CITY OF CHICAGO
DEPARTMENT OF PROCUREMENT SERVICES
ROOM 403, CITY HALL, 121 N. LASALLE STREET

JNCP Form Rev ____

FILE COPY

JUSTIFICATION FOR NON-COMPETITIVE PROCUREMENT

COMPLETE THIS SECTION IF NEW CONTRACT

For contract(s) in this request, answer applicable questions in each of the 4 major subject areas below in accordance with the Instructions for Preparation of Non-Competitive Procurement Form on the reverse side.

Request that negotiations be conducted only with IIT Dept of Civil and Arch Engineering for the product and/or services described herein.
(Name of Person or Firm)

This is a request for X (One-Time Contractor Requisition # 37173, copy attached) or _____ Term Agreement or _____ Delegate Agency (Check one). If Delegate Agency, this request is for "blanket approval" for all contracts within the _____ (Attach List)
(Program Name)

Pre-Assigned Specification No. _____
Pre-Assigned Contract No. _____

COMPLETE THIS SECTION IF AMENDMENT OR MODIFICATION TO CONTRACT

Describe in detail the change in terms of dollars, time period, scope of services, etc., its relationship to the original contract and the specific reasons for the change. Indicate both the original and the adjusted contract amount and/or expiration date with this change, as applicable. Attach copy of all supporting documents. Request approval for a contract amendment or modification to the following:

Contract #: _____
Specification # _____

Modification #: _____

Company or Agency Name: _____

Contract or Program Description: _____
(Attach List, if multiple)

Yilmaz Halac	312 745 4232		Chicago Fire Department	3/07/08
Originator Name	Telephone	Signature	Department	Date

Indicate **SEE ATTACHED** in each box below if additional space needed:

X PROCUREMENT HISTORY

This product has never been procured previously. The CFD has also never entered into a partnership with IIT previously.

S. S. R. B.
DATE 5/6/8
RECOMMEND 5-0
APPROVED
CONDITIONALLY APPROVED
RETURN TO DEPT.
DISAPPROVED

X ESTIMATED COST

Phase I: $35,624.55
Phase II: $17,500.00
Phase III: $60,625.00

See attachment for detail description

X SCHEDULE REQUIREMENTS

See attachment

☐ EXCLUSIVE OR UNIQUE CAPABILITY

The CFD has a unique opportunity to partner with the Illinois Institute of Technology Department of Civil and Architectural Engineering staff and students for Research and Design, Mapping/Planning, and Construction of a Mock-up Model, Documentation, and Construction of a Complete Model. The project will be take two semesters and be managed by Professor Megri and technician John Kriegshauser. The project will also build a partnership that will result in a low cost 3-D reduced-scaled model including streets, buildings, and detailed information used for training and case studies. The CFD has this unique opportunity in part because our headquarters are located on the IIT campus as well as exceptional expertise that IIT will bring to this project.

The Department of Civil, Architectural and Environmental Engineering (CAEE) has the background record and facilities to successfully embark on this research and complete it as proposed. Several of IIT faculty members have

demonstrated their expertise in fire-related research in projects and/or cooperating efforts with such organizations as NASA, the Chicago Fire Department, Underwriters Laboratories, WJE Engineers, Systems and Electronics, Inc. and IIT Research Institute. Among their most notable projects were one on a comprehensive study of degradation of structural systems due to fire and another on fire safety issues during construction projects. Among the facilities of Department of Civil, Architectural and Environmental Engineering (CAEE) include structural materials and model laboratories that will be available to this research. These laboratories offer a variety of modern testing machines and test platforms and are available for use in research studies dealing with architectural engineering. The Department also maintains two machine shops that are used for fabrication and instrumentation of structural models employed in experimental studies. The CAEE Department's MTS and Universal Testing machines are equipped with electronic data monitoring and can also be connected to any automated data acquisition system for test purposes.

☐ OTHER

APPROVED BY:

DEPARTMENT HEAD OR DESIGNEE

4/15/08
DATE

BOARD CHAIRPERSON

5/6/8
DATE

Proposed Model Budget

Note: The following materials are done on a sectional basis. In other words, the final large model is a multiple of 6 times the individual unit cost.
Phase 1 consists of creation of one section.
Phase 2 consists of software and custom hardware interface development.
Phase 3 consists of full execution of entire model. The majority of materials from phase 1 will be reusable.

Line Item Description	*Cost each*	*Quantity*	*Total Cost*	*Total Cost*	*Quantity*
			Cost on Sectional Basis Phase I	Total Model (Materials thru Phase III)	
Image Creation					
Sanyo Short Distance Projector	$2,500.00	1	$2,500.00	$12,500.00	5
Acrylic					
Base Acrylic 1" Cast Clear 4x8	$600.00	1	$600.00	$3,000.00	5
Street Acrylic 1/16" #7328 4x8	$90.00	1	$90.00	$450.00	5
Block Insert Acrylic 1/8" 7328 4x8	$110.00	1	$110.00	$550.00	5
Buildings Acrylic Cast Clear 1" 4x8	$600.00	1	$600.00	$3,000.00	5
Buildings Acrylic Cast Clear 2" 4x8	$2,000.00	1	$2,000.00	$10,000.00	5
Additional Materials					
Acrylic Solvent	$300.00	1	$300.00	$1,500.00	5
Milling Overhead	$500.00	1	$500.00	$2,500.00	5
Paint	$150.00	1	$150.00	$750.00	5
Applicational Tools	$200.00	1	$200.00	$1,000.00	5
Fly Cutter	$100.00	1	$100.00	$500.00	5
Machinery			$500.00	$2,000.00	
Base					
Power Adapter	$100.00	1	$100.00	$500.00	5
Metal Framework	$850.00	1	$850.00	$4,250.00	5
Hardware	$100.00	1	$100.00	$500.00	5

Labor			
Shop Director (John)		$3,000.00	$3,000.00
Student Teaching Assitants (2 @ 2 semesters)		$6,000.00	$8,000.00
A. Megri, summer salary		$7,617.00	$0.00
Fringe Benefits - 25% for academic months		$750.00	$750.00
Fringe Benefits - 7.65% for summer months	-	$582.70	$0.00
Total Direct Costs		$26,649.70	$54,750.00
Indirect Costs @ 50%	-	$8,974.85	$5,875.00
TOTAL REQUESTED	-	$35,624.55	$60,625.00

Computer Hardware Phase II

Custom Six-Screen Video interface	$10,000.00
would include 6-way video production, synchronous DACs, Ethernet interface, configuration ROM	
Students Teaching Assistants	$4,000.00
Equipments	$3,500.00
TOTAL REQUESTED	$17,500.00
Total cost for three phases:	CFD TOTAL COST: $113,749.55

ILLINOIS INSTITUTE OF TECHNOLOGY

Monday, April 14, 2008

From: Dr. A.C. Megri (Illinois Institute of technology)
To: Chicago Fire Department

Object: Budget for the project "The Creation of a Dynamic, Scaled Disaster Simulation Model of Downtown Chicago"

	Year 2008		Year 2009			
Equipment for Image Creation		Cost Share, IIT				
Equipment	3,973		3,973		17,375	25,321
Equipment	4,293		4,293		20,016	28,601
Equipment	600		600		1,200	2,400
Equipment			6,614			6,614
Labor						-
Technician (Kriegshauser John)	2,500		-		2,500	5,000
Student Teaching Assistants (2 @ 2 semesters)	5,000		4,100		7,500	16,600
A. Megri, summer salary	7,617	7,617	-	4,000	-	11,617
Other - Graduate student tuition	-	7,488				-
Fringe Benefits - 25% for academic months	625		-		625	1,250
Fringe Benefits - 7.65% for summer months	583		-	306	-	889
Total Direct Costs	25,190	15,105	19,579		49,216	93,985
Indirect Costs @ 50%	8,162	3,809	2,050		5,313	15,525
TOTAL REQUESTED	33,352	18,914	21,629	4,306	54,528	113,815
GRAND TOTAL	132,729					
CFD Budget	113,815					

www.iit.edu

Civil, Architectural & Environmental Engineering
3201 S. Dearborn
AM- Suite 228
Chicago, IL 60616

312.567.3540
312.567.3519 fax

www.iit.edu/~ce

Project Manager and Principal Investigator:

Dr. A.C. Megri

CITY OF CHICAGO
PURCHASE REQUISITION

Copy (Department)

DELIVER TO:	REQUISITION: 37173
336 FINANCE 10 W. 35TH STREET 14TH FLOOR CHICAGO, IL 60616	PAGE: 1 DEPARTMENT: 59 - FIRE DEPARTMENT PREPARER: Jean L Roberts NEEDED: APPROVED: 3/11/2008

REQUISITION DESCRIPTION

SMALL ORDER STANDARD NON-COMPETITIVE PARTNERSHIP WITH IIT TO BUILD A 3-D SCALED MODEL OF DOWNTOWN CHGO FOR TRAINING
SPECIFICATION NUMBER: 64015

COMMODITY INFORMATION

LINE	ITEM	QUANTITY	UOM	UNIT COST	TOTAL COST
1	90661	66,053.00	USD	0.00	**0.00**

DESIGN AND CONSTRUCTION OF A 3-D REDUCED SCALED TRAINING MODEL OF DOWNTOWN CHGO

SUGGESTED VENDOR: **REQUESTED BY:** Jean L Roberts

DIST	BFY	FUND	COST CTR	APPR	ACCNT	ACTV	PROJECT	RPT CAT	GENRL	FUTR	Dist. Amt.
1	007	0142	0594128	0140	220140	0000	00000000	000000	00000	0000	0.00

LINE TOTAL: **0.00**

REQUISITION TOTAL: **0.00**

Where a commodity is for a particular or unique use other than standard quality, grades, color, size or other characteristics, give details of how it will be and for what purpose
Requisitions prepared incorrectly will be returned to the using department

37173

PROPOSAL

The Creation of a Dynamic, Scaled Disaster Simulation Model of Downtown Chicago

Ahmed Chérif MEGRI, Ph.D.
Director of Architectural Engineering Program

Department of Civil and Architectural Engineering
Illinois Institute of Technology
3201 S. Dearborn, Chicago, IL 60616-3793, USA
Office: 312 567 5713
Fax: 312 567 3519
megri@iit.edu

&
Professor John Kriegshauser

Friday, November 16, 2007

Table of Contents

Abstract

The objective of this project is to design and construct a 3-D, reduced scale model for a portion of downtown Chicago. The model will be used to test and simulate the likely performance of fire defense strategies in case of fire or other catastrophes related to public health.

This model will include streets, buildings, and detailed information that help the Chicago Fire Department in intervention, considering various scenarios and case studies.

The model will be built in phases, with the overall design calling for a sophisticated, computer-driven LED illumination scheme built within the model base. The model thus will be able to display animated scenarios of virtually any depth and focus, by means of time-varying color and brightness.

The final model will be fully adaptable and demountable, and will be designed to transport easily to various facilities. The usefulness of the model thus will extend to many areas of the Fire Department and city, as an educational tool within the department and for community outreach.

CAD Computer-generated images and laser-cutting methods will be primary among techniques used to design the model, but hand assembly will also be a part of the project.

Possible additional uses for the model will be wind tunnel measurement of pressure distribution, as well as the study of urban microclimates impact on building energy demand.

This project will include:

1) Identification of the scale, materials, technologies, and strategies of construction.
2) Physical mapping and computer modeling of the downtown built environment.
3) Design of the physical model and computer/electronic components.
4) Construction of a reduced-area mock-up for final approval by the City of Chicago.

Project Phases

The model project is complex, involving a good degree of materials consumption and labor, and will requite many disciplines working together to produce a consistent and seamless result. With this in mind, careful planning and consistent progress are paramount to ensure the successful completion of the project.

The following phases are suggested to help ensure the best results of this very exciting project:

Phase I: Research and Design

- Step 1. The team is to assemble talented team members in various disciplines (discussed at the end of this document). The team members will begin concentration on the following issues of the project:
    - Acquaintance with objectives and methodologies.
    - Agreement on scale(s) of streets and city blocks within the model.
    - Definition of overall construction practice (including rough decisions about materials, technologies, and so forth. Many suggestions on these topics follow in this document).

- Step II: Research will commence by various teams of the project.
    - Electrical engineers will begin investigation of technologies required for the illumination.
    - Computer Science students will discuss the computer technologies and I/O interface(s).
    - Architects, civil and Architectural engineering engineers will begin to establish guidelines for physical construction of the individual structures that comprise the main model.
    - Other team members will research within their respective areas.

- Step III: Research will be compiled and final decisions about the methods and components will be finalized. Design of the model in schematic form will be completed in CAD, so that each part of the project team can verify that physical needs within the model are met in an ideal fashion.

Phase II: Mapping / Planning

- During this phase, the individual disciplines will break into groups, to plan and develop their respective areas.
    - Architects, civil and architectural engineering engineers will begin to map the city blocks. Standard methodologies for

drafting standards, construction techniques, and level of detail will be established. CAD drawings for all downtown buildings within the scope of the trial model will be created during this time.
    - Other disciplines (engineers, computer scientists, and so forth) will begin to design their respective interfaces.
    - At the end of this phase, a mock-up proposal will be created, and prior to construction of the mock-up, meetings will be help between various parties to approve the plans.

Phase III: Construction of a Mock-Up Model

- All team members will coordinate to produce the trial mock-up model. Depending on the size of the team and project budget, and also primarily the desires of the client, the mock-up model may consist of solely the execution of the street system, city blocks, and buildings. Alternatively, the mock-up may demonstrate the full capabilities of the model, with a computer interface and software being developed at this time as well.

- The Chicago Fire Department will investigate the project at this time, and will give go-ahead to create the full model at the Department's discretion.

Phase IV: Documentation

- The documentation of the project is very important, for future maintenance, adaptation of the model over time, and construction of future phases. For more information on specifics needing to be addressed, please see the *Documentation* section of this document, following.

- This phase concludes the likely scope of the initial project part.

Phase V: Construction of a Complete Model

- The complete model will be constructed at this time, taking into consideration any input given by the client after review of the mock-up, and also considering any aspects of the initial design that need improvement. As before, the full model being built may consist solely of streets, blocks, and buildings (with the intention of creating the computerized parts of the model at a later date), or may be a full build-out of the project as designed.

Phase VI: Completion of Complete Model (not included in the actual budget)

- This phase would include the construction and integration of the electronic components of the model, in the event that the full model is not constructed in Phase IV.

Model Overview

- **Objectives**

  The Downtown Chicago model will be used for educational purposes by the Chicago Fire Department, both in use as a means to familiarize employees with the one of the world's most complex urban environments, but also as a dynamic visual aid that will be used to illustrate and simulate computer-generated models of emergencies.

  The Chicago Fire Department is the Nation's leading fire department in terms of disaster preparedness and event forecasting. This scale model of downtown Chicago will serve as an invaluable tool in a growing collection of advanced technology employed by the department, and will be a very understandable means to understand complex systems. The Department may also use the model as a means of community outreach, as it can be transported to various meetings with community groups.

  The model also has potential other uses that go beyond the scope of this project, including wind tunnel testing, and environmental modeling.

- **Scope**

  The Chicago Fire Department model will be built in two distinct phases:

  1. Full-scale Mock-Up

  - A complete execution of the model (as discussed above in *Phases*), constructed to include the area bounded by Madison, Adams, LaSalle, and Dearborn Streets.

  2. Complete Model

  - Boundaries to include the full area between Division and 14th Streets to the north and south, and from Navy Pier to Canal Street on the west.

  The representation in the model shall include all city blocks, streets, and all included structures greater than 6 or 7 stories (55 or 65 feet in height).

  It is foreseen that the model will become a primary tool for the Chicago Fire Department, and one of the goals of the project is to produce a construction that can be of befit to the department for many years to come. Hence, consideration shall be given at all times to the longevity of the model and means to maintain its working condition.

- **Physical Features**

  - Overview

The basic concept for the model is a modular, acrylic structure sitting atop a rigid, opaque base. The components of the model will be base, streets, city blocks, and buildings. The highlight of the model will be an array of multi-

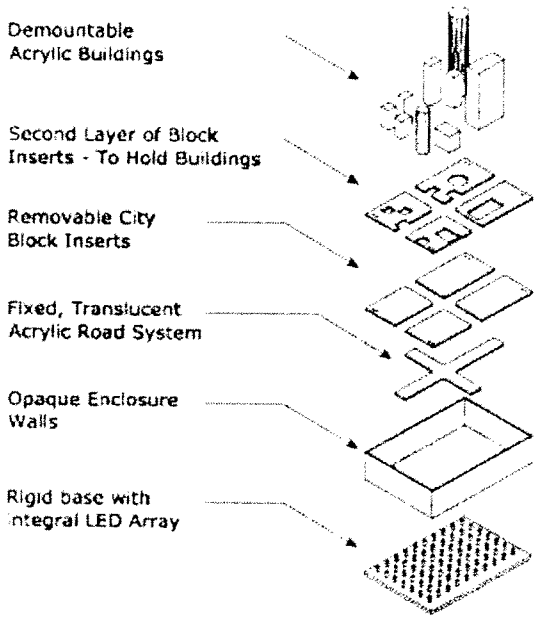

Figure 1: Schematic View of the Model Assembly

colored Light-Emitting Diode (LED) lights built into the base structure, which will illuminate the various acrylic features of the model based on input from a computer interface.

These LEDs and computer interface will present a powerful tool that can be used for a variety of features. First, they can dynamically demonstrate computerized simulations and predictions of disaster propagation. Second, they will be a versatile tool that can be used to educate members of the department on disaster-readiness strategies. Finally, individual buildings can be quickly identified by color in various categories – for example, high risk of terrorist threat, lack of fire protection systems, financial and government institutions, daily population, and so forth. These various combinations will be limitless and current at all times, due to the programmable computer interface of the model. As more sophisticated computer models or new concerns arise, the model will be able to adapt to meet these demands.

The model must be constructed with the understanding that it is to be a working model for the purposes of the Fire Department. With this in mind,

portability, durability, and ease of use must be given substantial and adequate consideration when constructing the model. The Fire Department operates out of many facilities, and it is conceivable that the model will be transported to various locations frequently over the course of its useful life.

Built to a scale that will be defined by the research team in consultation with Fire Department, the model will provide an adequate level of detail, and ample room for visibility of occurrences happening at street level. Also, this scale will allow sufficient space within the model such that wiring and electronic devices can be implemented without extreme difficulty in placement.

- **Base**

The base of the model is to be constructed of durable wood or aluminum. The base should be entirely opaque at the sides and bottom, so that light from within does not suffer interference or leakage, which would undermine the presentation quality of the model.

Handles are to be incorporated in each modular part of the model base, so that transportation is facilitated. The project team will need to determine the appropriate sizes for the base(s) of the model and ideal orientation(s).

- **Street System**

The street system will form the primary organizing and spatial system of the model. As downtown Chicago is a relatively stable and highly built environment, it is not foreseen that any substantial changes to the roadway system will occur during the lifetime of the model. Roads and alleys thus will be affixed permanently, and will give order and rigidity to the other elements.

Care must be given to the construction of the roadway system. A system of dowels or chairs will need to be devised to raise the roadways off the bottom of the model (flush with the top of the base), to accommodate the LED system within the base. At the same time, these elements should not be intrusive to the appearance of the streets when seen from above.

The streets should be constructed of sandblasted acrylic, ¼" in thickness or greater. The street names should be clearly identified on each street, either by etching or by permanently affixed lettering of another sort.

- **Special Considerations**

  While topographically, Downtown Chicago is nearly flat, the area nevertheless has a complex downtown road system that includes 2- and 3-story roadways, as well as numerous operable bridges and rail

viaducts. As the multi-level road system is of critical importance to the field of disaster readiness, special consideration must be given to this aspect of the model design.

One option is to physically represent the multi-level streets as multiple levels within the model. However, this strategy is not recommended, as certain streets are nearly completely enclosed by structures, and the upward-shining LED system will be impossible to understand through two-level roads. Also, not having a flat model surface will make transportation difficult.

Recommended, thus, is a special notation and visual organization that clearly indicates the level of roadway in question, but with all road levels physically existing on the same plane. This will require extra care in ensuring that LED lights illuminate solely the roadway in question, without bleed-over and confusion. Similarly, legibility must be given special consideration in such a crowded environment.

Also, as the streets are the primary place where information and activity are to be taking place in model simulations, it is highly recommended that separate scales be used for streets and city blocks, allowing streets to be over-scaled in relation to the blocks themselves.

- **Geographic Features**

Geographic features, such as the Chicago River, Lake Michigan, and Parklands are to be included in the project as deemed necessary by the project team. If roadways are to be shown on a flat plane (recommended – see *Street System, Special Considerations*, above), then the geographic features shall be created of translucent acrylic of similar thickness to that of the road system, but preferably of a slightly different color. Translucency is important to allow LED arrays below the geographic features to shine through; a color close to white is important so that color shining through is not significantly changed.

- **Block Inserts**

The city blocks within the model scope are to be built to fit within the street and alley system affixed to the model base. The blocks will be constructed of double-thick, clear acrylic. The bottom layer will be uncut, providing a stable base. The top layer will be identical, but will have cut-outs to accept the model buildings that are to be placed on the model. These cut-outs will stabilize the buildings and will prevent buildings from shifting when the model is in use.

Each block is to be numbered, according to the city numbering system, and each building on each block is to be assigned a sub-number. The block

number and building sub-number are to be laser-etched in each space accommodating a specific model building.

Chairs or other support for the blocks will need to be devised. These supports can either be affixed permanently to the base of the model, or can be attached physically to the block inserts. The prior is advised.

Block inserts will need to be fitted with small holes or other means to extract them from the model bases. One way to achieve this functionality is to cut small circular penetrations in the acrylic (roughly 0.020"), which can accommodate a small round extraction tool.

- **Individual Buildings**

Individual buildings will be constructed of acrylic. The acrylic is to be laser-cut, and joined together at edges with typical means. Care should be taken to not mar the surface of the acrylic with adhesives, as the model buildings will remain unpainted.

Each model building shall be laser-etched discretely with its assigned block and number, to assist in reassembly of the model after transport. The buildings shall be designed to fit snugly into the openings provided in each city block. Whenever possible, façade detail shall be added to each building (at a level of detail determined by the project team), to aid in recognition and identification.

- **Building (Address) Identification**

A system of clearly expressing building addresses must be devised by the project team. These can be incorporated by etching into in the sidewalk areas of individual model blocks. In this manner, only the primary addresses of shown structures could be listed. Another method would be to include in a more explicit (and possibly more visible) fashion a regular progression of addresses within the streets themselves. These numbers then would be permanently a part of the model; they could possibly then be produced with a technique that renders them more visible during model use.

- **Subterranean Structures and Air Rights**

The downtown area includes as vast network of subterranean systems. These include the CTA subway system, an abandoned coal freight rail network, the pedestrian Pedway system, and myriad utility lines of various types. In addition, many structures – both buildings and roadways – are built on air-rights over active freight and passenger rail service. These hidden structures can naturally be of interest to the Fire Department in modeling.

City of Chicago
Richard M. Daley, Mayor

Chicago Fire Department

Raymond Orozco
Commissioner

14th Floor
10 West 35th Street
Chicago, Illinois 60616-3799
(312) 745-3705
(312) 745-3880 (FAX)
(312) 747-5047 (TTY)

http://www.cityofchicago.org/fire

FINANCE / PAYROLL

08 APR 23 PM 1:32

To: Montel M Gayles
Chief Procurement Officer
Department of Procurement Services
City Hall Room 403

From: Jean Roberts
Director of Finance
Chicago Fire Department

Re: Specification: 64015
Vendor: Illinois Institute of Technology
Requisition: 37173
Sole Source request – 3D Scaled Model of Downtown

Date: March 10, 2008

The Chicago Fire Department is requesting that requisition 37173 be processed as a Sole Source Professional Services Contract. The project will be a joint partnership between the CFD and the Illinois Institute of Technology's Department of Civil and Architectural Engineering to build a 3-D model for use as a training tool.

Enclosed with this request are the following attachments:

1) DPS Project Checklist.
2) Justification for Non-Competitive Procurement
3) FMPS requisition
4) Vendor quote

Your assistance in this matter is appreciated. If you have any questions or require any further information, please contact me at (312) 745-3681.

Revised

CITY OF CHICAGO
PURCHASE REQUISITION

Copy (Department)

DELIVER TO:	REQUISITION: 37173
336 FINANCE 10 W. 35TH STREET 14TH FLOOR CHICAGO, IL 60616	PAGE: 1 DEPARTMENT: 59 - FIRE DEPARTMENT PREPARER: Jean L Roberts NEEDED: APPROVED: 5/1/2008

REQUISITION DESCRIPTION

DESIGN AND CONSTRUCT A 3D MODEL OF DOWNTOWN CHICAGO
SPECIFICATION NUMBER: 64015

COMMODITY INFORMATION

LINE	ITEM	QUANTITY	UOM	UNIT COST	TOTAL COST
1	90661	113,749.55	USD	0.00	**0.00**

DESIGN AND CONSTRUCTION OF A 3-D REDUCED SCALED TRAINING MODEL OF DOWNTOWN CHGO

SUGGESTED VENDOR: **REQUESTED BY:** Jean L Roberts

DIST	BFY	FUND	COST CTR	APPR	ACCNT	ACTV	PROJECT	RPT CAT	GENRL	FUTR	Dist. Amt.
1	007	0142	0594128	0140	220140	0000	00000000	000000	00000	0000	0.00

LINE TOTAL: **0.00**

REQUISITION TOTAL: **0.00**

Where a commodity is for a particular or unique use other than standard quality, grades, color, size or other characteristics, give details of how it will be and for what purpose
Requisitions prepared incorrectly will be returned to the using department