

**U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION**

BUILDING SEISMIC SAFETY PROGRAM

**Nonstructural Hazards Mitigation
Implementation Plan**

*Cost Effective Tools and Procedures, Suggested Strategies,
Available Training, Funding, Schedules and Guidelines*

January 14, 2004

CONTENTS

INTRODUCTION.....	3
Background	3
Objectives	3
NONSTRUCTURAL HAZARDS MITIGATION TOOLS.....	3
Nonstructural Hazards Quantification Report	3
Nonstructural Hazards Rehabilitation Guidelines	5
Nonstructural Hazards Rehabilitation Training.....	5
NONSTRUCTURAL HAZARDS MITIGATION RECOMMENDATIONS.....	5
High Risk	5
High Zone	6
Specific Recommendations.....	6
CURRENT BUILDING INVENTORY	6
SCHEDULES	7
FUNDING.....	8
Nonstructural Hazards Identification.....	8
Nonstructural Hazards Mitigation.....	8
Nonstructural Hazard Training	8
REFERENCE.....	9
APPENDICIES	10

**Bureau of Reclamation
Building Seismic Safety Program**

Program Manager

John R. Baals, P.E.
Seismic Safety Program Manager
Structural Analysis Group, D-8110
PO Box 25007
Denver, CO 80225
Phone: 303-445-3222
Fax: 720-544-4730
Cell: 303-910-0683

Nonstructural Rehabilitation Team Leader

Tim Brown, P.E.
Structural and Architectural Group, D-8120
PO Box 25007
Denver, CO 80225
Phone: 303-445-3709
Fax: 720-544-4750
Cell: 303-589-4006

Pacific-Northwest Region Program Contact

Dan Wilson
Civil Engineer
Attn: PN-3410
1150 North Curtis Road, Suite 100
Boise, ID 83706-1234
Tel: (208) 378-5208
Fax: (208) 378-5381

Mid-Pacific Region Program Contact

Herman Williams
Property Specialist
Attn: MP-3700
2800 Cottage Way
Sacramento, CA 98525-1898
Tel: (916) 978-2364
Fax: (916) 978-2450

Upper-Colorado Region Program Contact

Dave Yates
Civil Engineer
Attn: UC-222
125 South State Street
Salt Lake City, Utah 84138-1102
Tel: (801) 524-3778
Fax: (801) 524-5499

cc: Sheral Palace
Attn: MP-3700
2800 Cottage Way
Sacramento, CA 98525-1898
Tel: (916) 978-5156
Fax: (916) 979-2450

Lower-Colorado Region Program Contact

Moses Moya
LC Engineering Services
Attn: LC-6211
PO Box 61470
Boulder City, NV 89006-1470
Tel: (702)-293-8133
Fax: (702) 293-8652

Great Plains Region Program Contact

Gerard Stallman
Attn: GP-2400
P.O. Box 36900
Billings, MT 59107-6900
Tel: (406) 247-7783
Fax: 406-247-7898

INTRODUCTION

Background

Nonstructural components are those elements of a building, such as furnishings, equipment and architectural features that are not part of the structural system. Even in moderate earthquakes, if unbraced, these elements are commonly damaged and the repair and business disruption costs can be very high. Nonstructural hazards can impede safe building egress and can result in injury to building occupants and nearby pedestrians.

In an effort to mitigate these hazards, the Building Seismic Safety Program (Program) has developed a number of cost effective tools, procedures and strategies to identify, evaluate and rehabilitate nonstructural hazards in Reclamation owned or leased buildings. This Nonstructural Hazard Mitigation Implementation Plan (Plan) is being developed to explain these procedures and to provide information to the Regional Seismic Safety Contacts about available Program funding, schedules and guidelines.

Objectives

The objectives of this Plan are:

- To establish the Program's methodology for nonstructural hazards mitigation.
- To identify reimbursable and non-reimbursable activities for nonstructural hazards mitigation.
- To establish schedules for nonstructural hazards mitigation.
- To provide recommendations and guidance to the Reclamation Seismic Safety Regional Contacts for the development of Regional nonstructural hazard mitigation programs.
- To identify Reclamation owned buildings for which the Program recommends nonstructural hazard mitigation.

NONSTRUCTURAL HAZARDS MITIGATION TOOLS

The Program has developed methodologies and tools for the mitigation of nonstructural hazards. The following describes these procedures and how they can be utilized by trained Reclamation personnel to manage these hazards.

Nonstructural Hazards Quantification Report

The mitigation of nonstructural hazards is accomplished by first identifying the deficiencies and then mitigating the hazards. These steps are presented below.

While nonstructural components are found in all occupied buildings, not all of these components are hazardous. Only the identified hazards will require mitigation. Mitigation of nonstructural hazards in buildings starts with an inventory of each component. Each component is categorized and quantified and may then be evaluated. This process of quantification and evaluation is called a Nonstructural Hazard Quantification (NHQ) activity. A specific NHQ report is generated to determine the hazard level. This Plan will only present the NHQ concept and addresses specific Program training that is available to teach the complete NHQ process.

The development of the format for the NHQ report was patterned from Chapter 11 of FEMA 356 [1]. Seismically hazardous nonstructural components are identified and quantified during a building inspection. Each component is then categorized by Architectural, Mechanical, Electrical or Furnishing discipline, and then evaluated to determine if the hazard should be mitigated. There are various reasons for mitigating nonstructural hazards. The primarily reason is for life safety however, they can also be mitigated for financial or other reasons.

The mitigation of hazardous components is accomplished by designating the component using three simple mitigation categories:

Category A: Mitigation by Relocation. Rehabilitation is accomplished by relocating the items. Many times simply moving the items away from main egress routes or away from public assemblies will satisfy risk reduction requirements.

Category B: Mitigation by Operations and Maintenance (O&M). Rehabilitation is accomplished by on-site O&M staff through scheduled, ongoing maintenance. Typical mitigation techniques include the use of common, off-the-shelf and easy-to-install clips, braces and other attachments.

Category C: Mitigation by Others. Rehabilitation cannot be accomplished by item relocation or by on-site O&M staff. Components are placed in this category if engineered solutions are required or if an O&M solution requires resources that are not available at the site.

The hazards from components that are classified as Category A or B can typically be corrected by Building Managers, O&M forces or building occupants using simple mitigation solutions. The Program has developed Nonstructural Hazards Rehabilitation Guidelines [2] (NHRG) to catalog these solutions with manufactures literature. The NHRG is organized by grouping the hazard or deficiency with the solution and can be used in conjunction with the NHQ report to provide the specifics to mitigate the identified nonstructural hazards.

Nonstructural Hazards Rehabilitation Guidelines

In November of 2001 the NHRG were standardized for the Department of the Interior. The intent of these Guidelines is to provide Building Managers, O&M personnel or building occupants with cataloged rehabilitation solutions to nonstructural component deficiencies that were identified during the NHQ process. Solutions identified in these Guidelines include a collection of typical details and manufacturers' data for off-the-shelf nonstructural component restraints. These documents are available free of charge to Department of Interior employees. They can be ordered from the Program's internet and intranet web sites [3] by clicking on the Announcements tab.

Nonstructural Hazards Rehabilitation Training

Nonstructural hazard mitigation training is available from the Program by several means. In fiscal year 2003, Program-developed training sessions were presented in Denver and at the Regional offices. Future training will be evaluated based on Regional and Area Office needs.

Program presentation at conferences or seminars is also an available method of training. The Program has presented nonstructural hazards training at a number of major conferences and will continue to review upcoming seminars and conferences for opportunities to provide related training.

The Program is also developing a method for automated training. This type of training is being developed to minimize training and travel expenses as well as to provide flexibility on the training delivery. An announcement on the availability of this training will be made near the end of FY 03.

NONSTRUCTURAL HAZARDS MITIGATION RECOMMENDATIONS

The Program recommendations for nonstructural hazard mitigation depend upon the level of seismicity and the level of risk for a particular building. Recommendations are made for High Risk and High Seismicity classifications. For additional information regarding the NHQ process and the Programs recommendations, a logic flow chart displaying the total mitigation process is included in Appendix A.

High Risk

After a structural evaluation of a building is completed, the Program performs a seismic risk analysis for the building. In accordance with Guidelines for Achieving Public Protection in Dam Safety Decision Making [4], the Program classifies buildings with a level of risk greater than 1×10^{-3} to be a high risk. This is the level of risk where risk reduction actions are warranted. The level of risk is calculated by the Program from data collected during the structural evaluation process. It includes information such as the

location of the buildings, the seismic potential of the area, the supporting soil type, the number of occupants in the building, and the building type and the shape of the building.

NHQs will be initiated and performed by the Program using Program resources as part of the seismic risk reduction process for those building classified as High Risk. The NHQ and any mitigation activities will be coordinated with the appropriate Region and Area Office contact.

High Zone

The Program recommends the NHQ process for all buildings with a site located in an area with a High Level of Seismicity. The Program will notify the managers of buildings classified as High Zone and provide the training and tools necessary for the management to complete the NHQ and mitigation process. In these cases where buildings are located in areas with a High Level of Seismicity and level of risk is less than 1×10^{-3} , Program funding will not be available for the NHQ or risk reduction process.

Specific Recommendations

The Program recommends the identification and mitigation of nonstructural seismic hazards, by means of a NHQ report and use of the NHRG, for all occupied buildings with a High Level of Risk or located in a High Level of Seismicity. The Program will initiate the NHQ report and mitigation process for all buildings classified as High Risk. In these cases, the NHQ process is non-reimbursable and the risk reduction measures are reimbursable. We would anticipate that building management would initiate the NHQ and mitigation process for buildings classified by the Program as High Zone. For these buildings, Program funding will not be available for the NHQ process or the mitigation of nonstructural hazards.

The identification and mitigation of nonstructural seismic hazards are similar to other safety hazards that are found in buildings. The management of these hazards is typically addressed by the building decision makers and their safety programs. It is recommended that these programs perform NHQs for buildings located in areas with a High Level of Seismicity as part of their on-going maintenance and safety activities.

When reimbursable Program funds are used for nonstructural hazard mitigation, a brief closeout accountability report or memo shall be submitted to the Program identifying the completion of the mitigation work.

CURRENT BUILDING INVENTORY

At the time of the development of this Plan, the Program is recommending the completion of NHQ reports for 309 buildings. As risk identification exercises continue, these numbers will change. A listing of these buildings, sorted by Region, is summarized

below in Table A. A complete listing of specific buildings can be found on the Program’s internet and intranet web sites [3] by clicking on the Briefings & Guidelines tab.

Table A

	PN Region	MP Region	LC Region	UC Region	GP Region	Total
High Risk Buildings	6	2	6	3	0	17
High Seismic Level	114	97	46	33	2	292
Total	120	99	52	36	2	309

SCHEDULES

Table B details the number of buildings that the Program has determined to be High Risk. The table summarizes, by fiscal year, the number of buildings the Program is scheduled to complete NHQ activities.

Table B

	2003	2004	2005
High Risk Buildings with Planned NHQ	11	2	4

A more detailed listing of High Risk Buildings and their scheduled completion dates can also be found on the Program’s internet and intranet web sites [3] by clicking on the Briefings & Guidelines tab. These scheduled dates have been coordinated with other activities, such as structural rehabilitation and accessibility action plans, which are currently scheduled for the buildings. It is recommended that building management and their Regional Seismic Safety Contact coordinate the schedule of NHQ activities in a similar fashion for buildings classified as High Zone.

FUNDING

Nonstructural Hazards Identification

The identification of nonstructural hazards in High Risk buildings is Program funded with non-reimbursable funds.

Identification of nonstructural hazards in buildings that are not classified as High Risk is a matter of general building safety and therefore will not be Program funded.

Nonstructural Hazards Mitigation

Nonstructural risk mitigation is Program funded with reimbursable funds for buildings with a classification of High Risk and those buildings located in an area with a High Level of Seismicity. Program funding can be made available upon request.

Nonstructural Hazard Training

Training initiatives such as the development and distribution of automated training, the development and distribution of the NHRG, labor and non-labor expenses incurred by the Program during Regional training sessions, conferences and seminars will be Program funded with non-reimbursable funds.

Training related expenses of non-Program personnel incurred for individual or customized NHQ training is not Program funded.

REFERENCE

[1] APrestandard and Commentary for the Seismic Rehabilitation of Buildings,@Federal Emergency Management Agency, FEMA 356, November 2000.

[2] ANonstructural Hazards Rehabilitation Guidelines,@U.S. Department of the Interior Seismic Safety Program, Volumes I and II, November, 2001.

[3] Bureau of Reclamation Building Seismic Safety Program Websites
<http://www.usbr.gov/ssle/seismicsafety/>
http://intra.do.usbr.gov/seismic_safety/

[4] AGuidelines for Achieving Public Protection in Dam Safety Decision Making,@Bureau of Reclamation Dam Safety Program, May 5, 2003.

APPENDICES

Appendix A – Nonstructural Hazards Reduction Implementation Plan Logic Flow Chart

Appendix A

Nonstructural Hazards Reduction Implementation Plan Logic Flow Chart

Nonstructural Hazard Identification and Mitigation Flowchart

