Seismic conservation of historical and cultural treasures of a world city: sizing the need and formulating an action plan for the museums of Istanbul, Turkey

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The exposure of the Marmara and Aegean regions of Turkey to a major and devastating earthquake in the near future is a scientific fact. An earthquake will put the rich and irreplaceable cultural heritage of world civilizations which are exhibited and stored in Istanbul Museums, at great peril. The tourism sector in the Marmara Region is largely dependent on the integral part of the world cultural heritage and cultural tourism. Protecting the tourism sector of the economy involves disaster preparedness education, and business resumption planning. Most importantly it involves seismic mitigation of the collections themselves. Disaster preparedness is needed for the protection of museum visitors, staff and the museum collections.

OBJECTIVES

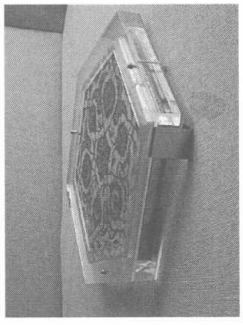
This project aimed to make the knowledge about disaster preparedness focusing on non-structural mitigation more widely available in order to save lives and prevent injuries of museum staff and visitors; to preserve our cultural heritage for future generations; to protect business continuity in the tourism sector and to assist this sector in prioritizing and developing practical non-structural seismic mitigation action plans.

MILESTONES

The project accomplished the following:

1. Compiled examples of hazards and best practices
2. Prepared educational electronic slide presentation explaining non-structural hazards and mitigation methods for museum collections both on display and in storage. Two hundred and fourteen slides covered the following topics:
    - What Happens During An Earthquake?
    - What Is Non-Structural Mitigation?
    - Principles for Non-Structural Mitigation
    - How Are Objects Damaged?
    - Reducing Risk in Exhibits
    - Reducing Risk in Storage
    - Reducing Risk in Public Facilities, Offices and Libraries in Museums
    - Where Can We Start?
    - What Is Being Done in Istanbul Museums? (Green et al., 2003; Marshall; Podany, 2001a; Podany, 2001b; Podany, 2001c)

Topkapi Palace Museum, Photograph: T Mimarlik Dekorasyon. Taahhüt San. Ve Tic. Ltd.



Sadberk Hanim Museum, Photograph: B.U., K.O.E.R.I., Disaster Preparedness Education Program

3. Held a seminar for museum directors and staff with sixty-one participants from 31 museums and organizations. The slideshow was shared by the project team (see note previous page) at the seminar.
4. Developed Non-structural Hazard Survey Forms
    - Museum Information Form to collect information about management and budget, museum building, museum collection, disaster experience and preparedness of each museum.
    - Rapid Room Survey Form to quantify non-structural mitigation needs.
    - Rapid Room Survey Summary Form
    - Object Risk Identification Form to tackle problem-solving and decision making for each object. (Marshall; Podany, 2001a; Podany, 2001b; Podany, 2001c).
5. Museum visits: Exhibit areas in fourteen museums were visited and surveyed, and storage areas in six museums were surveyed among 50 museums in Istanbul to test survey forms and to quickly identify and quantify risks and develop potential approach. These museums were selected according to the following criteria:

- The institutions they work under: Museums' management, budget, staff and technical possibilities differ according to the institutions they work under.
- Collection content: Museums that have different type of collection content, have different needs in the field of non-structural mitigation.
- Museum type: A variety of types of museums such as palace museums, monumental museums, house-museums have different exhibition and storage conditions.
- Number of visitors. The most visited museums within their directorate will be those whose contribution to the local economy seems significant (Atagok, 1999)

6. Data analyzed and report prepared A full report was prepared for the Ministry of Tourism and Culture, and disaster mitigation advocates. Recommendations include rapid implementation of easy non-structural mitigation measures and a series of short and long-term steps to develop more expertise and research-based solutions in this area.

PROJECT RESULTS

Identifying non-structural risk in museums

Risks

Non-structural risks were evaluated from the perspective of the potential risks to visitors, staff, and the collections themselves. The most common risks at the museums are as follows

Risk of broken glass

- Window and door glass
- Showcase glass
- Mirror glass
- Balustrade and elevator glass

Risk of free-standing objects and riggings on the floor

Free-standing objects and riggings on the floor, which are taller than they are wide (or deep), are at risk of overturning Shorter or wider objects may slide Large objects that have been fastened only from their bottom or objects fastened on a free-standing unsecured base or rigging (esp bust fastened on pedestal) are also at risk of overturning These are

- Showcases
- Free-standing objects on the floor or standing on unsecured base
- Humidity controllers and air conditions
- Fire extinguishers
- Footed storyboards
- Furniture (for instance; bookcases, buffets or tables at palace museums etc.)
- Computers for visitors' usage
- Barriers
- Folding screens

Risks within showcases

In addition to fastening the showcases themselves, the objects within the showcases need to be stabilized and secondary dangers also need to be mitigated. These risks are.

- Objects falling by overturning, sliding, slipping out from their places or hitting of hanging and swinging objects,
- Objects hitting into each other because of crowding
- Pedestals, mannequins or mounts used to exhibit/fasten that are not fixed to the showcase base may fall or slide,
- Glass or panels in the showcase's ceiling under the lighting fixture may break,
- Fluorescent light bulbs may fail,
- Glass shelves within the showcase may break

Risks of hanging objects

Objects hanging on walls or from a case or ceiling can swing and hit other objects or slip out of their places and fall This risk takes three forms

- Unsecured objects hung on the wall (eg. with only one nail)
- Objects hung from ceiling with open hooks,
- Objects which are secure, but can hit other objects if they swing.

Risks from the ceiling of the building

Piece or objects, which can fall from the ceiling of the building by breaking off, can damage uncovered objects below. These are as follows:

- Plaster relief pieces on ceiling breaking and falling off (esp., plaster relieves at palace museums),
- Pipes falling from above or pipes cracking and releasing water,

- Lighting fixtures falling, sliding or hitting objects,
- Suspended ceiling pieces falling and hitting object,
- Roof window breakage. (Marshall; Podany, 2001a; Podany, 2001b; Podany, 2001c).

Forms

The project team developed three survey forms that are aimed to help museum staff in quantifying non-structural risks in the museums.

Method

The method used in the forms and during the on-site surveys at the museums begins with categorizing the measures into 3 categories; easy, medium and hard to apply. These categories also correspond roughly to cost of application. The reason for this is our belief in the general principle that anything that can be done easily and inexpensively should be tackled as a high priority as there are few barriers to safety, beyond a decision to act.

Easy methods are considered to be low-cost and can be easily-applied These methods include

- Using museum wax, monofilament and steel wire to fasten objects to horizontal or vertical surfaces, to reduce risk of tipping and falling
- Using metal hooks on objects that are hung on walls, or from ceilings to reduce risk of falling
- Placing sand bags inside the objects in order to reduce the risk of toppling
- Placing rubberized shelf mats under small objects to reduce risk of sliding
- Using mechanical latches to prevent cupboard doors from opening
- Placing restraints on open shelving to reduce risk of objects falling.

Medium methods are considered to be ones that cost somewhat more, are more time consuming and require more labor power Some methods may also be in this category because they require special permission to accomplish. These include:

- Fastening objects to surfaces using specially-produced mounts
- Using padding between objects
- Preserving objects in storage in boxes or containers
- Covering glass surfaces with security film
- Bolting or screwing objects to surfaces in order to reduce risk of toppling

Difficult methods are considered to be those that are expensive, require special production or may be very hard to find an appropriate solution due to the difficulty in fastening to a wall of a historical building or the aesthetic concerns, etc. These methods include:

- Designing & producing or buying a new shelving system
- Producing a base isolation for the particular object
- Producing special solutions for objects that have special conditions

The project team spent time with museum professionals to verify the logic of this categorization system. While there is general consensus, the decisions made during a rapid assessment are necessarily subjective. The project team found that it was possible to spend time discussing the dilemmas posed by any one object, and many considerations beyond time and money might also influence decisions about a particular method, or application of a method Some of these are: aesthetics, adjacent objects, available skills and materials, medium and long-term plans for the exhibit, the frequency of exhibit change, the durability of method, and so forth might all

During the research on non-structural risk identification in museums, the project team's purpose was to conduct a rapid survey. Rather than to make final decisions about mitigation methods, the objective was to gain an overview of needs. It is recommended therefore, that each museum undertake this process using it's own staff both for rapid survey and prioritization as well as for making individual decisions about the stabilization method to be used with any particular object or group of objects

How to use the forms

Step 1 – Form 1A:
RAPID ROOM SURVEY FORM

The aim in using Form 1A is to quickly and easily separate the objects that need to be mitigated into easy, medium or difficult methods The reason for this is to focus on the easy methods that can be realized quickly and help taking action.

By looking at the room as a whole, and considering the range of objects, materials and display methods, a pre-classification and sifting can be done by referencing the Rapid Room Survey form. Making this pre-classification does not require looking at the objects separately. Instead, museum specialists can

easily decide the category of the mitigation method for groups of objects in general, and then quickly count the objects in each group

One could generally determine the size of the object or material for the mitigation method by using the columns "small, medium and large" on same form if desired. The logic of this is that larger objects require more material to create a fastner, and that this separation would further help in estimating the cost of mitigation.

Step 2 – Form 1B.
RAPID ROOM SURVEY SUMMARY FORM

After surveying and collecting information using Form 1A in every room, Form 1B can be used to summarize this data, consider the results museum-wide and determine the approximate cost for the mitigation methods. This is a tool for museum administrators to use in planning and budgeting.

Step 3 – Form 1C:
OBJECT RISK IDENTIFICATION FORM

This form can be used after Form 1A and/or Form 1B, to help in making decisions about how to secure objects that can not be secured by an easy method. When medium or difficult methods are required it becomes important to examine each object individually Form 1C can be used in two different ways.

- Only the upper part including the sections named "Photograph" and "Notes on the mitigation method suggested" can be used It is important to write the inventory number, the name and the place of the object in order to be able to identify particular objects among many forms filled. If a museum specialist is able to decide what kind of method is needed to secure the object and what the priority level is at first glance, then it would be enough to fill the upper part only However, the photograph of the object with its surrounding and a sketch/notes on what kind of method is thought to be appropriate for that object, would help a team in considering the options and deciding on details It would also aid mount-makers in reviewing and planning the work to be done.
- Using the whole form If museum specialists or teams have trouble in assessing the risk to the object, or how to approach mitigation, the scoring system at the lower part of the form can be helpful both in deciding the priority level of the object and in specifying its vulnerabilities. The questions investigate subjects like physical condition of the object, the possibility of toppling, and secondary threats. In the scoring part at the end, the checkmarks in each column are counted, and the priority level set based on the highest score. When two scores are very close to each other, the higher risk level should be accepted.

In the end, these decisions will be subjective It may change according to the people working on the subject, and may vary from situation to situation.There may be places where an easy method can turn into "hard to apply" because of a variety of challenges. The scoring is offered only to help professionals become conscious of the variables and considerations, and as consistent as possible in decision making

It is not easy to create a standard under these circumstances Comments on the use of the forms vary from museum to museum Museums that are big in size and have many objects mention that the forms may be useful, while on the other hand, smaller museums mention that it may not be necessary to use such forms as decision-making and action may more easily be controlled.

FORM 1A - NON-STRUCTURAL MITIGATION IN MUSEUMS
RAPID ROOM SURVEY FORM

Name / Number of the Exhibition Gallery - Storage:

Type of Object / Other*	# Objects	No Risk	Difficulty of Mitigation Methods								
			Easy Methods			Medium Methods			Difficult Methods		
			Small	Med.	Big	Small	Med.	Big	Small	Med.	Big
TOTAL											

* **Other:** (fire extinguisher, humidity controller, lighting, suspended ceiling, pipes and ducts, window glass, furniture, signs and storyboards, showcases and cabinets and etc.) may also cause a threat during an earthquake.

Classification of Fastening Methods at the Exhibition Galleries:
Easy: Museum wax, sand bag, monofilament, steel wire, rubberized shelf mat, metal hook
Medium: Plexi and metal mounts, security film to the window, anchoring
Difficult: Base isolation

Classification of Fastening Methods at the Storage Areas:
Easy: Mechanical latches, restraint in open shelves, rubberized shelf mat, metal hooks
Medium: Padding between objects, boxing, anchoring
Difficult: Base isolation, fastening big objects, new shelving system