

Final Report of the Committee on Unreinforced Masonry Buildings of the Nevada Earthquake Safety Council [DRAFT REPORT]

Craig M. dePolo, Chairperson

Committee Members:

Michael Blakely

Timothy Ghan

Werner Hellmer

Gennady Stolyarov II

Kyle West



**There are hundreds, if not a few thousand,
Unreinforced Masonry Buildings (URMBs)
In Nevada.**

**These buildings pose one of, if not the greatest,
seismic threats to Nevada. URMB's have been
damaged by at least 12 different Nevada
earthquakes including the M6.0 Wells
earthquake in 2008.**

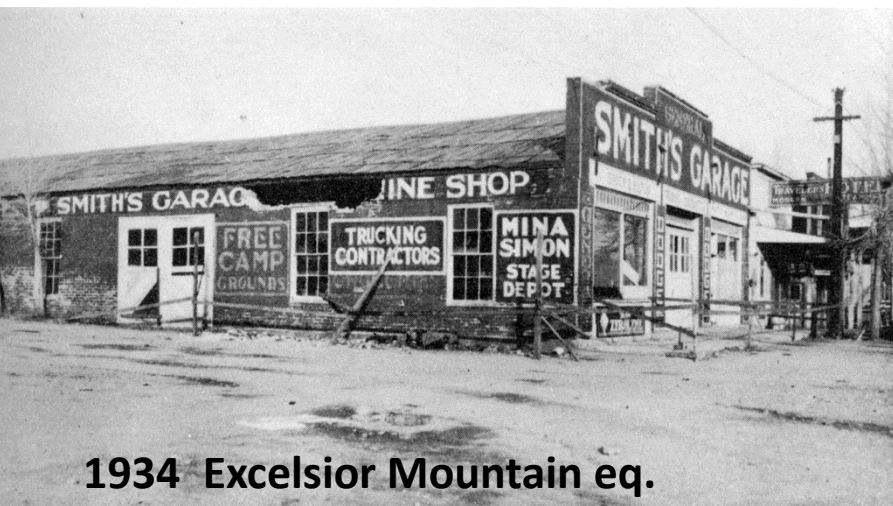
**The impact of earthquake damage to URMBs
can create a multitude of negative
consequences.**

**Setting in motion and following through with
the reduction of the seismic risk of URMBs in
Nevada is one of the most important things the
NESC can do in the next decade.**

1915 Pleasant Valley eq.

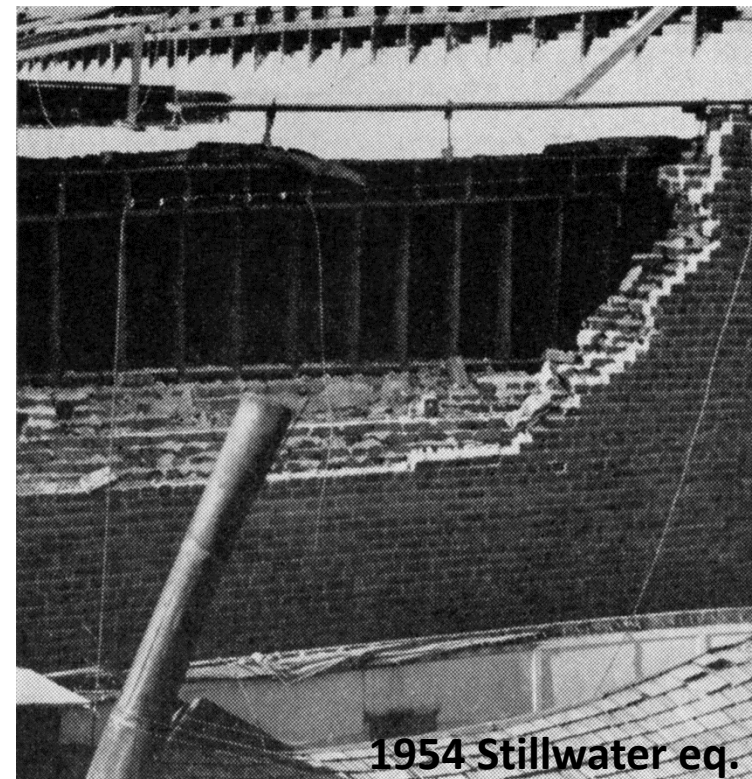


1932 Cedar Mountain eq.



1934 Excelsior Mountain eq.

**URMB Damage has Occurred
during Most Major Nevada Earthquakes**



1954 Stillwater eq.

2008 Wells, Nevada Earthquake



2008 Wells, Nevada Earthquake

Some Non-Residential URMB Stats:

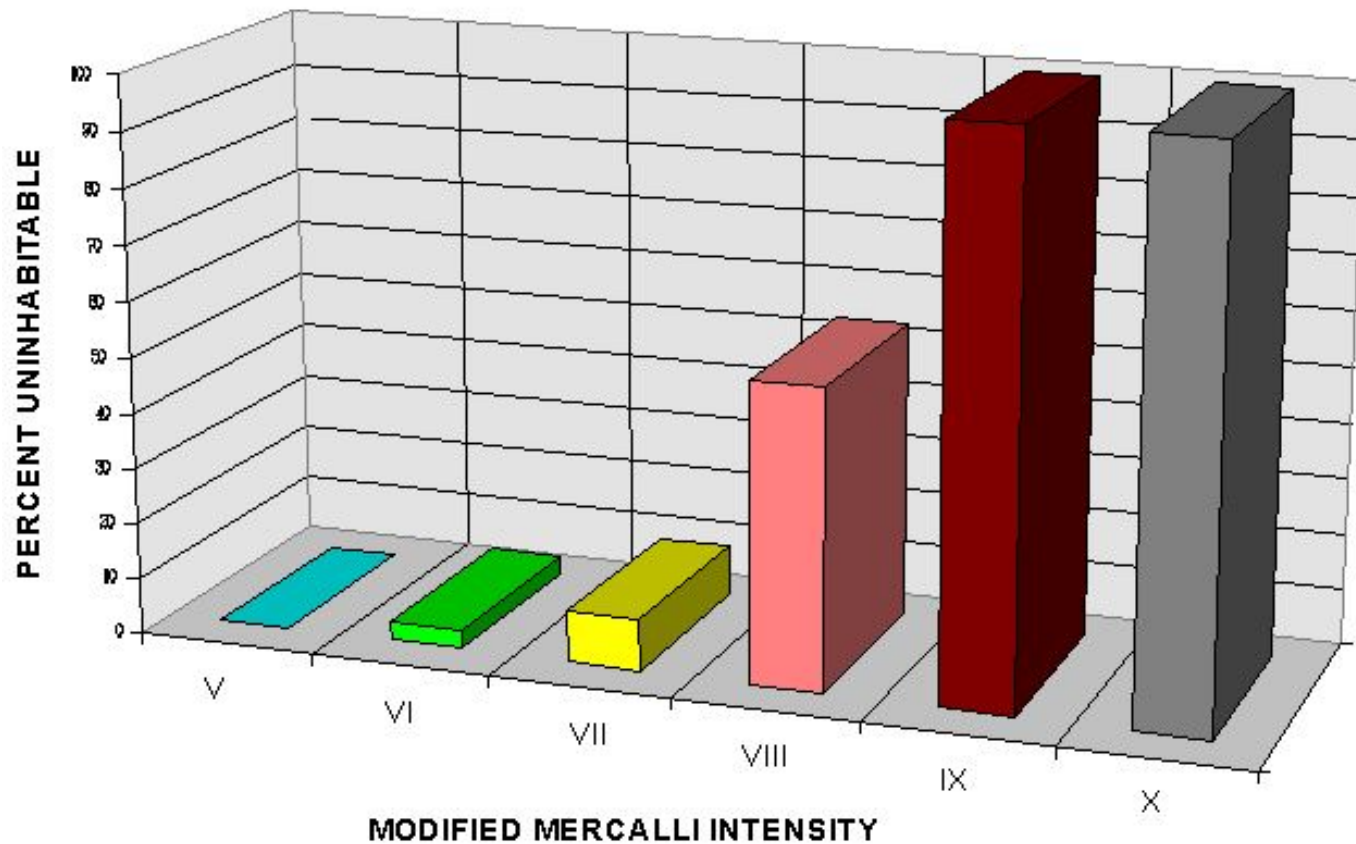
- **10 of 15 moderately to severely damaged (67%) – potentially life threatening.**
- **3 of 15 partial to total collapse (20%).**
- **1 of 15 potentially deadly staying inside (7%).**
- **15 of 33 exits had potentially deadly debris (45%)**





Collapse of URMBs in the 1933 Long Beach, California Earthquake

UNREINFORCED MASONRY PERCENT UNINHABITABLE BY MMI INTENSITY LEVEL



Source: Association of Bay Area Governments



Interior cross bracing helps prevent building collapse

Rehabilitation of Unreinforced Masonry Construction is Achievable

Bracing of URM parapets keeps them from toppling to the sidewalk below



Some Background Considerations

STAPLEE

Social	<ul style="list-style-type: none"> ▪ Is the mitigation action socially acceptable? ▪ Will the action adversely affect any one segment of the population? ▪ What effects will the action have on the social, historic, and cultural environment of the community?
Technical	<ul style="list-style-type: none"> ▪ Is the proposed action technically feasible and does it provide the appropriate level of protection? ▪ What types of technical/professional expertise will be required to plan and implement the project? ▪ Will the action create more problems than it solves? ▪ How long will it take to complete the project? Is this a reasonable timeframe?
Administrative	<ul style="list-style-type: none"> ▪ Does the community have the capability (staff, expertise, time, funding) to implement the action? ▪ Can the community provide the necessary maintenance of the project?
Political	<ul style="list-style-type: none"> ▪ Is the mitigation action politically acceptable? ▪ Will the general public support or oppose this project?
Legal	<ul style="list-style-type: none"> ▪ Does the community have the authority to implement the proposed action? ▪ Will the action comply with local, State, and Federal environmental regulations? ▪ Do homeowner association bylaws apply to the project site? ▪ Is the action likely to be challenged by stakeholders whose interests may be adversely affected?

Some Background Considerations

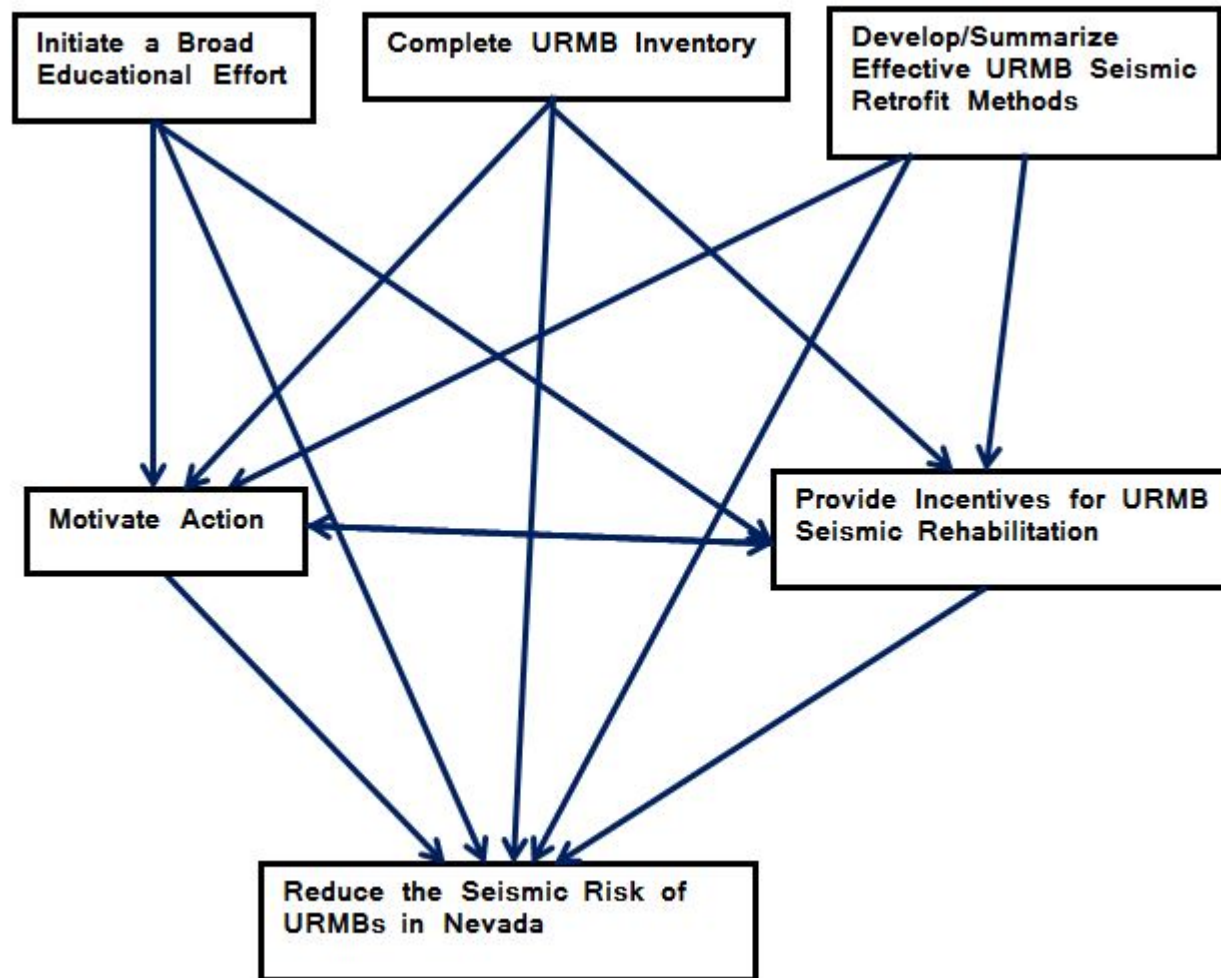
STAPLEE

Economic	<ul style="list-style-type: none">▪ Do the costs of the action seem reasonable for the size of the problem and the likely benefits?▪ What burden will be placed on the local economy to implement and maintain the action?▪ Will the action generate additional jobs locally?
Environmental	<ul style="list-style-type: none">▪ Is the proposed action in a floodplain or wetland or will it indirectly impact the natural and beneficial functions of a floodplain or wetland?▪ How will the action affect the natural environment?▪ How will the action affect utility and transportation systems?

Roadmap for Reducing the Seismic Risk of Unreinforced Masonry Buildings in Nevada

- 1) Complete URM Survey of Nevada and Prioritize by Seismic Risk**
- 2) Initiate Broad Educational Efforts on the Hazards of URBs**
- 3) Motivate Action that Reduces the Seismic Risk from URBs**
- 4) Provide Incentives to Retrofit/Reduce the Seismic Risk of URBs**
- 5) Develop/Summarize Effective Seismic Retrofit Methodologies for URBs**
- 6) Rehabilitate Vulnerable URBs and Other URM Structures**

URMB Seismic Risk Reduction Flow Chart



Unreinforced Masonry Building Seismic Risk Reduction Strategies

1) Complete URM Survey of Nevada and Prioritize by Seismic Risk

Goals:

- a) complete the survey for all Nevada communities quickly
- b) devise a seismic risk prioritization strategy for URMBS
- c) prioritize URMBS within communities
- d) develop updated URMBS information
- e) tabulate, publish, and post the results

Mechanisms:

- a) survey grants/support/teams
- b) URMBS survey publication
- c) post results online
- d) list essential facility URMBS in state
- e) develop a white paper for the state legislature
- f) update MyPlan web application with survey results

2) Initiate Broad Educational Efforts

Goals:

- a) provide a general understanding the URMb seismic risk
- b) provide rational to motivate decision maker action
- c) develop a broad support base for these actions
- d) provide information for retrofit
- e) provide a decade-long window-of-opportunity for seismic retrofit

Mechanisms:

- a) URMb section on NESC website
- b) develop and distribute URMb audience-targeted fliers
- c) develop a white paper for the legislature on URMbs
- d) advertise the URMb summit and results to Nevadans
- e) URMb blog during summit & possibly annually thereafter

3) Develop/Summarize Effective Seismic Retrofit Methodologies for URBMs

Goals:

- a) develop/summarize a suite of seismic risk reduction methodologies
- b) develop/summarize a suite of effective URMb retrofit methodologies
- c) develop/summarize different performance-based engineering approaches

Mechanisms:

- a) URMb Summit in Reno, Nevada
- b) commission University of Nevada summary report (UNR & UNLV)
- c) develop an owner's and contractor's guide to URMb seismic retrofit
- d) develop post-earthquake URMb repair and retrofit guide
- e) develop and hold retrofit workshops throughout Nevada

4) Motivate Action that Reduces the Seismic Risk from URBMs

Goals:

- a) create a momentum for decision makers to advocate risk reduction
- b) create support for decision makers through partnerships
- c) create support momentum to sustain a 10-year + effort
- d) create incentives for owners of URBMs to undergo the effort of retrofit

Mechanisms:

- a) execute a NESC full-press advertisement effort – press releases, interviews
- b) advertise NESC URMb educational materials/effort
- c) launch a decade of seismic risk reduction; joint effort; Gov. proclamation
- d) document URMb damage in future Nevada earthquakes

5) Provide Incentives to Retrofit/Reduce the Seismic Risk of URMBS

Goals:

- a) motivate decision makers, building owners, and the public towards action
- b) reduce the burden to building owners
- c) provide Federal and other grants to owners to help offset costs
- d) seismically retrofit as many URMBS as possible

Mechanisms:

- a) advertise and support pre-disaster mitigation grants
- b) provide tax incentives
- c) wave inspection fees
- d) provide community bond incentives
- e) provide insurance incentives
- f) provide moral support (NESC awards in excellence; ShakeOut web site)
- g) develop a regulation/law that requires retrofit of high seismic risk URMBS
- h) require earthquake safety placards on non-compliant URMBS

6) Rehabilitate Vulnerable URMBs and Other URM Structures

Goals:

- a) set community, county, and state goals for seismic risk reduction
- b) rehabilitate as many URMBs as possible, highest risk first
- c) achieve a significant amount of seismic risk reduction in Nevada

Mechanisms:

- a) encourage/require retrofit of high seismic risk URMBs
- b) help owners apply for pre-disaster mitigation grants
- c) require that upgrades or repurposing of URMBs includes a seismic retrofit
- d) develop professional/private/public partnerships to promote retrofit

What Does the NESC Need to Do?

- 1) Create a NESC Website & Populate It with URM Materials**
- 2) Create URMB Seismic Risk Reduction Coalition**
- 3) Support/Promote URMB Inventory Completion & Publication**
- 4) Co-Host URMB Seismic Risk Reduction Summit**
- 5) Develop URMB Risk Reduction Strategies for Nevada**
- 6) Develop Information Products and Fliers (use in-state resources)**
- 7) Develop URMB Seismic Risk Reduction White Paper**
- 8) Support a Summary of URMB Seismic Retrofit Techniques**
- 9) Launch the Decade of URMB Seismic Risk Reduction (2020-2030)**

Inventories of Nevada URBMs

Critical Intelligence for URMb Seismic Risk Reduction

Larger Communities have been conducting Inventories

Need a Strategy to Complete Nevada Inventory

Need a Strategy to Rank URMbS w/r to Seismic Risk

Summarize and Publish Nevada URMb Inventory Results



Why URM Seismic Risk Reduction Summit?:

- **generate URM awareness – popularize to make a window-of-opportunity for awareness and for your involvement, education, and engagement**
- **gain state-of-the-art rehabilitation approaches and programs, successful risk reduction**
- **broaden URM building seismic risk reduction experience base**
- **develop general strategies and potential policies towards reducing URM building seismic risk**
- **allow for professional interaction and advancement; promote interaction, education/information, and promote creative-effective-practical risk reduction solutions**

Potential Nevada Earthquake Safety Council Products to Support the Reduction of the Seismic Risk of Unreinforced Masonry Buildings

NESC White Paper of Risk Reduction Strategies: Professional and political guide to motivate Nevadans to reduce this seismic risk – more supportive information and decision charts/diagrams , 3-10 p

Consumer Guide to Risk Reduction: 10-20 p; explain URM danger, Nevada URM statistics, retrofit options and opportunities, risk reduction progress in Nevada, insurance implications, many visuals

Unreinforced Masonry Building Seismic Risk Fliers: 1 p

- Overview of URM Problem and Solutions
- Homeowners Guide to Unreinforced Masonry Construction
- Building Owners/Contractors Guide to Unreinforced Masonry Construction
- Building Inspectors/Planners Guide to URM Seismic Risk
- Political Leaders/Decision Makers Guide to URM Seismic Risk
- Hospital & Critical Facility Guide to URM Seismic Risk
- School Guide to URM Seismic Risk
- 2008 Wells Earthquake and URMs
- Example of a URM Retrofit – Start to Finish

WHAT BUILDING OWNERS CAN DO:

1

GET YOUR BUILDING EVALUATED.

2

Train tenants on what they should do during & immediately following a disaster.

3

Encourage TENANTS to have adequate insurance.

4

RETROFIT YOUR BUILDING.

URM RETROFITS ENTAIL ADDING STEEL STRENGTHENING TO A BRICK BUILDING

RETROFITS OF URM BUILDINGS MAY INCLUDE AMONG OTHER THINGS
(1) PARAPET BRACING
(2) & (3) ATTACHING THE ROOF AND FLOORS TO THE EXTERIOR WALLS
(4) OUT-OF-PLANE WALL BRACING AND
(5) OVERALL BUILDING BRACING.



URM RETROFITS INCLUDE ADDING STEEL STRENGTHENING TO A BRICK BUILDING

MORE EXTENSIVE RETROFITS MAY ALSO INCLUDE WALL AND FLOOR BRACING.

Bureau of
Emergency
Management **PBEM**



Bureau of
Development
Services FROM CONCEPT
TO CONSTRUCTION

BUILDING OWNERS GET AHEAD OF THE NEXT EARTHQUAKE

DRAFT

DO YOU OWN A URM?

WHAT'S A URM?

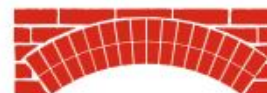
An UnReinforced Masonry (URM) building is one with at least one bearing wall constructed of masonry with little or no reinforcement. In such buildings there is generally little or no structural attachment between the exterior brick walls and the roof and floors of the building. URM's were typically built before the 1960s.

SIGNS INCLUDE

CLASSIC RED BRICK



ARCHED WINDOWS

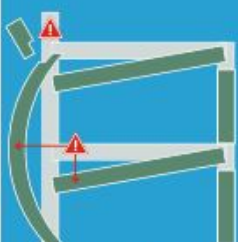


ROW OF BRICK ENDS



Take action today to help protect yourself, businesses, homes and communities.

WE'RE ALL AT RISK FROM EARTHQUAKES



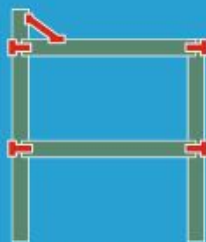
UNREINFORCED BUILDING

WHAT HAPPENS TO A URM DURING AN EARTHQUAKE?

Walls pull away from floors and roofs.

Walls partly or fully collapse, resulting in falling brick.

A building can collapse and cause injury and destroy the building and its contents.



REINFORCED BUILDING

IMPACTS

Beyond the visible loss of community character, quakes can have serious impacts on URM.



INJURY



DAILY LIVING/BUSINESS DISRUPTION



DAMAGE TO INTERIOR PROPERTY



DAMAGE TO BUILDING INVESTMENT

75% OF BUSINESSES CLOSE
IF NOT REOPENED WITHIN A WEEK OF AN EARTHQUAKE



A loss of income during a disaster can cause you to lose valuable employees. Retrofitting can speed up recovery and get your business open sooner.

URM MYTHS

MYTH: I CAN'T AFFORD THE COST OF RETROFITTING

TRUTH: A major earthquake could destroy your building, impacting your income for years to come. You can't afford not to protect your investment.

MYTH: IT SURVIVED THE LAST EARTHQUAKE, IT'S FINE!

TRUTH: Unseen damage from past earthquakes is compounded by the next one, which could be stronger.

MYTH: RETROFITTING WILL SAVE THE BUILDING

TRUTH: Retrofitting does not prevent all damage but the investment may save lives. It may also get you back in business faster.

**SEE HOW YOU CAN PREPARE
ON THE NEXT PAGE**



[About Us](#)[Plans & Projects](#)[Prepare](#)[Hazards](#)[NETs](#)[BEECN](#)[Plans & Projects](#)[Unreinforced Masonry \(URM\) Seismic Retrofit Project](#)[Project Information](#)[Policy Committee](#)[Seismic Retrofit Support Committee](#)[Retrofit Standards Committee](#)[Committee Resources](#)[BDS URM Database](#)[Subscribe to RSS](#)

MOST POPULAR

[URM Policy Committee Final Report
\(December 2017\)](#)[Benefit Cost Analysis Report
\(November 2016\)](#)[Cover Memo for Updated Cost
Estimates](#)[VIDEO: URM Building Earthquake
Simulation](#)[Committee Resources](#)

Unreinforced Masonry (URM) Seismic Retrofit Project



Information about the City of Portland project to improve the earthquake safety of unreinforced masonry (URM) buildings.

UPDATE: Portland City Council passed a resolution on June 13, 2018 providing guidance to City staff on developing a mandatory seismic retrofit policy for unreinforced masonry buildings.

Approaches to Influence URMBS Seismic Risk Reduction Actions

Carrot - to the maximum degree possible, but watch out for dependencies

Reasoning – necessary approach for widespread acceptance

Social Cueing – powerful approach, part of widespread acceptance

Fairness/Shared Burden – could motivate reluctant owners; those who benefit from the risk reduction share the financial burden

Uniform Message from Different Agencies/Groups – powerful approach, credibility

Repeated Message – reach people that aren't listening, especially if it is in a format they respond to; 7 to 9 message repeats for impact

Windows-of-Opportunity – powerful approach, includes grants, risk-reduction decade, and strong earthquakes with unacceptable URMBS damage

Stick - used elsewhere, but not always the best approach for Nevada Communities

Widespread, aggressive URMBS seismic risk reduction will take planned broad and consistent support in information, products, and advocates. Several sponsors are necessary.

Nevada Unreinforced Masonry Building Website (NESC Website)

Web Site:

- 1) Annual NESC Webmaster that will be responsible for the site**
- 2) Domain name? EarthquakesNevada.com NVeqSafeCouncil.com
LynnIsGreat.com; obtain domain name**
- 3) Context-tenner: a) 100% professional, b) easy to understand and use, Jane
or Joe bag of doughnuts, minimize or at least explain technical language
in narrative and instructions, help folks *find* rather than *search***
- 4) Can NDEM support the site (~\$200/yr)?; need to ask the question before we
take donations**
- 5) Next step – buy site, site architecture and map; target many important audiences**



Nevada Unreinforced Masonry Building Website (NESC Website)

Web Site:

- 1) Annual NESC Webmaster that will be responsible for the site**
- 2) Domain name? EarthquakesNevada.com NVeqSafeCouncil.com
LynnIsGreat.com; obtain domain name**
- 3) Context-tenner: a) 100% professional, b) easy to understand and use, Jane
or Joe bag of doughnuts, minimize or at least explain technical language
in narrative and instructions, help folks *find* rather than *search***
- 4) Can NDEM support the site (~\$200/yr)?; need to ask the question before we
take donations**
- 5) Next step – buy site, site architecture and map; target many important audiences**



Placard from Santa
Barbara

**1925 Santa Barbara, California
Earthquake** Unreinforced
Masonry Damage to the
Hotel California

