

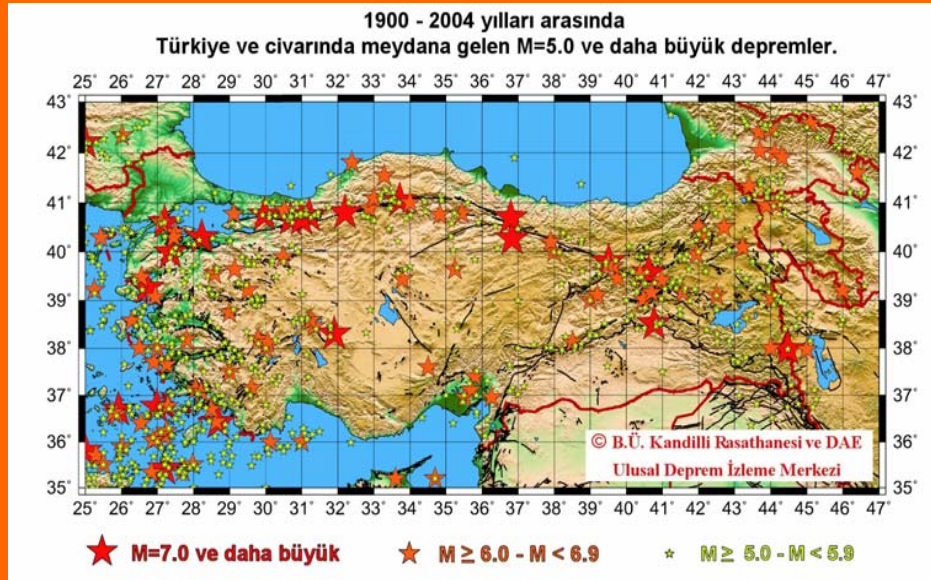
MUSEUM SOS: Strategies for Emergency Response and Salvage  
American Museum of Natural History, New York, U.S.A.  
May 11-16, 2004

# **NON-STRUCTURAL MITIGATION AGAINST EARTHQUAKE: A CASE STUDY OF ISTANBUL MUSEUMS**

Nevra Ertürk, Research Assistant  
Yildiz Technical University, Faculty of Art and Design (FAD)  
Museum Studies Graduate Program, Art Management Program  
nerturk@yildiz.edu.tr

Bilgen Sungay, Architect, Project Development Team  
Bogazici University (B.U.), Kandilli Observatory and Earthquake Research Institute (KOERI),  
Disaster Preparedness Education Program  
bsungay@boun.edu.tr

# INTRODUCTION



Resource: <http://www.koeri.boun.edu.tr/sismo.marmara.jpg>

Earthquakes in Turkey and vicinity between 1900-2004 with  $M > 5$

- 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 exhibited and stored in Istanbul Museums at great peril.

# INFORMATION ABOUT ISTANBUL MUSEUMS

- There are approximately 200 public museums in Turkey, administered by the General Directorate of Cultural Assets and Museums, Republic of Turkey, Ministry of Culture and Tourism. Additionally, 98 museums in Turkey are under various other public and private institutions, agencies and foundations with oversight by Republic of Turkey, Ministry of Culture and Tourism.
- Istanbul, the most populous city in Turkey, has approximately 50 public and private museums which daily host thousands of visitors.
- The content of Istanbul Museums' collections are classified as follows: history, ethnography, art, textile, archaeology, industry and technology, military, aviation, calligraphy and decorative arts (T.C. Kultur Bakanligi, Turkiye Muzeleri, Ankara: T.C. Kultur Bakanligi Anitlar ve Muzeler Genel Mudurlugu, 2002).

# DESCRIPTION OF THE PROJECT

**Project Title:** 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.

**Project Team:** Nevra Ertürk, Bilgen Sungay and Dr. Marla Petal (project mentor).

The project was implemented in cooperation with Bogazici University, Kandilli Observatory and Earthquake Research Institute, Disaster Preparedness Education Program and Yildiz Technical University, Faculty of Art and Design, Museum Studies Graduate Program.

**Project Period:** July-December, 2003.

**Research support** was provided by the World Bank's ProVention Consortium "Applied Research Grants for Disaster Risk Reduction" Program.

# PROJECT OBJECTIVES

- To research the needs, priorities, and feasibility of taking non-structural mitigation measures to protect the cultural heritage exhibited and stored in Istanbul Museums.
- To make the knowledge about disaster preparedness focusing on non-structural mitigation more widely available in order to
  - protect lives and prevent injuries of museum visitors and staff
  - preserve the cultural heritage for future generations
  - protect business continuity in the tourism sector

# PROJECT METHODOLOGY

**Step 1:** Compilation of the examples of earthquake damage and best practices in non-structural mitigation field from national and international area.

**Step 2:** Preparation of an educational slide presentation entitled "Earthquake Preparedness in Museums: A Non-Structural Look" explaining non-structural hazards and mitigation methods for museum collections both on display and in storage.



# PROJECT METHODOLOGY

**Step 3:** Organization of an educational seminar entitled “Non-Structural Mitigation for Earthquake Protection in Museums” for museum directors and staff. 61 people attended to the seminar from 31 museums and organizations.

**Step 4:** Development of “Non-Structural Hazard Survey Forms” to help in identifying, rapidly quantifying and prioritizing the risks in the exhibition galleries and storage areas.

The project team developed 3 survey forms. These are as follows:

Rapid Room Survey Form

Rapid Room Survey Summary Form

Object Risk Identification Form







# PROJECT METHODOLOGY

**Object Risk Identification Form** can be used 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.

**APPENDIX 4**  
**FORM 1C - OBJECT RISK IDENTIFICATION FORM**

INVENTORY NO: \_\_\_\_\_ OBJECT/THEMATICAL REGION NAME: \_\_\_\_\_

OBJECT/TOUCHING LOCATION / NO AT THE MUSEUM: \_\_\_\_\_

EXHIBITION / STORAGE METHOD: \_\_\_\_\_

**SUGGESTED FASTENING METHODS** (more than one method can be used)

Specially produced mount     Knotting     Security Film     Case isolation

Padding     Slings     New clamping system     Other \_\_\_\_\_

**PRIORITY IN FASTENING:**     Low     Medium     High

**PHOTOGRAPH** \_\_\_\_\_

**NOTES ON THE SUGGESTED FASTENING METHOD** \_\_\_\_\_

	LOW PRIORITY	MEDIUM PRIORITY	HIGH PRIORITY
<b>Material Property</b>	<input type="checkbox"/> stable and solid	<input type="checkbox"/> _____	<input type="checkbox"/> hard and fragile
<b>Object Type / Plugging Condition</b>	<input type="checkbox"/> strong in good condition	<input type="checkbox"/> some parts are weak	<input type="checkbox"/> faulty and fragile
<b>Number of glass</b>	<input type="checkbox"/> monolithic	<input type="checkbox"/> several pieces, tight connection	<input type="checkbox"/> loose connections
<b>Eccentric Element/impediments</b>	<input type="checkbox"/> none	<input type="checkbox"/> a little but small	<input type="checkbox"/> some and big
<b>Projection Height / Base</b>	<input type="checkbox"/> base is larger than its height	<input type="checkbox"/> its height is equal to base	<input type="checkbox"/> its height is greater than its base
<b>Weight / Dispersion</b>	<input type="checkbox"/> lower than 1/3 of height	<input type="checkbox"/> evenly distributed	<input type="checkbox"/> higher than 1/3 of height
<b>Form of the Base</b>	<input type="checkbox"/> flat and/or symmetric	<input type="checkbox"/> a little irregularity	<input type="checkbox"/> unusual or not flat
<b>Stability (during shipping)</b>	<input type="checkbox"/> stable and solid	<input type="checkbox"/> slight movement or rocking	<input type="checkbox"/> easily moved or rocked
<b>Threat to Object/People Present</b>	<input type="checkbox"/> none	<input type="checkbox"/> to objects occasionally	<input type="checkbox"/> to people in all objects
<b>Location / Accessibility</b>	<input type="checkbox"/> easy to access	<input type="checkbox"/> a little difficulty in access	<input type="checkbox"/> difficult to access
<b>Relocation</b>	<input type="checkbox"/> easy, quick	<input type="checkbox"/> with some difficulty	<input type="checkbox"/> very difficult
<b>Necessity/Threats*</b>	<input type="checkbox"/> none	<input type="checkbox"/> a little	<input type="checkbox"/> several or many
<b>Importance Degree</b>	<input type="checkbox"/> study pieces	<input type="checkbox"/> for display	<input type="checkbox"/> unique
<b>Component**</b> <b>Use the</b>	<input type="checkbox"/> low risk	<input type="checkbox"/> medium risk	<input type="checkbox"/> high risk
<b>GRADING (number of high risk)</b>	<b>LOW PRIORITY</b>	<b>MEDIUM PRIORITY</b>	<b>HIGH PRIORITY</b>
<b>GRADE NUMBER</b>			

\*Secondary Threats: all of the objects that can fall down on it or outside it, glass that can be broken etc.  
\*\* These components can be pedestal/shelving systems, cases, supports or other structures. The risks that they use have one risk of toppling to damage or to be damaged.

NOTE: Always choose the higher risk level when you a choice among two grades that are very close to each other.  
This form document was adapted from an UNESCO source.  
© 2006 ICOM, Disaster Preparedness Committee, and ICOM, I.A.D., Museum Studies Program

# PROJECT METHODOLOGY

**Step 5:** Exhibition galleries in 14 museums and storage areas in 6 museums were visited and surveyed to test survey forms and to quickly identify and quantify risks and potential approach.

The museums were selected according to the following criteria:

- The institutions they work under
- Collection content
- Museum type
- Number of visitors

**Step 6:** Preparation of project report to inform both authorities and advocates for cultural heritage preservation.

# GENERAL OBSERVATIONS

## THE MOST COMMON RISKS

- Risk of broken glass
- Risk of free-standing objects
- Risks within showcases
- Risks of hanging objects
- Risks from the ceiling of the building

# GENERAL OBSERVATIONS

## CHALLENGES FACING NON-STRUCTURAL MITIGATION WORK

Challenges may differ from museum to museum according to their administrative status, physical conditions, earthquake consciousness of the museum staff and collection content.

- Museum building
- Number of objects
- Exhibition galleries / storage areas conditions
- Management /Bureaucracy
- Budget
- Number of staff
- Aesthetic concerns
- Functional concerns
- Psychological and social concerns
- Earthquake consciousness

# RECOMMENDATIONS FOR MITIGATION METHODS

## FOR EXHIBITION GALLERIES

- Fastening showcases
- Mount and monofilament
- Museum wax
- Sand and lead bags
- Base isolation

## FOR STORAGE AREAS

- Adequate anchors and bracing
- Restraints tied across open shelving
- Boxed or containerized objects
- Padding between objects
- Securing large objects
- Mechanical latches

# PROJECT RESULTS

- Several Istanbul Museum have already taken or began to take impressive measures on non-structural mitigation against earthquake and are continuing to be the leaders for the action, to encourage other museums by sharing information.
- It is possible to start with cheap and practical non-structural mitigation methods immediately.
- Knowing the quality of both application and materials used and which methods are appropriate for which objects are very important for both efficiency and effectiveness.

# PROJECT RESULTS

- There is a need for more scientific research in the field of non-structural mitigation on chemical testing of existing materials and shake table testing of mitigation methods.
- There is a need for wider education in the field. People from various fields in the tourism sector, museum staff, students, skilled crafts people and restorationists are some groups that can be trained.
- It is important to publish the research and work realized in this field in order to be able to put the subject on the agenda of scientific field and of public opinion.



# PROJECT ACHIEVEMENTS

- A slide presentation about non-structural mitigation in museums is prepared in both Turkish and English, and will be shared over internet (<http://www.ahep.org>). J.Paul Getty Museum experts will continue to support the project team to develop the educational slide presentation for self-study.
- Approximately 200 CD's containing the presentation, project report and former documents from J. Paul Getty Museum experts are developed and distributed to the institutions the museums work under, to be further distributed to the museums in Turkey.



# PROJECT ACHIEVEMENTS

- Two lessons in non-structural mitigation for museum collections have been integrated into courses on Maintenance & Conservation and Collection Management at Yildiz Technical University, Faculty of Art and Design, Museum Studies Graduate Program.
- A Memorandum of Understanding has been signed between four universities, Bogazici University, Istanbul Technical University, Mimar Sinan Fine Arts University and Yildiz Technical University in Istanbul to work together for the protection of cultural heritage against earthquake risk.

# POSSIBLE FUTURE PROJECTS

- The technical specifications and limits of existing methods should be experimentally researched with shake-table testing. New methods should also be investigated in this manner.
- Sources for purchasing non-structural mitigation materials in local markets should be researched and chemical content of these materials should be tested.
- A multi-disciplinary group of people from various fields and volunteers who want to become specialists in this subject should be identified and supported to participate in local and international training programs.

# POSSIBLE FUTURE PROJECTS

- A mobile training and mount-making unit could be established to tour museums and provide on-site consultation and training on easy and moderately difficult mitigation methods.
- One or two museums can be selected as demonstration sites to implement and showcase comprehensive non-structural mitigation, emergency planning, and staff training.
- An inter-disciplinary center to consolidate interest, expertise and workspace for research-development, education, consulting, technical support, specialized and temporary storage, and salvage operations after disaster can be created for long-term systematic implementation and extension of these lessons throughout Turkey and the region.

# ACKNOWLEDGEMENT

- Dr. Marla Petal, Director, B.U., KOERI, Disaster Preparedness Education Program
- Republic of Turkey, Ministry of Culture and Tourism
- Republic of Turkey, Istanbul Provincial Directorate of Culture and Tourism
- Directors and staff of all Istanbul Museums
- Prof. Tomur Atagök, Chairperson, Yildiz Technical University, FAD, Museum Studies Graduate Program
- Prof. Dr. Gülay Barbarosoglu, Director, B.U., KOERI
- Prof. Mustafa Erdik, Chairman, Bogazici University, KOERI, Earthquake Engineering Department
- Assoc. Prof. Eser Durukal, Bogazici University, KOERI, Earthquake Engineering Department
- Dr. Jerry Podany, Head Conservator, J. Paul Getty Museum, Department of Antiquities
- Mr. Kevin Marshall, Lead Preparator, J. Paul Getty Museum
- Robert Sieger, Mount-maker
- Mr. Suha Ülgen, Interactive Media and Geographic Information Systems Inc.
- Ms. Süheyla Sezan, Project Coordinator, B.U., KOERI, Disaster Preparedness Education Program
- Ms. Rebekah Green, Civil Engineer, Cornell University
- Mr. Caglayan Tugal, Architect; Ms. Fatos Basaran, Architect, T Mimarlik Dekorasyon Ins. T. San. ve Tic. Ltd. Sti.
- ProVention Consortium Disaster Risk Reduction Program