

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

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## **Executive Summary**

There are hundreds, if not a few thousand, Unreinforced Masonry Buildings (URMBs) in Nevada. These older buildings can be severely damaged during earthquakes and pose one of, if not the greatest, seismic threat to our state. URMB's have been damaged by at least 12 different Nevada earthquakes including the magnitude 6.0 Wells earthquake in 2008. Earthquake damage to URMBs creates a multitude of negative consequences for the state, such as injury and death; loss of property, revenue, and jobs; and a loss of tourism. Setting in motion and following through with the reduction of the seismic risk of URMBs in Nevada is one of the most important steps NESC can take over the next decade.

### *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 of the results
- 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)

The task of realistic risk reduction is daunting and larger than the available resources allow. To achieve effective seismic risk reduction of URMBs requires an effort of equal large magnitude, from the Governor, to the Legislature, to local government officials, to the people. There has to be conviction to go forward with this difficult task. It will require a large earthquake message campaign that is targeted to be effective and is highly influential. Sharing the burdens and incentivizing the seismic rehabilitation of URMBs are some of the concepts that can lead to success. The required information and popularization of the URMB threat and solutions can be accelerated using a strategic "window-of-opportunity" called the "Decade of URMB Seismic Risk Reduction." The roadmap to achieve this includes these major objectives:

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

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

## **The Problem**

Nevada is one of the most active earthquake states in the Union and many damaging earthquakes have struck the state. Unfortunately a building type that is particularly vulnerable to earthquake damage exists in Nevada, unreinforced masonry buildings (URMBs). These buildings can partially or completely collapse during strong shaking, causing deaths, injuries, and property damage. Compounding losses include loss of business revenues, loss of wages and jobs, loss of services to a community - such as housing, loss of tourism, and loss of tax base.

Some of the most vulnerable of these URMBs are brick and stone buildings constructed in the 1800s and early 1900s. Many of these buildings were quickly and poorly constructed with little consideration to the quality of building materials. They are commonly made of weak materials - such as lime mortar, which deteriorates with time. These buildings are also commonly not well maintained. And URMBs were not designed to withstand strong earthquake shaking. Nevada has hundreds to thousands of URMBs throughout the state and in virtually all of its communities. A number of these buildings have been seismically retrofitted for life safety, but most have not been seismically rehabilitated and are vulnerable to strong shaking.

## **The Solution**

An engaged strategy that systematically reduces the seismic risk of Nevada unreinforced masonry buildings needs to be devised, adopted, and enacted. This strategy should initially focus on the URMBs with the highest seismic risk. Seismic risk is a function of earthquake hazard and seismic vulnerability. Seismic vulnerability considers factors such as building occupancy (how many people and how long they are in a building), community importance, and potential impact on adjacent structures. The solution to reducing the seismic risk of URMBs is unfortunately costly in consideration, rehabilitation, and time. Specific strategies that can reduce these burdens are necessary if a reduction of this risk is going to be achieved. Reducing the seismic risk of URMBs in Nevada is a safety and an economic consideration, and is a challenge Nevada needs to take.

## **The URMB Seismic Risk Reduction Roadmap**

In 2017 the Nevada Earthquake Safety Council commissioned a committee to examine the URMB seismic risk in Nevada. This includes considering ways to reduce this risk that makes sense to Nevadans, that are effective and achievable, and that are fair in approach. The Unreinforced Masonry Building Committee has developed this roadmap and other products in response to this charge. This roadmap presents the

considerations and strategies that if engaged in over time, can achieve the desired risk reduction for Nevadans.

Historically, the reduction of URM seismic risk is most effective when it is a community effort. This is why education specifically tailored to communities about the problem, solutions, and benefits is a critical early step. Guidance, encouragement, support, and incentives can be provided by county, state, and local governments.



## **Unreinforced Masonry Building Seismic Risk Reduction Strategies**

### **1) Complete URMB Survey of Nevada and Prioritize by Seismic Risk**

#### **Goals:**

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

#### **Mechanisms:**

- a) survey grants/support/teams
- b) URMB survey publication
- c) post results online
- d) make a list of 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 rationale 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) Motivate Action that Reduces the Seismic Risk from URMBs**

#### **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 URMBs 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; join effort; Gov. proclamation
- d) document URMB damage in future Nevada earthquakes

### **4) 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

## **5) Develop/Summarize Effective Seismic Retrofit Methodologies for URMBs**

### **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
- f) 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

## Technical Background of URBMs Seismic Vulnerability

The 1961 Uniform Building Code required buildings in earthquake zones to be designed for prescribed forces. It specified that “all elements within the structure which resist seismic forces or movement shall be reinforced so as to qualify as reinforced masonry.” Thus, code compliant masonry construction since 1961, and in some cases earlier, should have been reinforced masonry.

However, lack of building departments and lack of code enforcement has made post 1961 URM buildings also suspect. Thus, the Nevada Earthquake Safety Council has chosen 1974 as a cut off date to use in its initial inventory of “Suspect URM buildings”.

Box shaped buildings with masonry exterior and interior bearing walls have long been designed for about 13% g as a prescribed horizontal inertial force. Historic earthquake ground motion records indicate that the real inertial forces are about 3 to 5 times 13% and even more depending on local site conditions.

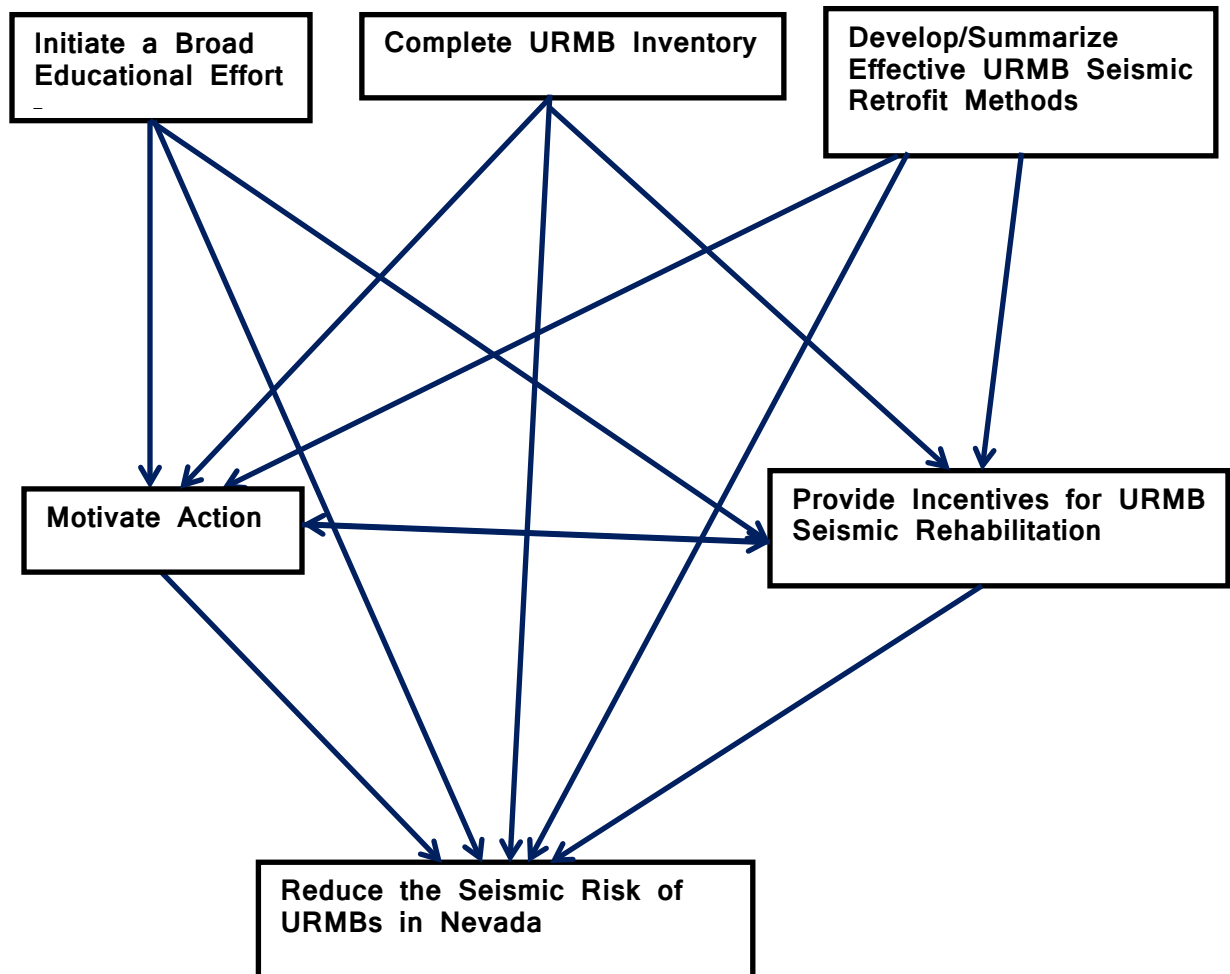
URMB Construction is brittle and weak in tension and without steel reinforcing it is prone to crack and fall apart. Parapets and chimneys fail in bending tension and can topple, walls can fail in shear or in out-of-plane bending and collapse. Reinforcing, commonly steel reinforcing, is necessary to stretch, provide ductility, and to hold the masonry units together after it cracks.

URMBs also have other traditional construction details that make them susceptible to collapse due to earthquake forces. “Fire cuts” were commonly used for floor and roof joist connections to masonry walls; these were traditionally intended to allow partial roof and floor sections to collapse without pulling walls inward during a fire. The result is that this detail weakens the floor-wall connection and allows the walls to fall outward during an earthquake. Roof and floor diaphragms were not shear connected to walls resulting in an incomplete horizontal force resisting system. Older URBMs used lime mortar rather than modern code required cement mortar. Lime mortar deteriorates over time and loses its ability to resist shear and tension forces.





## URMB Seismic Risk Reduction Flow Chart



## URMB Seismic Risk Reduction Action Chart

**Nevada Earthquake Safety Council**

### Things

**Nevada Earthquake Safety Council's Web Site**

**Unreinforced Masonry Building Inventory of Nevada Communities**

**Development of Practical, Likely Effective Strategies to Reduce Seismic Risk**

**Unreinforced Masonry Buildings Seismic Risk in Nevada - Consumer Guide & Targeted Audience Informational Fact Sheets**

**Nevada Earthquake Safety Council White Paper on Strategy including Motivation, Goals, Approaches, and Reduction of Impediments; for legislators, decision makers, and officials**

**Decade of URMB Seismic Risk Reduction**

### Actions

**Reduction of Seismic Risk of Unreinforced Masonry Buildings Coalition**

**Reduction of Seismic Risk of Unreinforced Masonry Buildings Summit**

**Popularize the Seismic Risk of Unreinforced Masonry Buildings**

**Knowledge/Information Campaign**

**Reduction of Seismic Risk for Nevada Unreinforced Masonry Buildings**

## Nevada Community Unreinforced Masonry Building Inventories

Without an understanding of how many unreinforced buildings (URMB) exist in a community, county, and overall in the state, it is impossible to devise an effective and realistic strategy to reduce their seismic risk. In 2012, the Nevada Earthquake Safety Council, the Nevada Bureau of Mines and Geology, and the Nevada Public Insurance Pool published a estimation of the numbers of URMBs in Nevada communities based on querying county assessor's building inventory data and using a series of parameters, such as building type and age, to select whether a building is a potential URMB (Nevada Bureau of Mines and Geology Report 54). This report states that this is only a general estimate and lists many reasons that could cause erroneous estimates, and stressed the need for communities to undertake URMB surveys that include field verification.

Nevada is currently in this second URMB inventory phase, with counties like Clark County, and cities, such as Carson City, Reno, and Sparks, conducting field based estimates. These communities used information gained in rapid visual building inspection classes and the like to help them in their understanding and execution of the survey. There are two significant results from communities conducting these surveys. The first, of course, is a realistic, more accurate count of the number of potential URMBs that pose a local seismic risk. The second result is it informs emergency responders, planners, engineers, and community officials of this potential earthquake problem in a way that has a much deeper impact than just reviewing a state study. They begin to know the locations of these buildings, where concentrations of URMBs are in a community (important for first surveys and situational awareness following a strong earthquake), and gain a conviction to work towards reducing this seismic risk. These survey results still possess uncertainties, for example not all retrofits are obvious from a visual survey of the outside of a building and some buildings are so covered up with exterior finishing that their building type cannot be determined. Additionally, several challenging but healthy societal questions to consider arise from having a URMB



inventory. These include, should the locations of potential URMBs in the inventory be made public, and should building owners, leasers, and renters be notified that their buildings may be a URMB? Although communities need to be involved, smaller Nevada communities may need technical and financial assistance to complete these surveys.

A third phase of this work is the prioritization of the seismic risk of URMBs, needed to know which buildings should be addressed first, for decision making, and for perspectives needed for writing proposals to gain support funding. This prioritization is principally on the consequences of a URMB failure, such as is this a critical facility or special structure like a school, how many people are in a building, how long are they in it, what are the potential impacts on adjacent buildings, what are the potential economic impacts and losses, and other considerations.

The results of the URMB surveys should be brought together and published within the next few years. This is for helping to strategize reducing the seismic risk of URMBs and for social and political support and leadership to take action to do so. This publication should include guidance and ideas to complete URMB surveys in all communities in Nevada.



## Nevada Unreinforced Masonry Building Website (NESC Website)

Outline of Proposal for the Nevada Earthquake Safety Council (NESC) Unreinforced Masonry (URM) Committee

*Meeting of October 24, 2017*

**Gennady Stolyarov II**, FSA, ACAS, MAAA, CPCU, ARe, ARC, API, AIS, AIE, AIAF,  
Lead Actuary, Property and Casualty Insurance,

and

**Tim Ghan**, CPCU,  
Assistant Chief,

Property and Casualty Section, Nevada Division of Insurance

- **Web Hosting:** MDDHosting - Professional Plan - <https://www.mddhosting.com/hosting.php>: Cost of \$9.50 / month = \$114.00 per year - Technically skilled and reliable service provider with strong culture of individualized support of users.
- **Domain-Name Registration:** <https://www.mddhosting.com/support/domainchecker.php?search=bulk>: Cost of \$19.95 per year
- **Content-Management System:** WordPress - open-source, free platform with easy-to-use interface: <https://wordpress.org/>
- **Labor:** All the work in setting up the website and uploading / maintaining the content could be performed by NESC members and staff, subject to a modest learning curve for the WordPress interface.
- **It is possible to render a website operational at a cost of approximately \$133.95 per year.**
- **Minimizing cost, maximizing efficiency:** The website could be deployed and updated most readily and expeditiously if this is done *outside* of the State of Nevada IT infrastructure (bypassing the need to use the Ektron content-management system in favor of the more versatile WordPress). *However*, this will require a decision to be made regarding *which entity or entities* will bear the cost.
- **Options for funding the website:**
  - Fundraiser dedicated to this purpose;
  - Individual donations;
  - Seeking support from one of the NESC member agencies;
  - External grants (may be a more involved process and a significant effort, given the small sums involved).
- **Decisions to be made:**
  - Domain name to use;
  - Source(s) of funding;
  - Content for website (What materials exist already?);
  - Static pages (How many and which ones?) and ongoing “blogroll” posts (places for updates; frequency depends on the inclination of those updating the website on a routine basis);
  - Graphical elements (Which ones exist already?);
  - Interactive features (e.g., a map of URM buildings): When to deploy and in what format(s) on the website.

## 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 - 10 pgs

**Consumer Guide to Risk Reduction:** 10-20 pgs; 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:

- Overview of URM Problem and Solutions (poss. draft included)
- 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



## Major Earthquake Hazards from Unreinforced Masonry Buildings in Nevada [draft flier example]

Learn more at the Nevada Earthquake Safety Council Website: [\[LINK\]](#)

### Unreinforced Masonry Buildings (URMBs):

- Most Nevada URMBs were constructed in the 19<sup>th</sup> and early 20<sup>th</sup> centuries, before the Uniform Building Code required earthquake-resistant construction in 1961. However, some post-1961 URMBs still were built because of inconsistent building-code enforcement until the mid-1970s.
- Many URMBs still exist in Nevada and are in use today. Most have not yet been retrofitted for earthquake shaking.
- Many URMBs used substandard construction methods and weak materials, like lime mortar.

### Dangers and Risks of URMBs:

- URMBs are brittle and can crack and fall apart in earthquakes unless reinforced.
- Walls can fall outward during an earthquake. Collapse of a URMB with occupants inside can threaten lives and cause injuries. People outside the building are also at risk.
- In the 2008 Wells earthquake, 35% of the town's URMBs were damaged.
- Many earthquake insurers will not cover URMBs, so owners may be at greater financial risk if earthquake damage occurs.

### Options for Retrofit:

- Reinforcement with materials such as steel is needed to hold the masonry together and allow the building to shake without collapsing during an earthquake.
- Specific enhancements to consider include parapet bracing, roof ties, wall anchorage, and out-of-plane wall bracing. Consult an engineer to determine the best options for your URMB.
- Seismic retrofits can be expensive. If a URMB has no historical significance, it may be less costly to replace it with a new building that is constructed using earthquake-resistant techniques and is safer than even a retrofitted building would be.
- If you own a URMB, some pre-disaster mitigation grants may be available for you to undertake a seismic retrofit. Taking advantage of these opportunities may achieve significant savings for the retrofit and even greater savings if an earthquake strikes.

### Estimated URMBs by County in Nevada - Source: [\[LINK TO SURVEY RESULTS\]](#)

County	Estimated Number of URMBs	County	Estimated Number of URMBs
Carson City	<b>NUMBERS TO BE FILLED</b>	Lincoln	
Churchill	<b>IN AS SURVEY RESULTS</b>	Lyon	
Clark	<b>ARE FINALIZED.</b>	Mineral	
Douglas		Nye	
Elko		Pershing	
Esmeralda		Storey	
Eureka		Washoe	
Humboldt		White Pine	
Lander		<b>TOTAL</b>	

- Over time, these URMB numbers have declined due to retrofits and replacements of older buildings with newer ones. However, much work remains to be done to reduce the seismic risk of URMBs in Nevada.

## URM Messaging and Communications - Ideas

Outline of Proposal for the Nevada Earthquake Safety Council (NESC) Unreinforced Masonry (URM) Committee

**Gennady Stolyarov II**, Lead Actuary, Property and Casualty Insurance, Property and Casualty Section, Nevada Division of Insurance

- **Consumer Guide:** Analogous to Nevada Consumer's Guide to Earthquake Insurance - [http://doi.nv.gov/uploadedFiles/doinvgov/\\_public-documents/News-Notes/EarthquakeInsurance\\_B.pdf](http://doi.nv.gov/uploadedFiles/doinvgov/_public-documents/News-Notes/EarthquakeInsurance_B.pdf)
  - 10-20 pages;
  - Explanation of danger of unreinforced masonry buildings;
  - Statistics by county (if available and reliable - after confirming that buildings are indeed unreinforced);
  - Options for retrofit;
  - Insurance implications of URM construction and retrofit;
  - Visuals of URM buildings damaged during earthquakes;
  - Historical progress in addressing this issue;
  - Create free PDF version, downloadable on URM Committee website.
  - Possible influences:
    - Nevada Bureau of Mines and Geology Report 54. "Preliminary Assessment of Potentially Unreinforced Masonry Buildings in Nevada". 2012. <https://pubs.nbmg.unr.edu/Unreinforced-masonry-buildings-p/r054.htm>
    - FEMA: "Unreinforced Masonry Buildings and Earthquakes: Developing Successful Risk Reduction Programs". FEMA P-774. October 2009. <https://www.fema.gov/media-library-data/20130726-1728-25045-2959/femap774.pdf>
    - Hess, Richard L. "Unreinforced Masonry (URM) Buildings". Supplemental Study. Prepared for United States Geological Survey and California Geological Survey. May 2008. [https://hazards.colorado.edu/archive/shakeout/unreinforced\\_masonry.pdf](https://hazards.colorado.edu/archive/shakeout/unreinforced_masonry.pdf)
    - "Unreinforced Masonry Buildings: Don't Play the Odds". Utah Hazard Mitigation & Recovery. Utah Division of Homeland Security. 2012. [https://uthazardmitigation.files.wordpress.com/2012/12/killer\\_buildings.pdf](https://uthazardmitigation.files.wordpress.com/2012/12/killer_buildings.pdf).
    - Results of ongoing and future surveys of URM buildings in Nevada.
- **Fact Sheets:** Concise presentations of 1-2 pages in length regarding:
  - Dangers of URM buildings;
  - Features of URM buildings (how to visually identify both URM and retrofitted URM buildings);
  - Options for retrofit;
  - Statistics by county in Nevada;
  - Any statistics regarding progress over time;
  - Section for customized messages by constituency:
    - Homeowners;
    - Renters;
    - Business owners;
    - Instructors;
    - Legislators and city officials.
  - Create free PDF versions, downloadable on URM Committee website.
  - Possible influence:
    - Northern California Chapter of the Earthquake Engineering Research Institute. Historic Buildings Committee. "Unreinforced Masonry Buildings Fact Sheet". 2004. [http://www.eerinc.org/old/quake06/best\\_practices/fact\\_sheets/historic\\_fs\\_urm.pdf](http://www.eerinc.org/old/quake06/best_practices/fact_sheets/historic_fs_urm.pdf)



## Approaches to Influence URMB 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 URMB damage

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

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

## Reducing the Seismic Risk of Unreinforced Masonry Buildings Summit

[strawman draft - idea generator]

**Location:** Reno, Nevada

**Possible Sponsors:** NV Eq Safety Council, Utah Seis. Safety Comm., UNR Eq. Engineering, BRP Committee WSSPC, EERI chapters, ASCE, FEMA, others?

**Cost:** est. \$20k (NEHRP? - speaker travel and room, room or other summit costs, proceedings volume production and printing support) sponsor donations (e.g., speaker travel, help cover a task for the summit such as helping with the proceedings volume, poster boards) Registration fee to cover food, break nibbles, and drinks.

**Talks and posters format;**

**Expanded-abstract proceedings volume**

Below is an overly ambitious agenda - but some topics can become posters

### **Why Summit?:**

- generate URMB 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

**Tuesday Evening** (start 3 p.m. with poster set up; posters up for entire summit - receptions/breaks are held around them)

4-7 pm Welcome Gathering at Posters (poster up for entire summit)

### **Wednesday**

[Definition of the Problem: (include historical examples, types of damage, and URM building damage stats - % damaged during strong earthquakes)]

#### **URM Buildings - Engineering:**

URM Building Damage Researcher (type of damage)  
URM Building Damage Researcher (damage statistics)  
URM Building Damage Christchurch Examples  
Non-Seismic Problems with URM Buildings? (poster?)  
Ranking and Prioritizing URM Buildings w/r to Seismic Risk (we really need this!!!!)  
URM Building Structural Risk Summary & Discussion (summarize talks and posters)

BREAK at Posters

#### **URM Buildings - Background & Inventories:**

URM Building Inventory - California  
URM Building Inventory - Utah  
URM Building Inventory - Nevada  
URM Building Inventory - Idaho  
Summary - perspectives on URM Building Numbers/Percentages (talks & posters)

LUNCH (Provided - registration fee covers) Lunch talk "*Considerations of Unreinforced Masonry Buildings for Earthquake Emergency Rescue*"

[Developing solutions for reducing the seismic risk of URM buildings]

**URM Building Seismic Rehabilitation Techniques:**

Differences between Bricks, Mortars, Rocks, CMUs  
Classic Rehabilitation Small Building Summary  
Classic Rehabilitation Large Building Summary  
Modern Rehabilitation Summary  
Out-of-the-box Rehabilitation Summary  
Just Nuts-and-Bolts - Partial Rehabilitation Perspectives

BREAK at Posters

**Complete Seismic Rehabilitation Examples (fix and cost):**

Building type 1  
Building type 2  
Building type 3  
House 1  
Summary URM Seismic rehabilitation (summarize talks and posters)

**Discussion with Recorder for Ideas:**

**POLICY DISCUSSION (led by XXX)**

**After Meeting Discussions at Posters? (hour or so)**

**Thursday**

**URM Building Seismic Rehabilitation - Economics:**

Cost to Seismically Rehabilitate URM Buildings (engineering firm)  
Cost to Seismically Rehabilitate URM Buildings (contractor)  
Financial Support and Incentives to Rehabilitate (FEMA summarize?)  
Summary Including Liabilities w/ & w/o rehabilitation (talks & posters)

BREAK at Posters

**KEYNOTE SPEAKER:** Lucy Jones - Reducing the Seismic Risk of URM Buildings (45 min + time for Qs) [Dr. Jones has not been contacted so is a placeholder - but she would be a beyond outstanding person for this speech]

**DISCUSSION with Recorder (person) for Ideas in the Wake of Keynote Talk:**

LUNCH (provided - registration fee covers - keep everyone on site)

**URM Building Seismic Rehabilitation - Societal Impacts:**

URM Building Owners and Economic Perspectives (include Homeowners)  
URM Building Tenants/Adjacent Building Owners  
URM Building Community Risk, Rehabilitation Impacts (Portland experience?)  
Summary of Societal Impacts - researcher (talks and posters)

BREAK at Posters (posters can be taken down after this break)

**Governance:**

Historical Governance Concerning URM Buildings in the West  
California State & Local Laws, Ordinances, and Attitudes Concerning URM Buildings  
Examples of Possible Laws and Ordinances that would Reduce URM seismic risk  
Governance in Reducing URM Seismic Risk Summary (talks and posters)

**POLICY DISCUSSION (lead by XX)**

**Friday**

**Reducing the Seismic Risk of URM Buildings:**

Messaging the URM Building Problem and Solutions  
Motivating URM Building Risk Reduction - What is Realistic  
Realistic Financial Incentives, Shared Burden, and Leadership Opportunities (politician?)  
The Rate or Pace of Seismic Rehabilitation

**Concluding Statements & Discussion:**

**Audience Comments Questions:**

**END by Noonish**

**Proceedings Volume for Summit:**

Each Presenter - 1 pg abstract + 1 pg figures (due 1.5 months before Summit - maybe allow longer if author requests)  
Participants List  
Sponsors Statement (intro/background)

**NESC & others Summit Press Releases:**

- 1) Announcing the Summit and Purpose (2 wks before?)
- 2) Summarizing the Summit and Opportunities for Actions (release Friday morning with a heads up Wed. before; possible daily releases during the meeting)



## **Some Comments from Michael Blakely (Structural Engineer):**

### **Potential Obstacles to Lower the Seismic Risk of URMBs**

1. Seismic retrofitting is expensive and for many old ordinary URM buildings demolition and rebuilding is a less expensive and yields a better result. Historically significant buildings may justify the high cost.
2. Retrofitting does not fix all weaknesses in a building. While damage resistance is improved and potential loss of life is reduced the building still may suffer significant damage and later may not be economically repairable.
3. Repurposing URM buildings is popular as urban renewal or to revitalize a neighborhood. Communities want older parts of town revitalized and minimizing the costs to owners and developers speeds this process. Ignoring the seismic risk is tempting but can be very costly in the long run.
4. Earthquake insurance is expensive and often not available for URMBs. This results in uninsured buildings with no money to make repairs after an earthquake event causes damage.

### **Current Status**

1. The Nevada statewide identification of URM buildings is well underway. Nevada Bureau of Mines Report 54 "Preliminary Assessment of Potentially Unreinforced Masonry Buildings in Nevada" was published in 2012 and its lists are being updated and refined.
2. Engineering analysis and mitigation repairs are well documented and available. Many Nevada design professionals already have experience designing building retrofits.
3. Earthquake awareness programs by the NESC have been well done. Classes on rapid hazard evaluation of buildings have been well attended by design professionals and building officials, and are being applied to Nevada communities.
4. Government agencies at all levels have not recognized the danger that URMBs present to our communities and have been reluctant to put in place regulations to require fixing or demolishing dangerous URMBs.

### **What Next**

1. Building departments need to adopt the International Building Code (IBC) appendix chapters 2 and 3 for seismic zones. They need to require seismic retrofits with major remodel projects.
2. Building departments and planning departments need to prohibit changes in occupancy in URM buildings that would increase the public risk from damage and injury. For example, do not allow a URM house to become a public accessible store or restaurant or allow a warehouse to become a restaurant, disco or brew pub without seismic retrofit.
3. City planners, City Councils, other public bodies and building owners need to understand that ignoring the URMB seismic risk is short sighted. Recovery costs are high and recovery times will be long. Businesses close and people just move away.
4. Incentives to reduce earthquake risk needs to be developed at all levels of government.