and recommended by ASME A-17.1 and A17.2 Code and by governing regulations or agencies. Submit all acceptance test certificates and forms to CTA for review and approval.

1. Reference ASME 17.1 Appendix X for required acceptance tests and inspections
2. Contractor shall submit the process plan outlining the acceptance testing including all required checklists, written description of each test and inspection and all instruments and equipment required to perform the acceptance testing and inspections.

B. Operating Tests: Load each elevator to its rated capacity and operate continuously for 30 minutes over its full travel distance, stopping at each level and proceeding immediately to the next. Record temperature rise of pump motor (except submerged pumps) during 30minute test period. Record failures of elevator to perform as required.

C. Advise the Authority, the Authority's Elevator Maintenance Department and inspection department of governing agencies at least seven (7) business days in advance of dates and times tests are to be performed on elevators

3.07 PROTECTION AND CLEANING

A. Provide suitable protective coverings, barriers, devices, signs, or such other methods or procedures to protect elevator work from damage or deterioration. Maintain protective measures throughout installation period.

B. Upon acceptance by the Authority or when directed, remove protection and clean exposed and finished surfaces.

C. During installations; and until elevator systems are fully operative, Contractor shall make necessary provisions to protect systems from damage, deterioration, injury to public and environmental conditions

3.08 OPEARTION AND MAINTENANCE TRAINING

A. Training

1. The Contractor shall develop and provide operation, troubleshooting and maintenance training in accordance with the General Requirements. The following training requirements shall be met:

a. Three (3) days of classroom plus two (2) days hands on training on the field shall be provided for 10 students per class. Six (6) training session for a total of sixty (60) students is required.
b. Time and place of training will be determined by the Authority, but must be completed no later than thirty (30) days prior to the Final Completion.
c. Training shall be organized to make optimum use of the required maintenance and operation manuals including training for replacement of all parts contained in the Parts Inventory list.
d. At the completion of the first training session, a narrated and properly edited training video shall be submitted for the authority on DVD or flash drive. The video shall be taken by the professional camera operator with quality image and sound track and will be used for the future trainings. The video shall cover operation of the elevator, function of the devices, maintenance, adjustment procedures and troubleshooting. The following items shall be included as minimum requirements:

i. Step by step adjustment procedure on the followings:

a) Door operators, DCL, DOL, full door opening, and so on…
b) Valve adjustment
c) Car Leveling and adjustment of leveling sensors and vans
d) Door: Door interlock, proper pressure, and restrictors.
e) Pump motor: Belt tension and alignment

ii. General overview of major items:

a) Packing
b) Piston
c) Shut off valve
d) Controller
e) Controller display
f) Hydraulic pump
g) Hydraulic tank
h) Door sills
i) Guide rails

iii. Daily operation and sequence of operation iv. Replacement and Installation of components:

a) Hydraulic packing
b) Door photo eye
c) Hydraulic valve
d) Door clutch
e) Door pickup rollers

v. Proper guide roller adjustment
vi. Verification of safety circuit
vii. Maintenance procedure and Frequency of maintenance
viii. Proper access of pit and top of car for inspection
ix. Proper test of fire service operation
x. Proper lubrication of components
xi. Troubleshooting techniques
xii. How to use proper communication device, machine room and car top.

e. Provide one (1) additional copy of all required submittals to the CTA Engineer for Authority use.
f. Provide two (2) copies in DVD format of training materials along with visuals and handouts to the Engineer for the Authority use.

i. Video shall be narrative.
ii. Video shall be separated by major components Sections
iii. Equipment Identification shall be as a part of the section title.

g. A separate training manual shall be submitted for approval prior the scheduling of the training. The O&M manual shall not be used as a training manual.

2. Scope of Work

a. All training, as described below, shall take place prior to Final Acceptance of equipment or materials by the Authority. Operations and maintenance training may take place as a combined class by agreement of the CTA Engineering. The minimum number of CTA employees to be trained will be no fewer than ten (10) total with a maximum of ten (10) per class. Those persons will be identified by CTA. The contractor shall video tape all training sessions and provide CTA with edited copy of the recording as stated above.
b. Operations training shall be tailored specifically to the furnished and installed equipment, and designed to teach the day-to-day operation of all equipment. The training shall be sufficient to bring personnel to a level of operating proficiency such that routine vendor support is not needed.
c. Maintenance Training shall be tailored specifically to the furnished and installed equipment, and designed to develop the knowledge and skills required to maintain all item(s) delivered.
d. Maintenance training shall be subdivided into two (2) major levels as follows:

i. System Level Maintenance Training, covering:

a) Theory of operation of the system and its major components.
b) System configuration.
c) Preventative maintenance, consisting of written procedures and schedules for the periodic maintenance of all equipment.
d) Written and validated inspection procedures and a system-level trouble-shooting guide (to the lowest field replaceable unit).

ii. Shop Level Maintenance Training, covering

a) Detailed theory of operation to module, board, and/or device level.
b) Component level troubleshooting and component replacement and adjustment.
c) Testing and alignment procedures of repaired units

3. Deliverables

a. The following course materials shall be delivered by the Contractor, according to the following specifications:

i. An Instructor's Guide containing all the information and direction necessary for the instructor to make an effective presentation. It shall include adequate guidelines to conduct a comprehensive training program. Individual lessons within the course shall be organized as separable blocks (or modules) which may be taught as a unit. The Instructor's Guide shall contain, as a minimum:

a) Discussion of student prerequisites (if any).
b) Program overview.
c) A statement of overall program goals.
d) Lesson plans (a session-by-session outline containing the following):

1) Student learning objectives, stated in measurable term
2) Overview of each lesson.

ii. A Student Manual including all materials for the student to interact in the learning situation. It shall contain, as a minimum

a) Program overview and introduction.
b) Statement of overall program goals.
c) Learning objectives, stated in measurable terms that specifically describe desired behaviors or knowledge to be gained.
d) A fully developed prose treatment (not outline format) of content presentation, developed in the same modular format as the Instructor's Guide.

e) Illustrations, charts, photos, and other graphics of actual system components as needed to enhance content presentation.

f) The training manuals shall be prepared and submitted for approval to CTA Engineering prior to training. The training manuals shall include procedures for adjustment and replacement of all electrical and mechanical components, and a troubleshooting guide.

iii. Audio-visual Aids consisting of a narrated video of not less than ninety (90) minutes duration to include, but not limited to, the following:

a) General overview of major features.
b) Daily operations.
c) Maintenance procedures such as (lubrication, adjustments, critical measurements, etc.
d) Frequency of maintenance procedures.
e) Parts replacement safety devices, lighting, etc.
f) Verification of safety circuits and methods of accessing and preserving computerized functional data if required.
g) Step-by-step adjustment procedures and installation of components.
h) Handouts, transparencies, and/or slides as necessary to ensure clear and comprehensive presentations.
i) The training video shall be taken from actual equipment installed under this contract by the professional camera operator.

iv. Supplemental Materials consisting of a functional mock-up or a functional representation is required of any equipment that requires theoretical discussion. This may be in the form of an animated schematic, a model of the equipment, an actual device, an interactive video training device, or an Authority approved substitute. All mock-ups shall become the property of the Authority for eventual turn over to CTA Engineering

v. The final copies shall be delivered to the Authority as follows:

a) One complete set of training materials that is completely camera-ready. Camera-ready copy is defined as typewritten or typeset originals or high-quality copies such that further copies can be made from them with no noticeable decrease in copy quality.
b) Five copies of all student and instructor materials, to be used for archival purposes
c) A set of complete student materials including training manuals for each participant enrolled in training classes. The O&M manual, training manuals and special tools shall be approved by the Engineer and delivered to the Authority for eventual turn over to CTA Engineering
d) The contractor shall video record all training sessions and provide CTA engineering with edited DVD copy of

the recording to be used as training guide for other CTA employees. Five copies of all student and instructor materials, to be used for archival purposes

vi. Flash Drives

a) Each flash drive shall include electronic copies of:
b) Operating Manual.
c) Maintenance Manual.
d) Annotated .dwg and .pdf wiring diagram.
e) Parts listing with manufacturer's part number and corresponding WMATA part number.
f) Annotated and original Logix (ACD) file.
g) Original display program for panel.
h) Maintenance Control Program (MCP).
i) Each flash drive shall provide operating, trouble-shooting and maintenance instructions, parts listing; recommended parts inventory listing, purchase source listing for major and critical components, emergency instructions, and similar information. Maintenance instructions shall include recommended lubrication frequency, and periodic maintenance requirements and schedules. Parts list and purchase source listing shall include electrical and control equipment. Manuals shall also include approved drawings and catalog cuts, folded if necessary. Manuals shall include information on maintenance/replacement cycles and design life expectations.

3.09 TESTING AND INSPECTIONS

A. Acceptance Tests:

1. The Contractor shall submit an operational test plan to the Authority for approval. When each elevator, furnished, installed, and tested, is ready to be placed in interim service, the Contractor, at no additional cost to the Authority, shall perform operational tests described below. The Authority shall be notified at least 48 hours prior to each scheduled test so that arrangements can be made for the presence of appropriate personnel to witness the tests. Acceptance Tests and inspections will be based upon the elevator meeting the requirements of the Specification and as evidenced by the operational test shall be witnessed by CTA representative.
2. All acceptance testing shall at minimum include items required by code. Copies of the acceptance test report should be submitted to CTA for approval

B. Elevator Tests

1. When the elevator work is fully completed, the Contractor shall demonstrate to the satisfaction of the Authority and Authorities Having Jurisdiction that the proper operation of every part of the equipment complies with all applicable requirements including the ASME Code.
   a. The inspection procedure outlined in the ASME A17.2 will form a part of the final inspection.

b. No shop test of elevator motor and no certified test sheets will be required.
c. The heating, insulation, and resistance of the motors will be determined under actual conditions after installation

2. The Elevator Contractor shall furnish all test instruments and materials, required at the time of final inspection, to determine compliance of the work with the Contract requirements. Materials and instruments furnished shall include standard 50-pound test weights, megohmmeter, voltmeter, and ammeter, Centigrade calibrated thermometers, spirit level, and stop watch. At the time of final inspection, tests shall include, but not be limited to, the following:

   a. After installation, each elevator shall be tested without load by the Contractor. The elevator shall be subjected to a test for a period of eight (8) hours continuous run. During the test run, the car shall be stopped at top and bottom levels, in both directions of travel with a standing period of ten (10) seconds at each landing.

3. Full-Load Run Test

   a. The elevator shall be subjected to a test for a period of one-hours continuous run, with full specified rated load in the car. During the test run, the car shall be stopped at top and bottom levels, in both directions of travel with a standing period of ten (10) seconds at each landing.

4. Speed Test

   a. The actual speed of the elevator car shall be determined in both directions of travel, with full specified rated load and with no load in the elevator car.
   b. Speed tests shall be made before and after the full-load run test.
   c. For hydraulic elevators, speed shall be determined with a temporarily mounted tachometer on the guide rail or stop.
   d. Car speed when ascending shall be not more than ten (10%) percent above not more than 10 percent below the specified car speed.
   e. Car speed when descending shall be not more than twenty five (25%) percent above not more than ten (10%) percent below the specified car speed.

5. Car Leveling Test

   a. Elevator car leveling devices shall be tested for ¼-inch accuracy of landing at all floors with no load in car and with full load in car, in both directions of travel.
   b. One re-level operation is permitted when full load is in the car.
   c. Accuracy of floor leveling shall be determined both before and after the full-load run test.

6. Insulation Resistance Test

   a. The complete wiring system of elevator shall be free from short circuits and accidental grounds. The insulation resistance of the system shall be more than one megohm when tested by using a 500V megohmmeter.

The elevator structure, equipment, and raceway shall be tested for continuity to ground

b. The elevator systems, including the emergency power return system shall be fully tested for all operating conditions.

c. Emergency power return system to be tested under the conditions of a total power loss to the elevator system. In order to verify that the emergency return system is fully operational, this test shall be conducted in the manner of shutting off the main breaker to the elevator power panel. This test shall be conducted in the presence of the Authority.

C. Contractor shall obtain and pay for all necessary permits and perform such tests as may be required for acceptance and approval of elevators by Jurisdictional agencies.

1. Contractor shall notify the proper inspectors to witness required testing.

3.10 WARRANTY INSPECTIONS AND TESTS

A. In addition to any warranty provisions covered by these specifications, the Contractor shall perform periodic inspections and tests of the elevators and all associated systems and controls. All required inspections and tests shall be performed as outlined in the latest version of ASME A17.1 (Table N-1, Hydraulic Elevators).

B. As part of the inspections, the Contractor shall, at no cost to the Authority, completely inspect and adjust machinery, and replace any parts showing undue wear, or tendencies toward malfunction, or any items indicating a need for modifications or design change. All adjustments and changes to the elevator software shall be documented. Contractor shall provide the software revision log. Contractor shall provide final version of the elevator program using media compatible with the elevator controllers. This shall be furnished as part of the guarantee obligation by the Contractor.

C. The Contractor shall prepare and submit to the Authority a written report indicating the results of all inspections and tests outlined in the latest version of ASME A17.1 (Table N1, Hydraulic Elevators).

D. The Contractor shall also submit to the Authority a written report stating the condition of the equipment, outlining any modifications to the maintenance specifications or operational procedures and respond in writing to questions raised by the Authority,

E. The inspections and tests shall be performed by the Contractor’s service representative. All costs involved with each of these inspections and tests, such as travel, accommodations, international charges, fees, tools, equipment and part costs, shall be paid in full by the Contractor.

F. The Contractor shall notify the Authority in writing at least two (2) weeks prior of the intent to conduct the elevator warranty inspections and tests.

G. The inspections shall be conducted Monday to Friday during non-rush hour periods. The warranty inspections shall take place during the twelve (12) month period starting from the date of substantial completion by the Authority of each elevator installation. The Authority’s representative will accompany the Contractor on the inspections.

3.11 CLOSEOUT SUBMITTALS

A. Provide all closeout submittals as specified in Division One section requirements.

B. Maintenance Manuals: Submit two (2) bound manuals for each station, for each elevator or group of elevators, with operating and maintenance instructions, parts listing, recommended parts inventory listing, purchase source listing for major and critical components, emergency instructions, and similar information. Include all diagnostic, maintenance and repair information available to manufacturer's and installer's maintenance personnel. Include a maintenance and lubrication schedule and directions. Include a copy of the elevator warranty, maintenance agreement, and maintenance schedule.

    1. Wiring Schematics: Submit wiring schematics and interconnections for the elevator control and drive system. Also, submit intercom system connection and controls.

C. Certificates and Permits: Provide the Authority with copies of all inspection/acceptance certificates and operating permits as required by governing authorities to allow normal, unrestricted use of elevators. One permanent frame for the certificate or operating permit shall be mounted in the car (or alternate location in the Customer Assistant Shelter as approved by the City of Chicago) and a duplicate shall be provided in the cab frame.

D. Diagnostic Tools: Deliver to the Authority's Elevator Maintenance Department the laptop computer, cables and other accessories with diagnostic software and other required software installed for the Authority's use; as specified herein and approved by the Authority.

END OF SECTION

ELEVATOR SCHEDULE - HYDRAULIC PASSENGER UNITS

Elevator Type:	Hydraulic
Elevator Quantities:	As indicated on drawings.
Capacity:	5,250 pounds
Rated Speed:	100 feet per minute
Travel Distance:	As indicated on drawings.
Openings:	As indicated on drawings.
Stops: Normal And Emergency Operation:	2
Machine:	Cantilever holeless single-acting or telescoping beside the-car single or double cylinder, displacement pump, a.c. motor.
Power Supplied:	208 volts a.c., 3 phase, 60 hertz.
Control System:	Solid- state-microcomputer,
Auxiliary Operations:	Emergency power operation, all levels.
Signal Equipment:	As Specified.
Car Enclosures:	5’-3” wide x 7’-1” deep (inside) or as indicated on drawings and minimum required by ADA.
Height:	8’-0” minimum ceiling height inside cab.
Door Type:	3’-6” x 7’-2” single.
Finish:	Stainless steel interior, glazed if shown, perimeter lighting soffit, troweled type flooring.
Hoistway Entrances:	3’-6” x 7’-2” single, two speed side opening slide glazed stainless steel door and stainless steel frame, power operator.
Additional Requirements:	Heat trace sills, cab and hoistway, cab troweled type flooring, hydraulic unit oil heater.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of HYDRAULIC ELEVATORS shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of HYDRAULIC ELEVATORS shall be included in the contract lump sum price as shown in the Schedule of Prices for ARCHITECTURAL WORK.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000.

Elevator Fault Table

WORD	BIT	DATA TYPE	DESCRIPTION	"0" STATE	"1" STATE
TBD	TBD	FAULT	24VDC POWER SUPPLY	FAULT	NORMAL
TBD	TBD	FAULT	SAFETY CIRCUIT GOOD	FAULT	NORMAL
TBD	TBD	FAULT	TOP FINALLIMIT TRIPPE	FAULT	NORMAL
TBD	TBD	FAULT	BOTTOM FINALLIMIT TRIPPED	FAULT	NORMAL
TBD	TBD	FAULT	DRIVE FAULTED	FAULT	NORMAL
TBD	TBD	FAULT	OVERLOAD TRIPPED	FAULT	NORMAL
TBD	TBD	FAULT	STOP BUTTON ACTIVATE	FAULT	NORMAL
TBD	TBD	ALARM	IN-CAR ALARM BUTTON PRESSED	ALARM	NORMAL
TBD	TBD	FAULT	MOTOR LIMIT TIMER TRIPPED	FAULT	NORMAL
TBD	TBD	FAULT	VALVE LIMIT TIMER TRIPPED	FAULT	NORMAL
TBD	TBD	FAULT	INSPECTION OPERATION ON	ON	OFF
TBD	TBD	FAULT	INDEPENDENT SERVICE ON	ON	OFF
TBD	TBD	FAULT	VISCOSITY CONTROLON	ON	OFF
TBD	TBD	FAULT	CONTROLLER TEST SWITCH ON	ON	OFF
TBD	TBD	FAULT	FIRE SERVICE PHASE 1ON	ON	OFF
TBD	TBD	FAULT	FIRE SERVICE PHASE 2ON	ON	OFF
TBD	TBD	FAULT	SMOKE SENSOR @ MAIN ON	ON	OFF
TBD	TBD	FAULT	SMOKE SENSOR @ OTHERS ON	ON	OFF
TBD	TBD	STATUS	EMERGENCY POWER OPERATION	ON	OFF
TBD	TBD	STATUS	OVERRIDE ON	ON	OFF
TBD	TBD	STATUS	CAR IS RUNNING UP	NOT-RUNNING	RUNNING
TBD	TBD	STATUS	CAR IS RUNNING DOWN	NOT-RUNNING	RUNNING
TBD	TBD	STATUS	BRAKE LIFTED	LIFTED	NORMAL
TBD	TBD	STATUS	CAR IS IN DOOR ZONE	NOT IN ZONE	IN ZONE
TBD	TBD	STATUS	INTERLOCKS ARE MADE	OPEN	NORMAL
TBD	TBD	STATUS	FRONT DOOR GATE SWITCH MAD	OPEN	NORMAL
TBD	TBD	STATUS	FRONT DOOR FULLY CLOSED	OPEN	CLOSED
TBD	TBD	STATUS	FRONT DOOR FULLY OPEN	CLOSED	OPEN
TBD	TBD	STATUS	FRONT DOOR REVERSAL ACTIVATED	OFF	ACTIVE
TBD	TBD	STATUS	FRONT DOOR PROTECTION ACTIVATED	OFF	ACTIVE
TBD	TBD	STATUS	REAR DOOR GATE SWITCH MADE	OPEN	NORMAL
TBD	TBD	STATUS	REAR DOOR FULLY CLOSED	OPEN	CLOSED
TBD	TBD	STATUS	REAR DOOR FULLY OPEN	CLOSED	OPEN
TBD	TBD	STATUS	REAR DOOR REVERSALACTIVATED	OFF	ACTIVE
TBD	TBD	STATUS	REAR DOOR PROTECTION ACTIVATED	OFF	ACTIVE
TBD	TBD	FAULT	DOOR REVERSALDEVICE FAILURE	FAULT	NORMAL
TBD	TBD	FAULT	ROPE BRAKE SET	FAULT	NORMAL
TBD	TBD	FAULT	LEVELING SYSTEM FAILURE	FAULT	NORMAL
TBD	TBD	FAULT	WATER INTRUSION ALARM ACTIVE	FAULT	NORMAL
TBD	TBD	FAULT	PLC PROCESSOR BATTERY LOW	FAULT	NORMAL
TBD	TBD	FAULT	PLC COMM. ACTIVE	FAULT	NORMAL

TBD	TBD	FAULT	PLC LOCAL/REMOTE	REMTE	LOCAL
TBD	TBD	FAULT	PLC RUN/PROG	PROG	RUNNING
TBD	TBD	FAULT	MASTER FAULT	FAULT	NORMAL
TBD	TBD	STATUS	SERVICE STATUS	OUT OF SERVICE	IN SERVICE
TBD	TBD	STATUS	CAR POSITION 1	NOT AT POSITION	AT POSITION
TBD	TBD	STATUS	CAR POSITION 2	NOT AT POSITION	AT POSITION
TBD	TBD	STATUS	CAR POSITION 3	NOT AT POSITION	AT POSITION
ANALOG DATA					
WORD	DATA TYPE	UNITS	DESCRIPTION	SCALE	RANGE
TBD	INTEGER	AMP	DRIVE MOTOR AMPS	X10	
TBD	INTEGER	KWH	PER DAY KWH	X1	
TBD	INTEGER		PER DAY UP COUNT	X1	
TBD	INTEGER		PER DAY DOWN COUNT	X1	
TBD	INTEGER		PER DAY FRONT DOOR CYCLES	X1	
TBD	INTEGER		PER DAY REAR DOOR CYCLES	X1	
TBD	INTEGER		TOTALTRIP COUNT	X1	
TBD	INTEGER	HOURS	TOTALRUNTIME	X1	

END OF SECTION

SECTION 14 30 00

TRANSIT SYSTEM ESCALATOR

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions and Division 01 Specification sections, apply to this section.

1.02 SUMMARY

A. The Contractor shall furnish all labor, material, equipment, and services necessary to furnish, install, commission and maintain the heavy-duty transit system escalator, suitable for operation in exterior environments, as shown on the drawings, specified herein, and as otherwise required for a complete working system. Escalator shall meet APTA applicable specifications.

B. Escalator enclosure and support infrastructure shall be furnished and installed as indicatedon the drawings.

C. The Contractor shall provide other services specified herein, including but not limited to maintenance during warranty period, initial and continuing maintenance service contracts.

D. Related Work: Coordinate and cooperate with station contractors responsible for the work at the station in order to maintain the schedule and to ensure the orderly sequence of the work. Provide templates, sleeves, inserts, and anchoring devices to station contractors forinstallation under their contract.

E. Related Sections:

1. Division 03, Concrete sections.
2. Division 05, Structural Steel and Miscellaneous Metals.
3. Division 22, Plumbing sections.
4. Division 26, Electrical sections.

F. Related Work Provided Under Other Sections

1. Wellway and Pit:

a. Clear, plumb, wellway with variations not to exceed one inch at any point.
b. Floor pockets and structural beams for support of escalator truss at each end as shown on Contract Drawings. Steel supports, if used, shall meet deflection requirements of AISC Specifications for Design, Fabrication, and Erection of Structural Steel for Buildings.
c. Fire rated enclosure of escalator truss including ends, sides and bottom inceiling plenum.
d. Patching and finishing around escalator landing plates after installation. Filler piece at lower end slide attachment. Cladding and finishing of exposed truss surfaces. Truss cladding shall not exceed ten pounds per square foot. Cladding shall be per drawings.
e. Waterproof Pit. Sump pit with flush grate and pump or indirect waste drain with oil separator. Liquids cannot be directed to sewer. Pump and/or drain must be easily accessible for maintenance from outside of

the escalator pit.Install drain cleanout outside of escalator pit.

f. Protect exposed exterior escalators with weatherproof canopy entire lengthof truss per ASME A17.1

g. Protect open wellways during construction per Cal/OSHA Regulations.

h. Protect escalator truss, steps, chains, landing plates, balustrades, handrails, and special metal finishes from damage, deterioration and environmental conditions during construction and until escalator system isfully operative.

i. Access route to escalator wellway, clear and free of construction materials and debris, provided to permit delivery of escalator truss, related equipmentand rigging equipment to wellway.

j. Area around escalator wellway, clean and free from construction materials and debris, to permit unloading and installation of escalator truss, relatedequipment and rigging required to install truss sections.

k. Venting or other means to prevent accumulation of smoke and gas in escalator truss as required by Local Building Code.

l. Fire sprinklers per local Fire Authority and Code requirements, with protective guards.

2. Electrical Service, Conductors and Devices:

a. Light with guard and GFCI convenience outlet in each pit and machine roomspace.

b. Three-phase mainline copper power feeder to terminals of each escalator controller in the remote controller cabinet with protected, lockable “open”,disconnect switch.

c. Wiring and conduit from escalator controller to remote monitoring panels,interface panels or consoles as required.

d. Fire alarm initiating devices in each escalator pit. Provide alarm initiating signal wiring from connection point to escalator controller terminals. Device to provide signal for general alarm and interruption of escalator operation.

e. Temporary power and illumination to install, test, and adjust escalator equipment. Temporary power shall have the same characteristics as the permanent power.

f. Conduit from the closest wellway of each escalator group or single escalator to the firefighters’ control room and/or the control console. Coordinate size, number and location of conduits with Metro and escalator contractor.

g. Escalator Illumination: Provide a minimum of 20 footcandles of consistentillumination over the entire escalator.

1.03 APPLICABLE CODES, STANDARDS, AND PUBLICATIONS

A. Regulatory Agencies: Escalator design, materials, construction clearances, workmanship and tests shall conform to all state and local codes and the requirements of regulatory agencies. Any additional requirements imposed by local agencies shall be incorporated into escalator installations.

B. Contractor shall obtain and pay for all necessary permits, inspections and perform such tests as may be required for acceptance and approval of escalators by jurisdictional agencies.

C. Escalator designs and installations shall be of the heavy-duty, transit-service type and shallbe in accordance with:

1. European Standard EN 115,except that the service and auxiliary brake shall havea deceleration rate of not more than 3 feet per second squared.
2. American National Standards Institute: (ANSI) ANSI/ASME A 17.1, except sections800 and 801; ANSI C1, "National Electric Code (NFPA 70)"
3. "American National Standard for building and facilities providing Accessibility and Usability for Physically Handicapped People" ANSI A 17.1 and the ADA Title 49 CFR TRANSPORTATION, Part 37.9 STANDARDS FOR ACCESSIBLE TRANSPORTATION FACILITIES, Appendix A, Section 10.3.1 (16), to the exclusion that they do not conflict with each other.
4. Institute of Electrical and Electronic Engineers (IEEE) Standards.
5. National Electric Code.
6. Underwriters Laboratories, Incorporated (U.L.).
7. National Fire Protection Association (NFPA 70 "National Electrical Code", NFPA 80 "Fire Doors and Windows", NFPA 130 "Fixed Guideway Transit System").
8. Chicago Building Code: Conform to all applicable codes for manufacture and installation of escalator system.

D. In case of a conflict between codes, regulations, or standards, the most stringent requirement shall take precedence.

E. Welding: Welding shall be performed in accordance with the requirements of AWS D.1.1. Welders shall produce evidence of current certification by the American Welding Society.

1.04 REFERENCES

A. ASME A17.1 – Safety Code for Elevators and Escalators.

B. ANSI/AISC 303 – Code of Standard Practice for Steel Buildings and Bridges.

C. ASME A17.2 – Guide for Inspection of Elevators, Escalators and Moving Walks.

D. ASTM A36/A36M – Standard Specification for Carbon Structural Steel.

E. ASTM A90 – Standard Test Method for Weight [Mass] of Coating on Iron and Steel Articleswith Zinc or Zinc-Alloy Coatings.

F. ASTM A123 – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron andSteel Products.

G. ASTM A153 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

H. ASTM A167 – Standard Specification for Stainless and Heat-Resisting Chromium-NickelSteel Plate, Sheet, and Strip.

I. ASTM A240/A240M – Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

J. ASTM A264 – Standard Specification for Stainless Chromium-Nickel Steel-Clad Plate,Sheet, and Strip.

K. ASTM A276 - Standard Specification for Stainless Steel Bars and Shapes.

L. ASTM A385 – Standard Practice for Providing High-Quality Zinc Coatings (Hot-Dip).

M. ASTM A653/A653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) orZinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

N. ASTM E84 – Standard Test Method for Surface Burning Characteristics of BuildingMaterials.

O. ASTM E136 – Standard Test Method for Behavior of Materials in a Vertical Tube Furnaceat 750 Degrees C.

P. EN 115 - Safety Rules for the Construction and Installation of Escalators and Passenger Conveyors.

Q. MIL-P-21035 - Paint High Zinc Dust Content, Galvanizing Repair (Metric).

R. MIL-P-26915 - Primer Coating, Zinc Dust Pigmented for Steel Surfaces.

S. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

T. SSPC-SP-6 - Surface Preparation Commentary for Steel and Concrete Substrates, Commercial Blast Cleaning, The Society for Protective Coatings.

U. AFBMA (Anti-Friction Bearing Manufacturer's Association) – Standards 9 and 11.

V. APTA Heavy Duty Escalator.

W. ADAAG – Americans with Disabilities and Accessibility Guidelines for Buildings and Facilities.

X. NFPA 70, 130.

Y. AWS 01.1 – Structural Welding Code – Steel; Applicable Edition.

1.05 DEFINITIONS

A. Manufacturer: The manufacturing firm responsible for furnishing, including but not limited to the fabrication, assembly, packaging, handling, storage, delivery and installation of the escalator.

B. Heavy-duty Transit Escalator: An escalator designed in substantial compliance with the APTA Heavy Duty Transportation System Escalator Design Guidelines, specifically for transit system usage. Substantially different from commercial units in the design of truss, machine, step chain, step chain tension device, steps, brake, and other components/equipment.

C. Flat Steps: Number of flat steps shall be measured from edge of comb plate in horizontal direction to first exposure of a riser, at upper and lower landings.

D. Working Points: Points of intersection of step nosing line and the horizontal line of the topand bottom landing plates at finish elevation.

E. Special Tools: Tools designed specifically for tasks associated with escalator examinations, maintenance, and repair, or those which are required for these tasks and are not readily available through normal purchasing channels.

F. Step Width: The horizontal distance between skirt panels.

G. Escalator Support: Supports provided at the upper, lower and intermediate supports needed to support the total loads of the escalator.

H. Slip Joints: A slip joint is a sliding joint required to support escalators in transit system applications. Location can be at top or bottom support areas but are generally located at the platform level or as indicated on the Contract Drawings.

I. Static Brake Load: The maximum accumulation for the total number of exposed steps on the incline. The Load per step is as follows: 40 inch wide step 674 lbs.; 32 inch wide step 540lbs.

J. Dynamic Brake Load: Minimum peak average load running in down direction on exposed steps on the incline: 40 inch wide step 320 lbs.; 32 inch wide step 256 lbs.

K. Motor Duty: Continuous operations with a minimum average peak step load as follows: 40inch wide step 320 lbs.; 32 inch wide step 256 lbs.

L. Step Chain Load is to be based on the step loads as follows: 40 inch wide step 320 lbs.; 32inch wide step 256 lbs.

M. Operational Conditions Duty requires that the escalator(s) be designed for usage of at least 140 hours continuous operation per week. During any 1/2 hour of any 3 hour period the escalator shall be designed to carry a load reaching 100% of the dynamic brake load.

N. Motor Duty: Continuous operations with a minimum average peak step load as follows: 40"wide step 320 lbs.; 32" wide step 256 lbs.; 24" wide step 192 lbs.

1.06 PERFORMANCE REQUIREMENTS

A. General: Escalators shall be designed with provisions for thermal expansion and construction of complete escalator assemblies due to changing ambient conditions as well as any movement of the facility caused by trains braking when fully loaded. Escalators shallbe of the heavy-duty type for use in transit systems.

B. No wood nor wood products shall be permitted in escalator systems, except in the enclosureas noted.

C. Operational Requirements: Hours of operation shall be considered as twenty-four (24) hours per day, seven (7) days per week. Direction of travel shall be considered as either direction, and unit shall be up and down reversible. Speed of operation shall not exceed 100 FPM based on manufacturer's standard advertised rate. The no load to full load speed shall notexceed + 4% of the advertised speed.

D. Structural Requirements: Contractor shall provide escalator truss mounting angles and truss supports with attachments, sized as required to install escalators into wellway structural support system as indicated on the Drawings.

1. Design to comply with material requirements defined in Part 2 of this section for“escalator truss”.
2. Loads Indicated: Shall be computed for heavy-duty transit system type escalatorsas described herein.

a. Escalator intermediate support points shall be provided by Contractor where required. Details and calculations shall be submitted by Contractorfor approval by the Authority.

b. Loads were computed assuming escalators shall not require a separate machine room outside of truss envelope.

3. Seismic design must be based on actual story drift data from the building's structuralengineer.

a. Seismic calculations shall be based on the APTA design loading.

4. Foundations: Provide additional room for escalator controllers.

E. Temporary and Permanent Electrical Power Services:

1. For the escalator drive systems: 208 volts, 3 phase, 3 wire, 60 hertz terminating ina disconnect switch in the escalator pit.
2. For lighting and receptacles: 120 volts, 1 phase, 3 wire, 60 hertz terminating in theescalator pit.

F. Environmental Operations Requirements:

1. General: Escalators shall be capable of operating with full specified performance capability while exposed to climatic and environmental conditions. Escalators shall be designed for exterior use and be able to fully operate while exposed to the natural elements of weather, including sunlight, rain, slush, snow and ice; all conditions of relative humidities while exposed to road salt, deicing chemicals, airborne dust, and debris; and in a dry bulb temperature range of minus twenty (- 20) to plus one hundred twenty (+120) degrees Fahrenheit.
2. Temperature Control: The ambient temperature of the escalator equipment in equipment rooms or in the pit must be maintained at a temperature range recommended by the manufacturer. Contractor to provide auxiliary heat, air conditioning and/or ventilation, including equipment, fans, dampers, controls and electrical power, as required to maintain that range. Provide product data and shop drawings for Authority's approval. Provide data and calculations indicating the possible design temperature extremes based on location, environmental conditionsand other factors. Coordinate work with other trades.

a. Combplate Heaters: Provide combplate heaters to prevent snow, slush and ice from interfering with escalator operation.

3. Sound Level: Escalators and equipment shall be designed to operate at or below a fifty-five (55) decibels sound level, measured three (3) feet from the escalator or equipment at any location, with the escalator operating normally, either free- running or under load. Transient noise shall not exceed 60 dBA measured using the fast meter response. An ambient level not to exceed forty-nine (49) decibels shall be maintained prior to units being turned on.
4. Vibration: Escalator shall be factory tested for vibration levels. A maximum velocity reading of four-tenths (0.4) of an inch per second shall not be exceeded. The metering device used to perform the test shall be a Bruel and Kjaer Model No. 2516 Integrating Vibration Meter. Readings shall be taken throughout the exposed travelof steps.

a. Bearings shall be rated for an AFBMA L10 life as specified, under a fluctuating bearing load. All bearings shall have basic dynamic load ratingsand a life of 200,000 hours.

5. Fire Protection: Fire protection shall comply with requirements as defined in

ASME A 17.1 and NFPA No. 130, "Fixed Guideway Transit System". Contractor shall provide escalators constructed of non-combustible materials throughout, with the exception of step side plates, handrails, handrail rollers, chain step wheels, and electrical equipment, as defined in ASTM E 136. Handrails shall have a flame spread rating of seventy-six (76) to two hundred (200), when tested in accordance with ASTM E 84.

G. Design, fabricate and install escalator parts subject to repair and replacement to be readily and easily removable and replaceable without requiring modification of truss structure, equipment space or escalator equipment.

H. The escalator specifications are intended to cover the complete installation of the escalator and to outline broadly the equipment required, but not to cover the details of construction. Such details are recognized to be the exclusive responsibility of the Manufacturer and Installer. It is hereby recognized that CTA or its designee did not nvent or develop any part of the escalator systems, but has only made selections of capacities, speeds, control systems, materials, from choices made available by the manufacturers.

1.07 SUBMITTALS

A. The Contractor shall furnish shop drawings, product data, specifications, catalog cuts and samples in accordance with the requirements of the Division 1 Section, “Submittals”, and as required herein.

B. Shop Drawings:

1. Shop drawings shall include, but not be limited to: escalator scale drawings of escalator truss in profile and plan; scale drawings of escalator balustrade, and vertical section through balustrade and truss midway between working points.
2. Fully Dimensioned Layout: Plan of pit, wellway, machine room and remote controller with associated equipment, indicating equipment arrangement and elevation section of wellway.
3. Drawings shall show truss stanchions; track system and supports; drive system; step nosing radius at upper and lower ends; drive chains and gear train; step chain or step links (including chin pitch, step, and trailer wheels); step assembly (including axle, step tread, frame, and riser); handrail system (including profile, guides, drive, and tension device); support details (including upper, lower, intermediate, and slip joint); balustrade deck cover; interior panels, skirt panels, bottom enclosure and exterior cladding and their moldings; safety switches and operating devices; motor and emergency brakes; floor plates; speed governor; metal gauges; radial, vertical, and horizontal dimensions required for manufacture, and positions of lower and upper working points; attachment of truss to structure; major mechanical and electrical components within truss; drainage and electrical interfaces; hand and finger guards; ceiling intersection guards; passenger instruction signs; emergency stop button; sump pit access panel and operating panel in upper and lower balustrades (including stop button, start and direction selection switches, and fault finder receptacle). Also, a complete schematic diagram shall be provided for the controller and all electrical devices.
4. Wiring diagrams detailing locations and wiring for power, signal, and control systems and differentiating clearly between manufacturer-installed wiring and station- contract-installed wiring. Indicate maximum and average power demands.
5. Power Confirmation Information: Include motor horsepower, code letter, starting current, full-load running current and demand factor.

6. Such other drawings hereinafter specified or required.

C. Product Data:

1. Escalator truss structural design calculations performed and sealed by a LicensedStructural Engineer in the State of Illinois.
2. Complete product data and specifications of escalator, equipment and accessories.
3. All bearing ratings, identification and catalog numbers shall be provided.
4. Test certificates for step chain shall be provided for approval. Include test results forhandrail drive chain and skirt/step clearances.

D. Samples: Submit samples of finish of materials, appliances, and accessories for exposed finished components. Label each sample with names of project, Contractor and manufacturer.

1. Provide samples of the balustrade panels, skirt panels and exterior cladding assemblies, including any backer panels, framing and fastening systems.

E. Maintenance Programs: Within sixty (60) days after Notice To Proceed is received, and prior to installation, Contractor shall submit detailed interim and revenue service maintenance programs, showing functions to be performed and their scheduled frequency.

1. Provide training video on DVD format. Video shall include the assembly and disassembly of the escalator and components that are utilized in the escalator, lubrication points, location of control and any other areas of service or maintenance.

F. Manuals: Prior to installation, Contractor shall furnish operating and maintenance data in accordance with the requirements of the Division 1 Section, “project Closeout” and herein. Contractor shall submit two (2) complete sets of operation and maintenance manuals for approval. After Authority approval and prior to the beginning of acceptance testing, five (5) sets of the approved manuals shall be provided by the Contractor. The manuals shall include the following:

1. Complete table of contents.
2. Complete instructions regarding operation and maintenance of equipment, including disassembly and assembly of drive system, handrail drive assembly, and track system. Included shall be complete illustrated, exploded views of all assemblies, and a complete, illustrated, exploded view for identifying all system parts.
3. Complete nomenclature of replaceable parts, part numbers, current cost, and warehouse location. If product source is another vendor, Contractor shall include name and address of other vendor. Parts manuals complete and specific to each escalator.
4. Sample copies of a proposed preventative maintenance chart.
5. Descriptions of safety devices.
6. Safety rules, tests, and procedures, including testing of all systems and sub-systems.
7. Procedures for adjusting brake, handrail tension, handrail chain drive tension, step chain tension, track system, and mechanical components, including pictorials.
8. Instructions for removing floor plate, replacing comb segments, and removing andinstalling steps and interior panels.
9. Troubleshooting techniques.
10. Detailed lubrication and cleaning schedule indicating weekly, monthly, quarterly, semi-annual and annual lubrication; and a description of each lubrication point, lubrication type, and specification.
11. Control and schematic electrical wiring diagrams of controller, including wiring

of safety devices to connections with remote indication and control panels for each escalator and group of escalators.

12. Electrical layout showing placement of lighting, light switches, receptacles, light fixtures, disconnect switches, and convenience outlets in machinery room, truss envelope, and pits.
13. Complete detailed drawings and wiring diagram of escalator fault-finding device and connection to annunciator panel.
14. The escalator manufacturer shall be required to provide certification, in writing and signed by an officer of the organization, that the Authority shall be provided with copies of any and all information, correspondence, bulletins, newsletters, manuals, techniques, procedures, drawings, sketches and any other documents related to maintenance, safety, operations, design changes, modifications, retrofits, etc., which relate to any part, component, equipment, system, subsystem, or material and services applicable to the escalator provided.
15. All of the above referenced shall be provided as it pertains to the original installation and for a period of ten (10) years after final acceptance of the escalator provided under the contract.
16. The referenced material shall be provided within thirty (30) days of publication or internal distribution by the escalator manufacturer. The material shall be deliveredto the Authority without prejudice or delay and at no additional cost.
17. The Contractor shall provide Manuals on three (3) copies of a CDROM.
18. The Authority must receive copies of all programs used to run any logic unit in theescalator controller.
19. The Authority must receive copies of software and interface cables used to program, troubleshoot and provide updates to the PLCs.
20. Submit for Authority's review and approval diagnostic tools to be provided by the escalator manufacturer including, but not limited to, laptop computer Windows based with latest operating system with non-proprietary program and software installed, product data and specifications, Escalator program with all input/outputs descriptions showing each component and accessories and software.

G. Certificates and Permits: Provide certificate signed by Manufacturer indicating conformance of furnished escalator with referenced codes and regulatory requirements. Provide Authority with copies of all inspection/acceptance certificates and operating permits as required by governing authorities to allow normal, unrestricted use of escalator.

H. The Contractor shall furnish warranties and bonds in accordance with the requirements ofContract Documents.

I. Contractor to submit written certification that the design and fabrication of the trusses andescalators will fit the field dimensions of the wellways within existing structures.

J. Record drawings: The Contractor shall furnish complete and legible field wiring diagrams and straight line diagrams showing the electrical connections, functions and sequence of operations of all apparatus connected with the escalator both in machine space and in pit, together with oil and lubrication charts, photographs or cuts of controller repair parts with part numbers listed, furnished in duplicate. One set shall be suitably framed under plastic and mounted in machine space where directed and other shall be assembled in bound form anddelivered to Authority.

1. Each device on wiring diagram shall be properly identified by name, letter or standard symbol identical with markings. A list of all devices together with identifying markings shall be provided on the working diagrams.

K. As-Built Drawings: At the end of the project, as part of the close-out procedures, the Contractor is responsible to provide revised contract drawings to reflect actual as-built conditions including all structural, architectural, electrical, mechanical and plumbing connections to the escalators.

L. Schedule: The Contractor must coordinate his work with the Authority and provide a writtenschedule for the Authority's approval.

M. Material Safety Data Sheets (MSDS):

1. MSDS and product data sheets shall be submitted with an index listing each product, along with the application method of the product, approximate quantity of product per escalator, and the component the product is applied to or associated with. TheContractor shall allow six (6) weeks for review of MSDS.

N. Within 30 calendar days after Notice to Proceed is received from the Authority, provide equipment layout plans, structural loadings, operating control locations, clearance dimensions, manuals and necessary information for the final station well ways for Authorityreview.

O. Upon completion, as-built drawings are to be submitted including schematic control wiring and electrical wiring diagrams and electronic and hard copies of ladder diagrams, logic, program with all input/outputs descriptions showing each component, software, cables and laptop computer windows based with the latest operating system with the non- proprietaryprogram and software installed.

P. Pre-acceptance test forms and process plan for acceptance testing.

1. ASME A17.2, Safety Code for Elevators and Escalators, Appendix X.
2. ASME A17.2, Guide for Inspection of Elevators, Escalators and Moving Sidewalks,Appendix B.

Q. Manufacturer's QA/QC plans and policy.

R. Plans, details and materials for providing and constructing temporary solid barricades for protecting the escalator work area, personnel and passengers. .

S. Temperature Control: Provide data and calculations indicating the possible design temperature extremes based on location, environmental conditions and other factors and how the temperature variations will be controlled. Provide product data and shop drawings for required temperature control equipment and installation including heaters, auxiliary heat, air conditioning and/or ventilation equipment, fans, dampers and controls.

1.08 QUALITY ASSURANCE

A. Manufacturer and installer of escalator shall have a minimum of five (5) years experience in the manufacturing and/or installation of equipment comparable to that specified in the geographical area. The firm(s) shall provide complete references upon the Authority's request.

B. Installer Qualifications: Engage the escalator manufacturer or an installer approved by the escalator manufacturer and who has completed escalator installations similar in material, design, and extent to that indicated for Project which have resulted in installations with a record of successful in-service performance.

C. Regulatory Requirements: Comply with applicable requirements of the laws, codes,

ordinances and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain and pay for all necessary permits, and perform such tests as may be required for acceptance and approval of escalators by jurisdictional agencies. Notify the proper inspectors to witness required testing.

D. Welding shall be performed in accordance with the requirements of AWS 5 D.1.1. Welders shall produce evidence of current certification by the American Welding Society.

E. Non-propriety PLC controller, computer system and software must be used in the escalatorsystem. .

F. Dimensions: Each escalator shall have a 40 inch or 32 inch nominal step width as specifiedand designed for a maximum of 30 degrees.

1.09 TRAINING

A. The installer of the escalator shall provide 40 hours of on-site training for the Authority's personnel in the proper use, operation and daily maintenance of the escalators. The trainingshall:

1. Review emergency provision, including emergency access and procedures to be followed at the time of failure in operation and other building emergencies.
2. CTA personnel shall be trained in normal procedures to be followed in checking forsources of operational failures or malfunctions.
3. CTA personnel to be trained in maintenance, testing and adjusting escalator's safetydevices.
4. Provide manuals for all material covered in the training program.

1.10 DELIVERY, STORAGE AND HANDLING

A. Packaged materials shall be delivered to the project in sealed containers bearing manufacturer's name and material identification. Materials shall be stored in strict accordance with the manufacturer's printed directions.

B. All stainless steel surfaces shall be protected with pressure sensitive vinyl protective covering, which is to be removed after completion of installation.

C. Protection: Protect materials against damage from mechanical abuse, plaster, salts, acids, staining, and other foreign matter by an approved means during transportation, storage, and erection, and until completion of construction work. All unsatisfactory materials shall be removed from the premises, and all damaged materials replaced with new materials at noadditional cost to the Authority.

1.11 PROJECT CONDITIONS

A. Protection: During installations, and until escalator systems are fully operative, Contractor shall make necessary provisions to protect systems from damage, deterioration, and environmental conditions.

B. A pit of proper depth with pit ladder, drains and waterproofing to be provided by the Contractor.

C. The Contractor to restrict operations to facilitate rail and passenger traffic during rush hours at stations open to rail traffic. Provide temporary solid barricades to protect installations from weather, personnel and passengers during installation.

D. Escalators are not be used for construction purposes or Contractors use of transporting materials or equipment during construction.

E. Protection: During installations, and until escalators are fully operative, Contractor to make necessary provisions to protect systems from damage, deterioration, injury to pedestrians, the general public and environmental conditions.

F. Coordination Requirements:

1. Contractor shall coordinate alterations required to accommodate escalators with the Authority.
2. Cladding: Contractor shall review any and all appropriate station and escalator contract drawings dealing with proposed methods of securing cladding to truss. Contractor shall coordinate with other appropriate contractors prior to any such actual work.
3. Floor finish at landing plates and newels: Contractor shall coordinate with other appropriate contractors and/or trades.
4. Contractor shall coordinate with other appropriate Contractors and /or trades for theinstallation of escalator pit heaters and ventilating fans where required.
5. Lock and key requirements: Contractor shall coordinate with the Authority.
6. Pit Drainage: Contractor shall provide a means to prevent water from accumulating in the pit. Provide a sump pit, sump pump, electrical power, piping of water from pit, etc. as required to control seepage. Coordinate with plumbing and electrical work.
7. Escalator pit heating and ventilation: Provide heaters and ventilating fans where required to maintain climatic conditions in pits favorable for optimum escalator operation. Heaters and fans to be thermostatically controlled.
8. Rigging Plan: Contractor to provide a rigging plan to the Authority for review and approval.

G. Tolerances:

1. Escalator nominal tread width shall be manufacturer's standard as shown on the drawings, and designed for a maximum of 30^0 Inclination may exceed this maximumby 1% should the site conditions warrant same.
2. Structural Dimension Requirements: Contractor shall design and fabricate escalators to fit within existing structures as constructed. Contractor shall certify field dimensions of well ways prior to manufacturing trusses.
3. If field dimensions are found not to be the same as shown on reference drawings for each escalator, Contractor shall perform minor structural alterations, or modify mechanical systems as required, at no additional cost to the Authority.
4. In the event of a discrepancy, Contractor shall notify the Authority immediately, and shall not proceed with installation in the areas of discrepancy, until the discrepancy has been fully resolved, and the Authority has instructed Contractor to proceed.
5. Failure of Contractor to report discrepancies shall constitute an acceptance of existing work as fit and proper for the execution and completion of Contractor's work.

H. Labeling Requirements: Every escalator shall be clearly marked with rated load and speed, braking torque, manufacturer serial number, and designated Authority identification.

I. Requirements of Regulatory Agencies:

1. Application, Permits, Inspections and Tests: Contractor shall obtain and pay for

all necessary permits, and perform such tests as may be required for acceptance and approval of escalators by jurisdictional agencies. Contractor shall notify the proper inspectors to witness required testing.

J. Factory Visit

1. The Contractor shall provide for the costs of up to three of the Owner's representatives to visit the factory a minimum of two times where the escalator is being manufactured.
2. One visit to be provided after the trusses are fabricated and a second visit to be provided once the escalator is assembled and ready for testing.
3. The Contractor shall not ship the escalator without the written approval of the Ownerafter conclusion of the factory visit.
4. Due to the long lead time for fabrication of the escalator, the schedule for the workto allow sufficient time for the factory visits and testing.

K. The Contractor shall fabricate and furnish the escalators designed for installations within the spatial and support system characteristics and coordinate the following station characteristics with the escalator requirements:

1. Escalator enclosure shall contain adequate space, vertical and horizontal dimensions, required for the installation, operation, maintenance and repair of heavy-duty transit system escalator specified herein.

2. Escalator equipment space designed with control panel, conduit, cable, panel board and disconnect switch providing 208 volt, three-phase, 3-wire, 60 hertz service on a lockable circuit breaker disconnect switch. Power distribution panel and lockable circuit breaker disconnect switch, located remote from escalator equipment space,will be provided.
3. The Contractor shall provide power and control wiring, in conduit provided, from the escalator control cabinet to the lockable circuit breaker disconnect switch and to the escalator machine. The Contractor shall make final terminations of all escalator-related wiring and conduit.
4. A convenience outlet and a switched light fixture, including all required conduit andwire, are to be provided in the pit.
5. Escalator pit provided with floor sump for drainage of accumulated moisture and liquids to City of Chicago sewer system.

1.12 WARRANTY

A. Special Project Warranty: For each escalator installation, provide special project warranty, signed by Contractor, Installer, and Manufacturer, agreeing to replace, repair, or restore defective materials and workmanship of escalator work during warranty period. This warranty shall be in addition to, and not a limitation of, other rights the Authority may haveagainst the Contractor under the Contract Documents.

1. "Defective" is hereby defined to include, but not by way of limitation, operation or control system failures, performances below specified ratings, excessive wear, unusual deterioration or aging of materials or finishes, unsafe conditions, the need for excessive maintenance, abnormal noise or vibration, and similar unusual, unexpected, and unsatisfactory conditions.
2. Warranty period shall be 12 months starting on date of Beneficial Use .
3. Warranty to start after the 30 day test period which will consist of continuous operation of the escalator without any interuptions caused by the warrantable defects.

B. Warranties: Provide coincidental product warranties where available for major componentsof escalator work. Submit with maintenance manuals.

C. A warranty inspection shall be required.

1.13 SPARE PARTS AND REPLACEMENT MATERIALS

A. Provide adequate spare parts on-site to ensure minimal downtime of the escalators duringthe warranty period. Spare parts shall include the list below at a minimum.

B. Parts must be coded for tracking purposes for replenishment.

C. Store critical spare repair parts on-site or in a CTA designated location.

D. Parts may be used by the Contractor for maintenance but shall be restocked within two weeks of their use at no additional cost to CTA.

1. Spare Parts and Maintenance Material: The Contractor shall provide to CTA's designated location, the following spare parts. The parts shall become CTA's property. The parts shall be delivered prior to Substantial Completion of the escalators.

a. Comb Plate/Demarcation Strips: 50 pieces, plus 10 left and 10 right, ifdifferent.
b. Steps: complete including demarcation and tread plates. 20 total.
c. Handrail Drive: One set for each particular assembly (left and right)including gears/chains and sprockets wheels.
d. Chain Rollers: Complete (two per axle) for highest rise unit.
e. Step rollers: Complete (two per step) for highest rise unit.
f. Brake Assembly: One for each size including actuator, drum and bearings,plus two sets of each size brake shoe/banks.
g. Demarcation lamps/fixture and ballast: Two complete units.
h. Drive sprockets (bullgear) – including sprockets for drive chain bullgear and handrail drive: One set (left and right) for each size drive.
i. Drive motor and gear box assembly: One set for each size drive.
j. Electrical contactors (up and down) relays, electronic starters, (control and isolation), coils and auxiliary contacts and control transformer: One set ofeach particular size for each escalator.
k. Switches (micro/safety), modules and sensors: One set for each escalator, total of three sets.
l. Fuses/lamps: One dozen for each size used.
m. Printed circuit board (Plug-in or hardwire): One for each type used.
n. Start switch/stop button assembly: Two sets of each type used.
o. Balustrade lighting lamps/fixture and ballasts. Two complete sets.
p. One complete handrail of each size.
q. One PLC processor module
r. I/O modules. One for each type

E. Maintenance and inpection tools: Provide a set of any speciality tools needed to properly adjust tests and inspect escalators including but not limited to:

1. Device to measure forces needed to activate the comb plate impact device. Deviceshould be EskAlometer brand or approved equal.
2. Set of 12" long feeler gauges in sizes appropriate to measure all required clearances
3. Gauges used to set the comb plate clearnaces

1.14 ROOM STORAGE CABINET

A. Room Storage Cabinet: The Contractor shall provide a stainless steel cabinet of not less

than twenty (20) cubic feet in volume (52 inches high x 36 inches wide x 18 inches deep) for installation in the Escalator Machine Room. The Cabinet shall have lockable doors and be mounted on legs, a minimum of four (4) inches above the finish floor. Cabinet shall be labeled for escalator control purposes, as directed by the Authority, and Contractor shall store small parts, supplies, tools, spare parts, replacement materials and other materials within.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include; but are not limited to, the following:

1. Schindler Elevator Co.
2. Kone Corporation.
3. Approved Equal.

B. Installation of escalators shall be performed by Manufacturer-authorized and factory-trained in heavy duty escalator installation persons in the direct employ of the Manufacturer.

C. Manufacturer shall meet the requirements for certification under ISO 9000.

D. All escalators, equipment, and accessories supplied under this contract shall be the product of a single manufacturer.

E. Escalator components; controls and machinery must be non-proprietary to facilitate the Authority's future maintenance of the equipment.

2.02 MATERIALS

A. Stainless Steel: Type 316. Shapes and Bars, ASTM A 276. Plate, Sheet and Strip, Over one-eighth (1/8) of an inch, ASTM A 264 with ASTM A 240/A 240M on ASTM A 36/A 36Mbase. Under one-eight (1/8) of an inch, ASTM A 167.

B. Escalator Truss: All escalator truss material sizes and finishes to comply with the requirements of Section 05 10 00, Structural Steel including, but not limited to the followingrequirements:

1. Hod-dip galvanize all steel, fasteners, bolts, washers and anchor bolts.
2. All bolts for truss to be ASTM A325 installed by tensioning to slip-critical levels.
3. All bolts connecting the truss to supporting structure to be ¾" diameter minimum.

C. Other Fasteners: Contractor shall provide nuts, bolts, washers, screws, nails, rivets and other fastenings necessary for proper erection and assembly of work. Fasteners shall be compatible with materials being fastened. Fasteners shall be furnished with self-locking nutsor retaining rings (spring washers, toothed disks).

1. Fasteners shall be equal to or of greater corrosion resistance than the mostcorrosion resistant materials being fastened ASTM A-480.

2.03 FINISHES

A. Stainless Steel: No. 4 finish.

B. Aluminum Castings and Extrusions: Commercial mill finish.

C. Galvanizing: Sheet Steel, ASTM A 653/A 653M, as applicable. Coating designation G

D. 185. Other galvanizing, ASTM A 123, ASTM A 153, ASTM A 385, as applicable.

E. Galvanizing Touch-up: Zinc dust coating, MIL-P-21035 or MIL-P-26915.

F. Paint and Corrosion Protection: Each escalator shall have the following minimum corrosionprotection:

1. All steel parts of the escalator to be hot-dipped galvanized unless approvedotherwise by the CTA in writing.
2. After welding, the truss to be hot-dipped galvanized with a coating in accordancewith ASTM A 90.
3. Cast metal parts such as gear housings, chain sprockets and return station half circles, to be hot-dipped galvanized and painted with a rust-inhibitive primer coat.
4. Steel parts which are specified to be painted after galvanized to be painted asfollows:

    a. First finish coat: two (2) mil (dry film thickness), minimum thickness.
    b. Second finish coat: two (2) mil (dry film thickness), minimum thickness.

5. Bright or uncoated axles, shafts, etc., shall be protected by zinc chromate or chromeplating.
6. Screws, nuts, washers and lock washers to be stainless steel unless approvedotherwise in writing by the CTA..
7. Handrail guides shall be of stainless steel.
8. Oil collector chutes and collection trays shall be fabricated of stainless steel.
9. All shims shall be manufactured from type 316 stainless steel.

2.04 ESCALATOR EQUIPMENT

A. The Contractor shall furnish and install heavy-duty transit system escalators in conformancewith the following requirements:

1. Vertical Rise: As indicated on drawings and verified.
2. Horizontal Work Point Dimension: As indicated on drawings and verified. The Authority reserves the right to modify, at no additional cost or delay to the Contract, the final elevations and work point dimensions for escalator within a range of plus or minus six inches prior to final approval of shop drawings and prior to fabricationof escalator components.
3. Inclination: 30 degrees.
4. Nominal Step Width: As indicated on drawings, manufacturer’s standard.
5. Nominal Clear Opening Width for Escalator Installation: As indicated on drawingsand verified.
6. Speed: Ninety (90) feet per minute “Up”; Ninety (90) feet per minute “Down”.
7. Number of Flat Steps:

    a. For New Construction: Three (3) upper landing steps pending rise, three (3)lower landing steps pending rise.
    b. For Existing Construction: Match number of flat steps.

8. Maintenance Speed: Ten (10) feet per minute.
9. Minimum Safety Factor: In accordance with EN 115 & current ASME A 17.1, or asstated herein, whichever is greatest.

10. Minimum upper and lower transitional track: Per latest APTA requirements.

B. Operating Controls:

1. Escalators shall have key-operated switches, accessible at both upper and lower landings, located on the exterior deck above the newel base. Alternate locations may be used subject to approval by the Authority.
2. Each keyed switch shall be clearly and permanently labeled, including starting anddirection selection.
3. Interlocks shall be provided to bring the escalator to a smooth stop, in either directionof travel, before a change of direction may be made.
4. Provide vandal resistant devices.

C. Safety Devices:

1. Safety devices required by ASME A 17.1 shall be provided on each escalator.
2. Safety devices depending upon interruption of electric circuit for their operation shall be interlocked with electric power supply to motor to apply brakes, and bring escalator to a smooth, safe stop in either direction of travel.
3. An interlock shall be provided to prevent operation of escalator until safety hazard or malfunction has been corrected if escalator stops because of malfunction, or actuation of one or more of the safety devices. Escalator shall be restarted by useof keyed switch only.
4. Safety devices shall be mounted in locations accessible for maintenance within escalators, and these devices shall be designed for ease of adjustment or reset. Devices shall be located so that operation is not affected by direct moisture and debris.
5. If escalators are equipped with braking system dependent upon activation of springs, then springs shall be of guidance compression type. The use of weights orself-excitation of the brake release shall not be allowed.
6. Disconnect switches capable of being locked in the "off" position shall be provided in both escalator pits, and at the drive of each escalator to prevent the starting of escalator from any other location.
7. Provide each pit access cover with a safety stop switch. The safety stop switch willprevent the escalator from operating if the cover is not in its proper position.
8. Step safety side brushes:

    a. Contractor shall provide escalator safety strips (brushes), as manufacturedby Escalator Handrail Company or approved equal.
    b. The escalator safety strip shall run continuously between the comb plate lights on each side of the escalator steps.
    c. The safety strip shall be attached to the top of the skirt panels at the intersection of the skirt and balustrade panels and below the continuous strip light on the balustrade. Safety strip shall not hinder operation of skirtsafety switches.
    d. The step nose shall pass below the ends of the bristles of the brush with clearance per manufacturer’s installation instructions.
    e. The length shall be the same as skirt panel sections for the straight segments to allow the skirt panel to be removed without disassembling the entire brush. Top and bottom radial segments with end caps and all fittingsfor a complete installation shall be provided.
    f. Fasteners for attaching the strips to the skirt panels will be selected to beappropriate and match the skirt panel construction.

9. At each escalator, the Contractor shall provide the following minimum additional safety devices that shall interrupt electric power within escalator, and automatically apply brakes and bring escalator to a smooth stop in either

direction of travel:

a. Device to stop escalator should escalator have misalignment of steps or linkages. This device, one (1) at top, one (1) at bottom, shall monitor steps before entry into comb as well as on return side and shall be manually reset.
b. Device or devices incorporating single operation to stop escalator should one (1) or both step linkages have significant amount of wear, experience breakage, change in length, change in strain, or should adjustable carriage move more than predetermined distance in any direction.
c. Device shall be employed to remove power if the escalator speed varies more than plus or minus (±) 20 percent.
d. Device shall remove power from escalator and apply brakes should an object become wedged between step tread of one (1) step and riser of another step during the formation of a landing.
e. Newel bases shall have device to preclude a passenger's hand from being carried into the handrail entrance of the newel. Should entrance of a foreign object accidentally occur, a device shall automatically apply brakes and bring escalator to a smooth stop in either direction of travel.
f. Device shall be provided to remove power and stop escalator should handrail break, lose motion, or stretch beyond a preset amount. The time between the stopping of the handrail and the removal of power to the drive unit will be adjustable from five-tenths (0.5) of a second to ten (10) seconds.
g. Devices shall be installed behind and through skirt panels at upper and lower landings of each escalator to remove power from escalator and apply brakes and bring escalator to a smooth stop, in either direction of travel, should the skirt panels be forced away from steps or if any object should become wedged between step and skirt panel.
h. Safety devices shall be incorporated at both the upper and lower comb plates which shall disconnect electrical power to the driving machine and activate the brake to bring the unit to a smooth stop in either direction of travel should any object become wedged between the comb and the step in either a horizontal (1500 Newtons) or vertical (668 Newtons) lifting direction.
i. Protection shall be provided to prevent accidental or sudden reversal ofescalator direction from designated direction of travel.
j. A disconnect switch shall be provided in the top and bottom escalator pitswhich will, when used, stop the escalator or prevent starting.
k. In addition, a fault-finding device (diagnostic equipment) shall be provided,capable of producing indications of the following data:

    1) Date, time, and cause of all escalator stoppages and failures.
    2) A monitoring of drive motor temperature.

l. Deteriorated and Missing Roller Detector: Provide a device for detecting deteriorated and/or missing step and axle rollers on the left and right sides while the escalator is running with or without passengers or load. The roller detector shall be integrated into the safety circuit. The device shall be manually reset.

D. Emergency Stop Button:

1. One (1) emergency stop button shall be located at each landing, accessible on

the exterior deck cover. Location shall be in the upper quadrant, forty-five (45) degreesabove horizontal of newels, as required by A 17.1 Code.

2. Stop buttons shall be momentary contact push buttons, red in color, shall bear the
U.L. label, and be constructed in accordance with U.L. standards.
3. Stop buttons shall be housed under clear, high-impact resistant plastic cover, which shall be self-closing by means of spring-loaded hinge at upper edge. Cover shall have clearly printed upon it, the words "EMERGENCY STOP" in one-half (1/2) inch high letters. When the cover is lifted an audible alarm shall sound at, or near, the top and bottom button locations until cover is returned to the closed position.

E. Balustrades, Skirt Panels, Bottom Enclosure and Exterior Cladding Assemblies:

1. Balustrade panels, skirt panels, bottom enclosure and exterior cladding assemblies consisting of stainless steel with a backer panel: Stainless steel to be a minimum of fourteen (14) gauge Type 316 stainless steel. Provide non-combustible backing panels of aluminum honeycomb or a material subject to the Authority's approval. Provide isolation for dissimilar metals. Stiffeners, brackets, attachment angles and other concealed ferrous metal framework to be hot-dipped galvanized and protected from galvanic corrosion or constructed of equivalent, corrosion-resistant materialsapproved in writing by the CTA..
2. Balustrade panels, skirt panels and exterior cladding of solid stainless steel (without a backer panel): Stainless steel to be a minimum of seven (7) gauge Type 316 stainless steel and to be in conformance with ASME A 17.1 code. There are to be no laminations nor square joints allowed. Stiffners, brackets, attachment angles and other concealed ferrous metal framework to be protected from galvanic corrosion orfabricated of equivalent, corrosion-resistant material.
3. Panels shall have edges sealed against moisture.
4. Panels shall be designed to achieve equal lengths for interchangeability.
5. Panels shall be attached to permit easy removal for inspection, lubrication and adjustment of safety devices.
6. Panels shall be sized so that not more than two (2) persons shall be required to remove a panel, and without the aid of special handling equipment.
7. Panel fastener requirements: Panels shall be fastened to their respective supports or mating portions with tamper-proof, flathead Type 316 stainless steel machine screws. Fasteners to be concealed unless approved otherwise.
8. When framework to which panels are fastened is less than one-quarter (1/4) of an inch thick, galvanized steel back-up plates with a minimum one-quarter (1/4) of an inch thickness shall be added which have tapped holes or clearance holes wherenecessary.
9. Provide recessed type skirt brushes along both sides of the skirt panel. Skirt brush must be installed at least one (1) inch above the nose of the stop line. Brush material is to be flame retardant. Skirt brushes shall incorporate two (2) rows of bristles and intermediate sections shall be capable of being removed independently of the remainder of the brush installation for access to motors or other sections of the trussinterior.
10. Handrails for adjacent stairs are not to be attached to the balustrades of the escalator.

F. Decking:

1. Decking to be Type 316 stainless steel, identical to balustrade, with minimum of fourteen (14) gauge thickness.
2. Decking to be designed to support a live load of one hundred seventy-five (175) pounds per square foot, without surface deflection.
3. Paneling, decking and other enclosures to be supported on galvanized steel

framework.

4. Baggage stops to be provided on any decking surface exceeding twelve (12) inches in from the center line of the handrail or on adjacent escalators when the distance between the centerline of the handrails is greater than 16 in width. Each stop to be at least two (2) inches in diameter, three-quarters (3/4) of an inch high, made of Type 316 stainless steel and fastened securely using two (2) Type 316 stainless steel fasteners to prevent turning and loosening. The distance between stops shall be noless than six (6) feet.
5. All decking is to be extended to finish walls and in one piece widths.
6. There shall be no exposed fasteners on the surface of the decking and cladding.

2.05 ELECTRICAL EQUIPMENT

A. Truss Wiring and Conduit:

1. Galvanized rigid pipe and/or liquid tight flexible metal conduit shall be used in thetruss.
2. For Class 2 circuits, 50 cord may be used in lengths not to exceed three feet.
3. Liquid tight flexible metal conduit must be CSA/UL approved.

B. Motors:

1. The driving motors shall be A.C. induction motors with starters. Voltage: 208 V.A.C.,3 phase, Frequency: 60 Hertz.
2. The motors shall be totally enclosed with external cooling fans.
3. The motor protection class shall be equivalent to IP 65.
4. Provide type F motor insulation per APTA 2.01E.1b.
5. The motor shall be flange-mounted to the main drive gear case and separated fromworm shaft by a non-metallic, energy-absorbing coupling.
6. Driving motors and motor switch gear shall be designed in such a way so as to provide a smooth start, which shall prevent possible passenger accidents as well asundue strain on drive components.
7. The rated efficiency shall be designed for continuous operation(s) under a load minimum average peak step as follows: Forty (40) inch wide step, three hundred twenty (320) lbs.; Thirty-two (32) inch wide step, two hundred fifty-six (256) lbs.
8. The motor horse power rating, starting torque and efficiency should be based on a design load of three hundred twenty pounds (320) lbs. per step, while maintaining the APTA requirement of step strength based on 674 lbs. load per step.

C. Controller:

1. The escalator control equipment shall contain diagnostic capabilities for ease of complete maintenance. The diagnostic system shall be an integral part of the controller and provide user friendly interaction between the service person and the controls. All such systems shall be free decaying circuits that must be periodicallyreprogrammed by the manufacturer.
2. Controller shall be mounted in freestanding NEMA 4X cabinets with strip heaters and labeled terminal strips. Equip each controller with heating pads capable of maintaining controller performance when room temperature is zero (0) degrees F. Controller cabinets to be ventilated and air conditioned if necessary to maintain the temperature range as specified by the controller components manufacturer. Provide a remote switch for the heating pads. Provide water tight conduit and connections.
3. The main control controller of an escalator shall contain at least the following devices: lockable main switch thermal and magnetic motor protection starter for up and down travel, hour counter, auxiliary contractors, phase failure device,

phase sequence monitor, and ground fault monitor.

4. All wiring in the control panel shall be neatly installed and terminated in the terminal blocks. All terminals shall be clearly marked. All components in the control panel shall be identified and matched to components as indicated on the wiring diagram.
5. The controller shall be equipped with an AC induction motor reduced-voltage starter, installed in line between the standard type contactor and the drive motor. The starter shall be solid state, capable of starting motors smoothly and gradually, reducing inrush current and mechanical shock upon start-up. Adjustable settings for accelerating time and starting torque shall be provided. The starter shall also contain auxiliary contacts and a thermal overload relay for motor protection. An acceptable starter is the Payne Engineering Series 18EM3, or approved equal.
6. Provide 2-Dry contacts to monitor system failure through SCADA.

D. Escalator Lighting Fixtures:

1. Step demarcation lights (located below steps at both landings) shall be provided in accordance with code requirements. Each landing shall have a minimum of three (3) lighting elements, (and be either NEMA 4 rated or IP65 rated for exterior escalatorsin accordance with local electrical code requirements).
2. Combplate lighting fixtures shall be provided by LED type fixtures (and be either NEMA 4 rated or IP65 rated for exterior escalators, labeled in accordance with localelectrical code requirements).
3. General Contractor shall furnish and install all maintenance lighting with quick start type PL compact fluorescent lamps as required for complete illumination of working spaces and specified areas within the interior of the escalator and its immediate surroundings. Upper and lower pits shall have internal lighting of 15- candles as a minimum. A main light switch shall be located at the entry to each wellway and/or pit. Vertical transportation equipment supplier shall coordinate with the Authority.

E. All electrical components to comply with the City of Chicago Code.

F. A lockable circuit breaker disconnect switch for each escalator to be provided.

G. All boxes and fittings in the shaft to be cast metal or malleable iron (NEMA 4X) and shall meet ANSI/NEMA FB 1. Threaded type material to match conduit. All electrical boxes exceeding150 in^3 to be supported independently.

H. All control equipment to be mounted in 12 gauge NEMA 4X cabinet with hinged door and heat strip. Controller panel to be of suitable size to fit all required equipment. All equipment and wiring to be attached to the control panel. There should not be any loose equipment in the control panel whether this equipment was supplied by the escalator controls manufacturer, escalator contractor, communications/signal or electrical contractors.

I. All wiring in the control panel to be neatly installed and terminated in the terminal blocks. All terminals shall be clearly marked. All components in the control panel to be identified and matched to components as indicated on the wiring diagram. Wiring to meet the requirements of section 26 17 50 Local Control Panels and 26 19 50 Identification.

1. Each wire and each cable to be labeled at terminals and at all accessible points in equipment, panelboards, control panels, motor control centers, manholes, handholes, and pull boxes. Labels to be self-sticking wire markers.
2. Each cable run to be assigned a circuit number and be recorded on a cable schedule showing from, to, purpose, number of conductors and length. Each wire shall be labeled according to the submitted shop drawings and wiring

diagrams

3. Cable/wire markers to be the wrap-around self-adhesive type, with factory or mechanical printed numbers, letters and symbols which are be used to identify allfeeders, mains and branch circuit conductors.
4. All conductors to be tagged on both ends at the time wires are pulled in and testedand markers shall not be removed for any reason.
5. Phase identification letters, in readily visible locations, to be stamped into the mainbus bars of switchboards and panelboards
6. Cable/wire markers to be installed on both ends of all conductors, both for internal and external cables. The cable/wire markers for external connections shall comply with Section 26 19 50 Identification. The cable/wire markers for internal wires and cables to be self-adhesive, self-laminating mechanically printed with a clear protective laminating over wrap or mechanically printed with a clear protective laminating over wrap or sleeve type tubing mechanically printed with permanent non smearing ink. Sleeve type wire markers to be properly sized for the conductor theyare being installed on.

J. Provide at least 3 sets Auxiliary contacts in control panel for each remote alarms or indications.

1. Emergency alarm.
2. Emergency stop.
3. Escalator malfunctions.

K. Complete wiring diagram showing the electrical connections, functions and sequence of all apparatus connected with the escalator shall be furnished for review and record. KAll cabinets containing motor drives, filter boxes, transformers and power reactors shall be supported on rails and isolated from the base building structure with elastomer pads having a minimum static deflection of 3/8". All connections to and from the cabinetry shall be flexible in order not to compromise the isolation system. Use flexible conduit for the final electrical connection, with all other conduit supports and clamps provided on a neoprene sponge insert. Cabinets shall be NEMA 4X.

1. Supply, installation and connections of the circuit breaker main line disconnect switch to be of the lockable type for the escalator.

2.06 CONDUITS AND WIRING

A. All conduit fittings and connections to be compression type. The use of set screw or indentations as a means of attachment is not permitted.

B. Connect motors and other components subject to movement or vibration, to the conduit systems with flexible conduit.

C. The Installer to furnish all materials and completely wire all parts of the electrical equipmentof the escalators.

D. All solid state and electrical components to be installed within NEMA 4X enclosures.

E. Conduits to be brought and connected to suitable approved connection boxes at all outlets,apparatus and panels.

F. Conduit Sizing, Arrangement, and Support

1. Size conduit per NEC for conductor type installed or for Type THW conductors,whichever is larger; 3/4-inch minimum size for conduit.
2. Conduits for small devices such as door switches, interlocks, etc. shall be permitted at ½ inch.

3. The total overall cross sectional area of the wires contained in any conduit shall notexceed 40 percent of the internal area of the conduit.
4. Arrange conduit to maintain headroom and present a neat appearance.
5. Route exposed conduit parallel and perpendicular to walls and adjacent piping.
6. Maintain minimum 6-inch clearance between conduit and piping.
7. Maintain 12-inch clearance between conduit and heat sources such as flues, steam pipes, and heating appliances.
8. Arrange conduit supports to prevent distortion of alignment by wire pulling operations. Fasten conduit using galvanized straps, lay-in adjustable hangers, clevis hangers, or bolted split stamped galvanized hangers.
9. Group conduit in parallel runs where practical and use conduit rack constructed of steel channel with conduit straps or clamps. Provide space for 25 percent additional conduit on racks.
10. Do not fasten conduit with wire or perforated pipe straps. Remove all wire used fortemporary conduit support during construction, before conductors are pulled.
11. No conduit to be attached to a cable tray or installed within 6 inches of a cable trayor light fitting except for termination.
12. Approved strain boxes t o be installed for all vertical runs in accordance with Code.

G. All interlock and limit switch branch wiring to be enclosed in flexible steel conduit withcovering of liquid tight Type "EF" with connectors having nylon insulated throat.

H. All screws used for terminal connections of all wiring to be provided with "star washers" ofproper size and type.

I. Conductors

1. Unless otherwise specified, conductors to be 98% conductivity copper, solid, for size 10 AWG and smaller, and stranded for size 8 AWG and larger to be stranded or solidcoated annealed copper in accordance with the NEC for Type THHW.
2. Where 16 and 18 AWG are permitted by Code, either single conductor cable in accordance with Code for Type TF, or multiple conductor cable may be used provided the insulation of single conductor cable and outer jacket of multiple conductor cable is flame retardant and moisture resistant.
3. Insulation Voltage Rating: 600 volts.
4. Insulation: ANSI/NFPA 70, type THHN/THWN, XHHW or THW.
5. The use of PVC insulation is not permitted.
6. Color Coding: All power conductors identified as to phase and voltage by means ofcolor impregnated insulation, as follows:

Voltage	ØA	ØB	ØC	Neutral	Ground
120/208V	Black	Red	Blue	White	Green
277/480V	Brown	Orange	Yellow	White	Green

7. For wire sizes No. 8 AWG and larger, color banding tape, minimum 2 inches wide,may be used at all accessible locations in lieu of colored insulation.
8. Multiple conductor cable to have color coding or other suitable identification for each conductor. Conductors for control boards shall be in accordance with Code.
9. No joints or splices to be permitted in wiring except at outlets.
10. All wiring shall test free from short circuits or grounds. Insulation resistance between individual external conductors and between conductors and ground to be not lessthan one meg-ohm.
11. Where size of conductors is not given, capacity shall be such that maximum

currentto not exceed limits prescribed by Code.

12. Equipment grounding to be furnished and installed. Ground conduits, supports, controller enclosures, motors and all other non-current conducting metal enclosures for electrical equipment in accordance with Code. The ground wires shall be copper, green, insulated and sized as required.
13. Terminal connections for all conductors used for external wiring between various items of elevator equipment to be solderless pressure wire connectors in accordance with Code. The Installer may at his option make these terminal connections on No. 10 or smaller conductors with approved terminal eyelets set on the conductor with a special setting tool, or with an approved pressure type terminal block. Terminal blocks using pierce-through serrated washers are not acceptable.

J. LSHF (Low Smoke Halogen Free) Wiring shall be used throughout the escalator installation.

K. PVC may not be used in the escalator installation.

L. All electrical connections outside of electrical panels or junction boxes to be made using military spec connectors. Connectors to be waterproof, environmental resisting with strain relief, vibration resistant, MIL-DTL-5015, MIL-DTL-26482, MIL-DTL-22992, MIL-DTL-38999, MILDTL-28840 AND MIL-DTL-83723.

2.07 ESCALATOR CONTROLLER SECTION

A. The escalator control equipment shall contain diagnostic capabilities as required for the ease of complete maintenance.

1. The diagnostic system shall be an integral part of the controller and provide user- friendly interaction between the service person and the controls. Controller shall be mounted in a stainless steel NEMA 4X cabinet. The door of the cabinet shall havea sealed window placed over the fault indicator board within.
2. The main controller shall use an Allen Bradley Programmable Logic Controller (PLC) or approved equal to control and monitor the status of the escalator. The escalator manufacturer shall provide all the communication programming given to theAuthority including all documentation.
3. There should be enough space in the controller cabinet to add two additional PLCcommunication or I/O modules to the standard PLC package.
4. The PLC in the remote control panel shall also have hardware and firmware provisions to communicate with interactive operator interface (monitor).
5. The PLC shall store the last 99 faults, accessible via laptop connection, panel viewor remote communications.
6. A copy of all working programs on approved computer medium, as well as in printedprogram listing shall be provided.

2.08 ESCALATOR CONTROL SYSTEM PROGRAMMING

A. The Escalator Control System PLC program must be designed in such a way that it can easily pass data to the Remote Data Collection Unit. This information must be provided in contiguous data files in the PLC Data Table. All faults must be provided with time and date stamp with day, month, year for date and hour, minute, second for time. The time and date stamp shall come from Real Time Clock in the PLC. The program must store 99 historical fault entries with the time and date stamp in a table format approved by the Authority.

1. The following data needs to be captured:

a. All Safety Device Trips w/Time and Date Stamps
b. SMC Dialog Plus info:

1) Three-Phase Current in Amps
2) Three-Phase Voltage in Volts
3) Power in KW
4) Power usage in KWH
5) Power Factor
6) Motor thermal capacity
7) Elapse time

c. Handrail speed left and right in ft/sec.
d. Step speed in ft/sec.
e. All General faults w/ time and date stamp including but not limited to:

1) Emergency Stop Switch
2) Pit Stop Switch
3) Broken Handrail
4) Broken Step Chain
5) Comb Impact-Upper
6) Comb Impact-Lower
7) Handrail Entry Upper
8) Handrail Entry Lower
9) Broken Drive Chain
10) Missing Step Upper
11) Missing Step Lower
12) Skirt Obstruction Upper
13) Skirt Obstruction Lower
14) Step Level Upper
15) Step Level Lower
16) Step Upthrust Upper
17) Step Upthrust Lower
18) Brake Wear
19) Drive Motor Temp.
20) Over/Under Speed
21) Handrail Speed
22) Reversal Stop Device

B. Deceleration Rate of the escalator during any stops.

1. Provide HMI shall gather all fault data on the panel. The Operator Interface Terminaland PLC real time clocks will need to be synchronized at all times.
2. The fault codes shall be developed by the escalator manufacturer in a 3 digit format,
   i.e. Emergency Stop Switch-Fault 001, Broken Step Chain-Fault 002, etc.
3. All PLC program shall have description of the run inside the program.
4. A copy of all working programs and software on approved computer medium, as wellas in printed program listing shall be provided.
5. The escalator manufacturer for each escalator location shall provide the Authority with a laptop computer Windows based with latest operating system with the program and software installed with required cables to plug into the PLC and all other accessories to use for diagnostic purposes of the escalator system. Manufacturer shall provide non-proprietary diagnostic software, Escalator program with all input/outputs descriptions showing each rung and other required software installed in the computer for use by the Authority's

escalator technicians.

2.09 MECHANICAL EQUIPMENT

A. Tracks:

1. Design and fabrication of tracks shall retain steps and running gear safely under loadrequirements and at the highest design speeds specified.
2. Contractor shall assemble and secure sections of track together for easy removal and replacement of defective sections. The system shall be adjustable, and welding of the tracks is not acceptable unless approved in writing by the Authority.
3. Design of the mechanical components shall provide for easy installation and removal without the dismantling of parts of the structure.
4. Tracks shall be properly supported on trusses to provide correct alignment and smooth transition to return stations. The rolling surface of the track shall have a minimum thickness of 3 mm.
5. The track radius shall be determined in conformance with EN 115 and the followingconstraints:

    a. The requirement for requisite number of flat steps shall be met.
    b. Track loading and wheel size shall be such that interaction force between each wheel and track shall permit escalator to meet requirements specified.

6. The guiding system for the step chains and step wheels shall be of hot-dipped galvanized or zinc-plated steel profiles with smooth and even running surfaces, and with the joints cut diagonally to the running direction. The profiles shall not be weldedtogether at the joints.
7. A second, continuous guiding profile shall be provided above the step chain rollers so that the step chains are positively guided in the area of the escalator open to passengers.
8. The step guides shall be designed to ensure that the gap between the step side plate skirt panel does not exceed one-thirty-second (1/32) of an inch at one (1) side or one-sixteenth (1/16) of an inch in total at both sides. Contractor shall provide the Authority with a printout of the readout of the step/skirt clearance per ANSI code.

B. Steps:

1. Step assemblies shall be one (1) piece, die-cast aluminum or Authority approved equal. Step treads shall have one-eighth (1/8) of an inch wide cleats on three- eighths (3/8) of an inch centers, not less than three-eighths (3/8) of an inch in depth, and shall be designed to mesh with the comb plates. Die-cast aluminum shall nothave more than 0.3 percent copper content.
2. Step ends shall be square in order to minimize step to skirt clearances. The entire step assembly shall be treated with not less than one (1) coat of zinc chromate primerand one (1) coat of aluminum enamel for corrosion-resistance.
3. Steps and their various attachments shall permit removal of steps without disturbing balustrades.
4. The design shall permit the running of the drive without steps for convenience in cleaning and inspection.
5. Step rollers shall have polyurethane tires on hubs, sealed roller bearings, and a diameter of no less than four (4) inches. Step rollers shall not require any additional lubrication and must be rated for severe, heavy-duty service. Step roller bearingsshall have a L10 rating of 100,000 hours.
6. Steps shall be constructed so as to be driven by step linkages to step or step

rollers.

7. Contractor shall provide washers and nuts as follows:

    a. Tap bolts: Lock washers
    b. Through bolts: Lock nuts or Authority approved equal.

8. Rated Loads:

    a. In addition to the minimum requirements given in the Codes, Contractor shall design the steps for a minimum load as described in the latest APTAstandard for the transit escalators. .
    b. The steps shall carry the load under maximum concentric and eccentric loading conditions without distortion.
    c. Contractor shall perform dynamic testing, witnessed by Authority representatives, to verify the structural strength and serviceability requirements.

9. Step treads and risers shall not end with a groove at the edge.
10. Contractor shall provide safety side plates as specified herein.
11. Steps shall have two (2)-inch thick, yellow demarcation lines, as required per A.D.A.guidelines.
12. Testing: Step assemblies shall be tested in accordance with ASME A17.1, 1990 "Step Fatigue Test" requirements, Section 1105, Rule 1105.1, as a minimum.

C. Step Chain:

1. Contractor shall provide endless, roller-type step chains; one (1) on each side ofstep.
2. Step chains shall be of heat-treated steel construction, supported at intervals bylinkage wheels.
3. A means to prevent steps from coming into physical contact with each other, and toprevent chains from sagging or buckling shall be provided.
4. A means to maintain constant distance between step axles shall be provided.
5. An automatic tension device to maintain tension under load and to compensate forwear shall be provided. The device shall be located within the truss at the lower end.
6. A means for individual fine adjustment of tension for each linkage shall be provided.
7. Step chains shall be constructed to permit removal of segments as may be required for replacement purposes.
8. Support wheels spaced to distribute load and to guide linkage throughout run shall be provided. Rollers shall be constructed of polyurethane material, with diameter sufficient to provide reliability, maintainability, smoothness of motion, and to operate within noise level requirements specified. The chain rollers shall have polyurethane tires on hubs, hermetically sealed bearings, a diameter of not less than four (4) inches, shall require no additional lubrication, and be mounted outside the chain link. Chain roller bearings to have a L10 rating of 100,000 hours.
9. Wheels shall be affixed to permit rapid replacement.
10. Each pair of step chains shall be a matched set within manufacturing tolerances. Only precision, roller-fish-plate chains of high grade, heat-treated steel shall be used as step chains. The pins, axles, bushing, and rollers shall be hardened and ground.
11. Both left and right step chain sections shall be secured together by means of a solid steel axle assembly every 16", either as an integral part of the step chain or, as an independent assembly to which the step is attached or, built into the

step assembly itself, and not subject the step itself as a means of securing the left and right stepchain sections together.

12. Step chain and chain pins shall have a minimal diameter of at least five-eighths (5/8) of an inch. In addition, the diameter will be of a size so that the surface pressure at engaging points will not exceed 2,900 lbs/sq.in. This is to be based on the peak average step loads as follows: 40 inch wide step 320 lbs. per step; 32 inch wide step256 lbs. per step.
13. The safety breaking factor of a step chain as defined as a ratio of chain breaking load to chain traction force, while assuming the maximum operating load of three hundred twenty (320) pounds per step for forty (40) inch steps, two hundred and forty (240) pounds per step for thirty-two (32) inch steps, shall be at least five (5).
14. A test certificate for the chain breaking load shall be provided.
15. A shielding device shall be provided to protect chain, track guides, and rollersagainst water, dirt, and debris.

D. Risers:

1. Risers shall be furnished with full height vertical cleats and shall form an interlocking unit with the step tread of the adjacent step.

E. Treads:

1. Treads shall be cleat type, designed to assure foothold with a comfortable tread surface and shall have chamfered or radiused nosings of one-eighth (1/8) of an inchat rise edge of tread.

F. Step Frames:

1. The step frame shall be reinforced and braced to carry the step treads.

G. Comb plate Assemblies:

1. Comb plate assemblies of wear resisting, non-corrosive metal material, with exposed anti-slip surfaces shall be fabricated.
2. Comb plate sections meeting the following requirements shall be provided:

    a. Shall be removable to permit ease of replacement without aid of specialtools or equipment.
    b. Shall be yellow color for safety/demarcation.
    c. Shall have not less than three (3) nor more than seven (7) comb platesections per comb plate assembly.
    d. Provisions for lateral and vertical fine adjustments shall be provided so that cleats of step treads pass between comb teeth with minimum clearances.
    e. Comb teeth meeting the following requirements shall be provided:

        1) Teeth shall penetrate the treads on escalator steps in such a manner so as to reduce to a minimum the danger of injury to passengers, and so as to prevent breakage and wear of teeth caused by interference with step treads.
        2) Teeth shall be designed so as to withstand a load of two hundred fifty (250) pounds applied in an upward direction at the tip of any one
        (1) tooth.
        3) Teeth shall not have any sharp edges.

3. A separate switch for vertical and horizontal detection shall be provided.
4. Comb Heating: For escalators installed at or adjacent to exterior locations or in unheated spaces, provide combplate heating utilizing underlay type heaters installed under both the upper and lower landings to ensure the normal operation of escalators under adverse conditions.

    a. Combplate heaters to prevent direct or tracked ice, snow, slush or moisturefrom interfering with escalator operation.
    b. Combplate heaters to be accessible for testing, maintenance and/or replacement.
    c. Combplate heaters to not cause surface temperatures of equipment accessible to the public to become hazardous.
    d. Combplate heaters to be thermostatically controlled for 120V. AC operation and have automatic control to disconnect them from the power source whenthey are not in use.

H. Floor Plates:

1. Shall have Type 316 stainless steel frames at floor openings, designed to be supported on truss heads.
2. Shall be designed to cover entire area of upper and lower landings as indicated.
3. Shall be reinforced, as necessary, to be rigid and able to withstand a live load of twohundred fifty (250) pounds per square foot with zero (0) deflection.
4. Shall be extruded of die cast aluminum in a ribbed pattern transverse to the escalator axis. Ribs shall be designed to provide maximum traction, and will be finished in thesame manner as comb plates.
5. Shall have exposed portions constructed of material and finish to harmonize with steps and comb plates.
6. Shall be light weight and removable for ease of access to machinery and maintenance areas below. Shall be fabricated in sections of a size and weight capable of being handled easily by one (1) person.

I. Drive Machinery:

1. Motor and drive mechanism shall be mounted within the truss envelope and step bank at the upper end. The motor shall be flange-mounted directly to the driving machine, connected by a non-metallic coupling.
2. Carriage Requirements: Carriages for tension drive chain shall move on tracks. Such movement shall be accomplished by use of precision ground rollers and horizontal guides to prevent slewing while adjusting carriage. Carriages with spring operated device to aid in adjustment of tension along with mechanical adjustment shall be provided. Carriages with scale and pointer on accessible section of carriage frame to indicate movement and amount of adjustment available shall be provided. Position scale and pointer to indicate zero (0) for initial position of carriage prior toplacing in service.
3. Shafts shall be designed for ease of assembly or disassembly using square keywaysof proper sizing.
4. Worm Gear Requirements:

    a. Single-stage type, with positive engagement shall be provided.
    b. Worm gear bearings shall be housed in an oil-tight, dust-proof case provided with a sight glass or dipstick method of determining oil level in the case. The case shall provide a convenient method of draining the oil.
    c. Lubricant compartment shall contain lubricant heaters for street level or above ground installations unless synthetic lubricants, subject to Authorityapproval are used.

d. Gear assembly shall be coupled to motor by worm shaft, brake unit, non- metallic coupling, and motor flange fastened to gear case. The assembly shall have no openings in order to minimize accumulation of dust and debris.

5. Rotating parts shall be provided with a means for lubrication and retention of lubricants. Sealed bearings shall be used in those environmental conditions where entry of water or dust may adversely affect bearing performance. Exposed, moving drive elements shall be protected by sealed metal housings which shall provide continuous lubrication to components. Gear bearings shall be rated with an ABMA L10 200,000 hours housed in an oil-tight, dust-proof case.
6. Provide oil level sensors and escalator shut off mechanism to shut off the escalator when the oil level is below minimum oil level as recommended by APTA where oillubrication is provided.
7. V-belt and tooth belt drives shall not be considered acceptable. If chain drives are used, they shall be protected against dirt and water by sealed housings, and shall have an automatic lubricating device and a means of taking up any slack in the chain.
8. Head shaft bearings shall be rated for ABMA L10, 200,000 hours.

J. Drip Pans:

1. Galvanized, 14 gauge welded, water-tight drip pans for the entire length and width of trusses shall be provided. Drip pans shall be of sufficient strength to support a concentrated weight of five hundred (500) pounds at any place in the drip pan. They shall also be sloped for proper drainage and collection of spent lubricants as well asany moisture or water which may enter the escalator.
2. Drip pans of sufficient size to collect and maintain, within truss areas, oil and grease drippings from step linkage and all forms of loose debris that may be deposited in drip pans from steps at turn-around points at upper and lower portions of truss shall be provided. This system shall be separate from the water drain in order to preventthe discharge of spent lubricants into sewer system.
3. Provide an access plate/hatch through the drip pan at the lower pit of the escalatorfor the purpose of cleaning drain catch basin or sump pump.
4. An oil water separator shall be provided with the escalators.

K. Handrails:

1. Traction drive handrails having a minimum contact of one hundred eighty (180) degrees around a drive wheel, and providing a minimum positive drive contact of forty-eight (48) inches shall be provided.
2. Handrails shall receive their motion from main escalator drive through direct gearing and drive shaft or drive chains, so that handrail and steps operate at the same speed in each direction of travel. Driving and guiding wheels shall have a groove to acceptthe wedge on the underside of the handrail.
3. For chain drive handrail drive system, provide a chain composing of heavy duty #80or greater for the chain drive. The chain and material for the chain is to be manufactured in the U.S.A.
4. A means to take up handrail slack using tensioning device, where required, shall be located within the escalators. In addition, a method of releasing the device for repairor removal of the handrails shall be provided.
5. A means to take up handrail slack using a tensioning device, where required, shall be located within escalators. In addition, an approved method of releasing the device for repair or removal of handrails shall be provided. Pre-tensioning of handrail shallbe considered unacceptable.
6. Newels meeting the following requirements shall be provided:

a. Surface of newel bases, adjacent to where handrail enters or leaves,

shallbe at an angle of ninety (90) degrees with surface handrail.

b. Newels shall be designed and constructed so that handrail shall return into newel end at a point inconspicuous and difficult for passengers to reach.

c. Newel wheels shall be provided at upper and lower newels.

d. Handrails, handrail drive system, and guides shall be so designed and installed that handrail cannot be thrown off or disengaged while running, and special design attention shall be given to area where handrail passes from drive system to guides. Stationary guides at the newel return shall not be considered acceptable. A method of guiding the handrail and reducing friction, either by a large diameter newel wheel or a set of smaller cluster rollers, shall be provided.

e. Handrail wheels shall have sealed bearings rated at ABMA L10 100,000 hours that have provision for retention of lubricant to ensure satisfactory lubrication and operation. Additional lubrication shall not be required.

f. Friction drive wheels and idlers shall be designed and positioned so that lubricant cannot reach surface of handrail. Marking and spotting of handrail by drive equipment shall not be permitted. Provide sealed bearings rated atABMA L0 100,000 hours.

g. Handrails shall be constructed of laminated, steel, wire mesh, or steel cable reinforced with a steel cable tension member providing a minimum strength of 25 KN over the splice area, flexible elastomer material vulcanized into an integral, non-separating, seamless, smooth handrail resistant to environmental conditions. A V-shaped underside design shall be used, providing a more positive drive. No cotton fabric shall be used.

h. Handrail color shall be black with three-quarters (3/4) of an inch round, white markers inlaid into the handrail material at twenty-four (24) inch intervals.

i. Handrail guides shall be continuous on exposed portion of handrails, Type 316 stainless steel, constructed of material which shall not be subject to corrosion nor pitting, and shall have a polished or specially coated, permanent finish to minimize frictional wear to undersurface of handrail. On the unexposed portion, guiding shall be by adjustable rollers having sealed bearings, and set in a way so as not to cause wear on the handrail.

j. Handrail gear box, if provided, shall have bearings rated at ABMA L10 200,000 hours.

k. Provide synthetic slider material.

L. Brakes: Each escalator shall be provided with the following brakes for stopping and lockingof movable drive components:

1. Motor brake shall be located on the motor shaft. Brake shall safely stop escalator upon activation of normal stop control, local or remote EMERGENCY STOP buttons, activation of any safety device, or upon loss of power.

2. Operational Sequence: Motor Brake

a. Brake shall be mechanically applied (fail safe) and electrically released.

b. Brake shall be capable of stopping and holding a descending escalator with a peak average load on the exposed steps in the incline area of: 40 inch wide step 320 lbs. per step; 32" wide step 256 lbs. Per step; 24" wide step 192lbs. per step.

c. Minimum stopping distance for an up or down traveling escalator under

any load shall be no less than six (6) inches. Stopping distances shall be adjustable and set to the Authority's approved distance. Stops shall be gradual and not abrupt.

d. Deceleration shall be smooth, gradual, and with no sudden stop at a rate notto exceed three (3) feet per second squared.

e. Brake shall be reset by key switches.

f. Design of brake shall provide ease of access to brake equipment for inspection and maintenance.

g. The brake operating temperature shall not exceed one hundred ninety-five
(195) degrees Fahrenheit above ambient. A monitor shall be provided, and if brake lining becomes insufficient for safe usage, restart of escalator shallbe prevented.

3. Step Band Lock

a. Transit Escalators shall be provided with a step band lock to prevent movement of linkages, while the escalator is disconnected from its powersupply.

b. The step band lock must be capable of preventing the movement of the escalator step band while holding a peak average load on the exposed steps in the incline area of: 40 inch wide step 320 lbs. per step; 32 inch widestep 256 lbs. per step.

c. The step band lock shall be manually applied and mechanically engaged tothe step band.

d. Provide an electrical interlock that will prevent escalator drive motors fromstarting when the step band lock is engaged.

M. Truss: Hot-dipped galvanized.

1. Trusses shall be sufficient total length to provide minimum number of flat steps listed in the specification. The truss shall span the distance between the support points as indicated. The working points as indicated shall not be moved. The truss extensionmethod shall be used to size the truss.

2. Trusses shall be sufficient width to accommodate the width of the finished escalator.

3. Trusses shall be designed to rest on the top and bottom support beams, and intermediate supports provided for each location. Vertical transportation equipment supplier shall use Type 316 stainless steel shims for installation with a maximum height of 2 inches.

4. Trusses shall be of ample strength to maintain alignment of tracks and moving parts, and so designed that they shall safely retain steps and running gear, and in case of failure to track systems, retain step mechanism within guides and envelope of thetruss.

5. The truss shall be designed to support the dead weight of the escalator and a fullpassenger load.

6. The deflection of the loaded truss shall not exceed one one-thousandths (1/1000) of the free supporting distance of not less than fifty (50) feet under full load.

7. The truss shall not vibrate when the escalator is in use.

8. The slip joint slide bearings shall be fabricated using three thirty-seconds (3/32) of an inch thick glass-filled TFE bearing surface, one sliding on the other. The expansion joint filler shall be rubber cork composition or neoprene strip.

9. Escalator truss shall be manufactured in sufficient number of parts to allow delivery to well-way through existing structure without modification to the existing structure. Contractor shall submit drawings demonstrating this

clearance, but remains responsible for installing escalator.

10. A permanent identification shall be provided on the truss for the centerline at bothends of the escalator and in both transition curves.
11. After welding, the truss shall be hot dip galvanized with a coating in accordance withASTM A90.

N. Field Splices and Connections: Field splices shall be rigid, non-deforming, and shall maintain alignment. Holes for attaching balustrade securing brackets shall be punched. Field modifications and/or burning shall not be permitted.

O. Access Panels: Access panels for access to escalator parts for inspection and maintenance shall be provided.

P. Intermediate Supports: Shall be stub column and beam type bolted to well-way structure. Stub columns may be welded or bolted to the truss.

1. Support trusses using intermediate supports described above shall be provided. No other attachments to structure shall be permitted. Truss mounts, including bolts, angles, shims, bearing pads, and spring supports, as required to align and install escalators shall be provided.

Q. Step Chain Tensioning Device: The step chain tensioning device shall be of a design thatkeeps the step chains at the correct tension.

1. The tensioning device shall be located at the lower end of the escalator, within thetruss, with the adjusting screws easily accessible and adjustable.
2. The tensioning device shall consist of two (2) chain sprockets for step chain return,and shall be fitted on a common shaft by means of roller bearings.
3. The tensioning shaft shall run on roller or precision ground roller bearings and guides in such a way that exact parallelism of the chain sprockets in the tensioning direction is ensured. Sleeve bearing (steel on steel) shall not be allowed.
4. The tensioning shaft shall be tensioned by compression springs at both sides.
5. The return guidings for the step rollers shall form an integral unit with the tensioning device and shall be connected to the rest of the step guiding system by means ofsliding attachments.
6. A pointer and scale shall be provided to gauge step chain tensioning and wear.
7. Bearings, if used, shall be rated ABMA L10, 200,000 hours.

R. Lubrication System Requirements:

1. All parts, other than sealed items, requiring lubrication shall be designed for an automatic or remote lubricating system. The system shall operate only when escalator is running and the amount of lubrication shall be fully adjustable. A reservoir with a low oil signal to the controller, and a minimum capacity capable of providing the OEM's required lubricator for one month of operation based on the specific operating hours shall be provided. The oil reservoir shall be equipped with a dipstick or a sight glass. The case shall be provided with a convenient method ofdraining the oil.
2. System shall be positive acting, located in escalator pit.
3. Reservoir level indications shall be provided where lubricants are contained withinhousings, supply tanks, and larger filler cups.
4. Electric heaters installed and connected to panel shall be employed to maintainlubricant viscosity where required.
5. Lubricants of the various assemblies shall be as applicable to that assembly.
6. Contractor shall furnish and mount, near the lubricating system in the escalator pit, a framed laminated lubrication chart for each escalator. The chart shall show the location of each lubrication point, type of lubricant to be used, and the

frequency oflubrication.

7. Bearings: All bearings shall be rated for severe, heavy-duty service. Sealed bearings shall be used where accessibility or manual lubrication is impractical in escalator design. Bearings requiring manual lubrication shall be furnished with fittings to accommodate the use of a pressure gun for lubrication. Contractor shall furnish appropriate pressure gun. Self-lubricating bearings or material other than ball or roller type bearings may be used where practical.
8. Manual Lubrication: Location of manual lubrication points shall be easily accessible and available.

S. Indicators: Escalator users shall be informed by means of indicator lights of the pre-determined running direction of the escalator. Two (2) circular cut-outs, minimum diameter two and three-quarter (2-3/4) inches, shall be provided in the upper and lower right-hand balustrade newels, in the handrail return side paneling, each containing an inset red and green light. The green light shall be illuminated at the entrance for escalator running direction and the red lamp shall be illuminated at the exiting end.

T. Maintenance Drive Unit: Means shall be provided for reduced speed maintenance operation that shall be controlled by a manual handset. When operated, the escalator shall run in the direction selected, at a speed of not more than ten (10) feet per minute. This speed shall be maintained when steps are removed for servicing. The running shall be continuous so long as an "up" or "down" button on the handset is being pressed. The handset shall have a thirty
(30) foot retractile type cord with a plug connector. When plugged into receptacle, there shall be no means of operating or running the escalator except by the service handset. Receptacles shall be located in both the top and bottom pits.

U. Lock Cylinders: All locks and keys shall be as per Authority approval. Contractor shall verify with the Authority that the requirements for hardware have not been amended or superseded. Contractor shall provide the Authority with length, finish, and keying requirements of each cylinder required.

V. Demarcation Lights: Step demarcation lights shall be provided at both upper and lower landings. Each landing shall have a minimum of three (3) fixtures, green in color, and U.L.labeled "suitable for outdoor locations".

PART 3 - EXECUTION

3.01 INSTALLATION

A. Contractor shall install complete and operating escalator in accordance with manufacturer'sinstruction and approved shop drawings.

B. Contractor shall install special tools in the room storage cabinet as specified above.

3.02 FIELD TESTING

A. General: Contractor shall notify the Authority seven (7) days prior to each scheduled test. Contractor shall perform testing in the presence of Authority. Contractor shall notify the appropriate local authorities having jurisdiction a minimum of seven (7) days in advance of substantial completion tests. Contractor shall provide all instruments, materials, and laborrequired for tests specified herein.

B. Acceptance Testing Requirements:

1. Testing shall be performed after installation and before the approved date of startof interim maintenance service for each station.
2. Testing shall be performed in accordance with the latest ASME A17.1 Part 8Secttion, Acceptance Inspections and Tests
3. Submitt testing and inspection plan for CTA approval

    a. Plan shall include but is not limited to all tests and inspections as describedin the ASME 17.1 Part 8 Section.
    b. Describe the methods of inspection and testing.
    c. Submitt list of testing apparatus and equipment including calibration certificates
    d. Submitt the list of measuring equipment. I.e. feeler gauges, micrometersetc. with the appropriate calibration certificates
    e. Submitt drawings, schematics and written principles of operation of anynon-standard or custom build apparatus used to perform the tests.
    f. Submitt the list of all parameters that the escalator needs to conform to i.e.brake torque, and test pass and fail criteria.

4. Contractor shall perform the following tests on each escalator under full load:

    a. Each escalator shall have a full field load brake test performed on it. The braking distance versus load curve shall be plotted and presented to the Authority for approval. The test and load curve shall be plotted for both ninety (90) feet per minute and one hundred twenty (120) feet per minute, as required. The stopping distance in the down direction shall meet all requirements of ASME A17.1.
    b. Twenty-four (24) hour test: The escalator shall operate continuously for twenty-four (24) hours after the acceptance test with no faults. If any fault occurs that shuts the escalator down, the fault must be corrected and a newtwenty-four (24) hour test begun.
    c. A full load truss test shall be performed on the escalator.
    d. Re-inspection: If any equipment is found to be damaged or defective, or if the performance of the escalator does not conform to the requirements of the contract specifications or the safety code, no approval or acceptance of the escalators shall be issued until all defects have been corrected. When the repairs and adjustments have been completed and the discrepancies corrected, the Authority shall be notified and the escalator shall be re-inspected. Rejected escalators shall not be used until they have been re-inspected and approved.

5. Advise the Authority, the Authority's Escalator Maintenance Department and inspection department of governing agencies at least seven (7) business days in advance of dates and times tests are to be performed on elevators.
6. Manufacturer, with Authority's personnel present, shall demonstrate and test the use of the diagnostic software and hardware to be supplied to the Authority with theescalator installation.
7. The escalator systems shall be fully tested for all operating conditions.
8. The escalator software, including diagnostic software, shall be fully tested.

3.03 WARRANTY INSPECTIONS AND TESTS

A. In addition to any warranty provisions covered by these specifications, the Contractor shall perform periodic inspections and tests of the escalators and all associated systems and controls. All required inspections and tests shall be performed as outlined in

the latest versionof ASME A17.1 for escalators.

B. As part of the inspections, the Contractor shall, at no cost to the Authority, completely inspect and adjust machinery, and replace any parts showing undue wear, or tendencies toward malfunction, or any items indicating a need for modifications or design change. This shall befurnished as part of the guarantee obligation by the Contractor.

C. The Contractor shall prepare and submit to the Authority a written report indicating the results of all inspections and tests outlined in the latest version of ASME A17.1 for escalator.

D. The Contractor shall also submit to the Authority a written report stating the condition of the equipment, outlining any modifications to the maintenance specifications or operational procedures and respond in writing to questions raised by the Authority,

E. The inspections and tests shall be performed by the Contractor's service representative. All costs involved with each of these inspections and tests, such as travel, accommodations, international charges, fees, tools, equipment and part costs, shall be paid in full by the Contractor.

F. The Contractor shall notify the Authority in writing at least two (2) weeks prior of the intentto conduct the escalator warranty inspections and tests.

G. The inspections shall be conducted Monday to Friday during non-rush hour periods. The warranty inspections shall take place during the twelve (12) month period starting from the date of Substantial Completion by the Authority of each escalator installation. The Authority's representative will accompany the Contractor on the inspections.

3.04 CLOSEOUT SUBMITTALS

A. Provide all closeout submittals as specified in Division One section requirements.

B. Maintenance Manuals: Submit two (2) bound manuals for each station, for each escalator or group of escalators, with operating and maintenance instructions, parts listing, recommended parts inventory listing, purchase source listing for major and critical components, emergency instructions, and similar information. Include all diagnostic, maintenance and repair information available to manufacturer's and installer's maintenance personnel. Include a maintenance and lubrication schedule and directions. Include a copy of the escalator warranty, maintenance agreement, and maintenance schedule.

1. Wiring Schematics: Submit wiring schematics and interconnections for the escalator control and operating system. Also, submit warning system connection and controls.

C. Certificates and Permits: Provide the Authority with copies of all inspection/acceptance certificates and operating permits as required by governing authorities to allow normal, unrestricted use of escalators. One permanent frame for the certificate or operating permit shall be mounted near the escalator (or alternate location in the Customer Assistant Shelteras approved by the City of Chicago).

D. Diagnostic Tools: Deliver to the Authority's Escalator Maintenance Department the laptop computer, cables and other accessories with diagnostic software and other required software installed for the Authority's use; as specified herein and approved by the Authority.

E. At the end of the warranty period, contractor shall provide the latest versions and

updates to the PLC programming software, diagnostic software or any other software that is neededto connect and program escalator controllers

3.05 MAINTENANCE

A. Maintenance service for each escalator installation indicated in this Section shall be furnished for a period of 12 months, commencing on the date of Substantial Completion of the work at that station. Maintenance service shall be by the escalator manufacturer/installer forces and furnished as follows:

1. Inspection of the installation shall be performed weekly to include making necessary repairs, greasing, oiling and replacement of worn or defective parts.
2. All work shall be performed by competent, trained and experienced escalator maintenance personnel.
3. Scheduled maintenance work shall not be performed on escalators during "rush hours" Monday through Friday from 0500 hours to 0900 hours and from 1500 hours to 1900 hours, or periods of heavy traffic as determined by the Authority. Maintenance shall be performed Monday through Friday between the hours of 0900 hours to 1500 hours, and Monday through Thursday 2200 hours to 0430 hours thefollowing day.
4. Emergency repair service shall be available at all times and shall be performed as required or as directed by the Authority. Response time shall be two (2) hours or less for normal callback service and one (1) hour or less for emergency callback service. Exclude only repair or replacement due to misuse, abuse, accidents or neglect caused by persons other than Installer’s personnel.
5. A manufacturer's technician shall be provided for stand-by service on the first day the escalator is being operated for public use. Service shall be provided for twelve
(12) continuous hours.
6. During this maintenance service period, all parts found defective shall be replacedwithout cost to the Authority.
7. The Contractor shall keep on the premises an adequate supply of contacts, switch parts, coils, springs, holders, relays, lamps, fuses, bearings, and other necessaryreplacement parts.
8. Contractor shall keep on the premises: two complete steps, an adequate supply of comb plate sections, an adequate supply of wheels and bearings, a spare brake assembly for each size machine and all other parts necessary to ensure prompt replacement in the event of a shutdown of escalator.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The work of Section 14 30 00, Transit System Escalator shall not be measured for payment.

4.02 PAYMENT

A. No separate payment shall be made for the work covered in this section. Payment for the work of Section 14 30 00, Transit System Escalator shall be included in the contract lump sum price as shown in the Schedule of Prices for Architectural Work.

4.03 PAY ITEM ACCOUNT NUMBER

A. Architectural Work: 090000

END OF SECTION