Potential URMs in Nevada

Presentation for the Nevada Earthquake Safety Council

9 November 2011

by Jonathan G. Price, Craig M. dePolo, and Gary L. Johnson
Nevada Bureau of Mines and Geology

Nevada Bureau of Mines and Geology

University of Nevada, Reno

Statewide • Worldwide

Nevada Public Agency Insurance Pool – Wayne Carlson

Nevada Department of Public Safety

Division of Emergency Management

FEMA

Federal Emergency Management Agency

USGS

U.S. Geological Survey

Seismological Laboratory
San Marin Hotel, an unreinforced masonry building (URM) that collapsed during the Wells, Nevada earthquake before the 21 February 2008 magnitude 6.0 earthquake

See http://www.nbmg.unr.edu/Pubs/sp/sp36/
Background:
Nevada is one of the most earthquake-prone states.
There are active faults nearly everywhere in Nevada. A magnitude 6.0 earthquake can occur anywhere in Nevada.

www.nbmg.unr.edu
“What happens in Las Vegas stays in Las Vegas,” but what happened in Wells can happen anywhere in Nevada.

Map by the USGS showing the probability of an earthquake of magnitude 6.0 (the size of the 21 February 2008 earthquake at Wells) or greater occurring within 50 kilometers (31 miles) in 50 years.

See http://www.nbmg.unr.edu/Pubs/sp/sp36/
HAZUS estimates for total economic loss from a magnitude 6.0 earthquake and probability of an earthquake of this magnitude or greater occurring within 50 years and within 50 km of the community.

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<tr>
<th>Community</th>
<th>Total Economic Loss</th>
<th>Probability in 50 years within 50 km</th>
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<tr>
<td>Las Vegas</td>
<td>$7.2 billion</td>
<td>12%</td>
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<tr>
<td>Reno</td>
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<td>67%</td>
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Total economic loss is from HAZUS. Probabilities are from the USGS at http://eqint.cr.usgs.gov/eqprob/2002/index.php.
Potential URMs in Nevada

URMs are structures that commonly collapse in large earthquakes. This is a problem of life safety and economic loss. There are tens of thousands of potential URMs in Nevada. We can reduce the risks from URMs.
Unreinforced masonry building (URM) that collapsed during the Wells earthquake on 21 February 2008

View from front, 20 May 2009

See http://www.nbmg.unr.edu/Pubs/sp/sp36/

View from back, 20 May 2009
Definition of potential unreinforced masonry (URM) buildings in Nevada: buildings listed by County Assessors or State Public Works as built before 1974 with brick, stone, or block masonry structure.

Caution: This is a preliminary study based on data provided by the County Assessors and the State of Nevada. We know there are errors in the database:

- URMs missed - not recorded as masonry structures
- URMs missed – ones on federal or Indian lands
- URMs counted due to wrong building type in the database
- Wrong locations due to poor address coding
- Misidentifications due to lack of construction date
- Buildings that may have been seismically retrofitted
- Buildings that have been removed.

Recommendation 1 (draft): Jurisdictions (cities, counties, state) should use this County Assessors’ data to follow up with on-the-ground inspections and checks of building plans. Individuals should determine if their buildings are URMs.
Potential URMs in Nevada – totals*

<table>
<thead>
<tr>
<th>Category</th>
<th>Number</th>
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<tbody>
<tr>
<td>Residential</td>
<td>7,354</td>
</tr>
<tr>
<td>Commercial &amp; Public (city and county)</td>
<td>16,145</td>
</tr>
<tr>
<td>State-owned</td>
<td>98</td>
</tr>
<tr>
<td>TOTAL*</td>
<td>23,597</td>
</tr>
</tbody>
</table>

* The total does not include buildings owned by the federal government.

http://gisweb.unr.edu/URM_project/
Potential URMs
Residential
Commercial & Public
State-owned

http://gisweb.unr.edu/URM_project/
Clark County potential URMs

2,396 Residential
11,963 Commercial & Public
0 State-owned
14,359 TOTAL
Potential URMs
- Residential
- Commercial & Public
- State-owned
Las Vegas area (base map = streets)

Potential URMs
- Residential
- Commercial & Public
- State-owned

Residential URM
Commercial URM
Nevada State URM
Potential URMs
- Residential
- Commercial & Public
- State-owned

Las Vegas area (base map = topography)
Las Vegas area (base map = aerial photograph)

Potential URMs
- Residential
- Commercial & Public
- State-owned

Residential URM
Commercial URM
Nevada State URM
Potential URMs
Residential
Commercial & Public
State-owned

I-15/US 95 interchange (streets base)
Moapa-Logandale-Overton

Potential URMs
Residential
Commercial & Public
State-owned
## Washoe County potential URMs

<table>
<thead>
<tr>
<th>Category</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>3,322</td>
</tr>
<tr>
<td>Commercial &amp; Public</td>
<td>2,445</td>
</tr>
<tr>
<td>State-owned</td>
<td>21</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>5,788</td>
</tr>
</tbody>
</table>
Reno-Sparks

Potential URMs
Residential
Commercial & Public
State-owned
Observations:

Because URMs are mostly 50+ years old, many have deteriorated and need maintenance. Some may have been damaged from shaking during previous distant or small earthquakes.
Potential URMs
Residential
Commercial & Public
State-owned
Potential URMs
Residential
Commercial & Public
State-owned
Potential URMs
Residential
Commercial & Public
State-owned
Potential URMs
Residential
Commercial & Public
State-owned
Potential URMs

Residential
Commercial & Public
State-owned
Carson City potential URMs

175 Residential
487 Commercial & Public
72 State-owned
734 TOTAL
Carson City

Potential URMs
Residential
Commercial & Public
State-owned

Carson City
Douglas County potential URMs

- 294 Residential
- 114 Commercial & Public
- 0 State-owned
- 408 TOTAL
Lyon County potential URMs

175 Residential
234 Commercial & Public
1 State-owned
410 TOTAL
Humboldt County potential URMs
184 Residential
192 Commercial & Public
1 State-owned
377 TOTAL
Elko County potential URM(s):

- **23** Residential
- **39** Commercial & Public
- **0** State-owned
- **62** TOTAL
Nye County potential URMs

228 Residential
144 Commercial & Public
0 State-owned
372 TOTAL
Potential URMs
Residential
Commercial & Public
State-owned
Conclusions:

There are tens of thousands of potential URMs in Nevada.

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<td><strong>TOTAL</strong></td>
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</tr>
</tbody>
</table>

URMs are located in every county and nearly every community in Nevada.

Many URMs are historically significant.

Many URMs are concentrated in downtown business districts and along thoroughfares.

* The total does not include buildings owned by the federal government.
URMs are structures that commonly collapse in large earthquakes. There are thousands of potential URMs in Nevada.

So what? Who cares?

This is a problem of life safety and economic loss. We can reduce the risks from URMs.

Western States Seismic Policy Council:

“Unreinforced masonry bearing-wall structures represent one of the greatest life safety threats and economic burdens to the public during a damaging earthquake. WSSPC recommends that each state, province or territory adopt a program to identify the extent of risk that unreinforced masonry structures represent in their communities and develop recommendations that will effectively address the reduction of this risk.” Policy Recommendation 11-4
URMs are structures that commonly collapse in large earthquakes. There are thousands of potential URMs in Nevada.

So what? Who cares?

We can reduce the risks from URMs.

Recommendation 1 (draft): Jurisdictions (cities, counties, state) should use this County Assessors’ data to follow up with on-the-ground inspections and checks of building plans. Individuals should determine if their buildings are URMs.

Recommendation 2 (draft): Jurisdictions should work toward seismically retrofitting URMs or removing them from human occupation. Take advantage of opportunities for federal funding for mitigation through FEMA. Bring buildings up to current code when remodeling. Learn from what other jurisdictions have done successfully. Provide incentives for individuals and businesses to retrofit URMs or to replace them with new buildings.
Potential URMs in Nevada

This is a problem of life safety and economic loss.
There are tens of thousands of potential URMs in Nevada.
We can reduce the risks from URMs.

Thank you!

Nevada Public Agency Insurance Pool – Wayne Carlson
## Number of potential URMIs

<table>
<thead>
<tr>
<th>County</th>
<th>Commercial &amp; Public*</th>
<th>State</th>
<th>Residential</th>
<th>Total#</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carson City</td>
<td>487</td>
<td>72</td>
<td>175</td>
<td>734</td>
</tr>
<tr>
<td>Churchill</td>
<td>177</td>
<td>192</td>
<td></td>
<td>369</td>
</tr>
<tr>
<td>Douglas</td>
<td>114</td>
<td>294</td>
<td></td>
<td>408</td>
</tr>
<tr>
<td>Elko</td>
<td>39</td>
<td>23</td>
<td></td>
<td>62</td>
</tr>
<tr>
<td>Eureka</td>
<td>0</td>
<td>35</td>
<td></td>
<td>35</td>
</tr>
<tr>
<td>Humboldt</td>
<td>192</td>
<td>1</td>
<td>184</td>
<td>377</td>
</tr>
<tr>
<td>Lander</td>
<td>57</td>
<td>67</td>
<td></td>
<td>124</td>
</tr>
<tr>
<td>Lyon</td>
<td>234</td>
<td>1</td>
<td>175</td>
<td>410</td>
</tr>
<tr>
<td>Mineral</td>
<td>60</td>
<td>57</td>
<td></td>
<td>117</td>
</tr>
<tr>
<td>Pershing</td>
<td>37</td>
<td>31</td>
<td></td>
<td>68</td>
</tr>
<tr>
<td>Storey</td>
<td>3</td>
<td>21</td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>Washoe</td>
<td>2,445</td>
<td>21</td>
<td>3,322</td>
<td>5,788</td>
</tr>
<tr>
<td>White Pine</td>
<td>138</td>
<td>1</td>
<td>93</td>
<td>232</td>
</tr>
<tr>
<td>Subtotal, N. Nevada</td>
<td>3,983</td>
<td>96</td>
<td>4,669</td>
<td>8,748</td>
</tr>
<tr>
<td>Clark</td>
<td>11,963</td>
<td>2,396</td>
<td></td>
<td>14,359</td>
</tr>
<tr>
<td>Esmeralda</td>
<td>2</td>
<td>14</td>
<td></td>
<td>16</td>
</tr>
<tr>
<td>Lincoln</td>
<td>53</td>
<td>2</td>
<td>47</td>
<td>102</td>
</tr>
<tr>
<td>Nye</td>
<td>144</td>
<td></td>
<td>228</td>
<td>372</td>
</tr>
<tr>
<td>Subtotal, S. Nevada</td>
<td>12,162</td>
<td>2</td>
<td>2,685</td>
<td>14,849</td>
</tr>
<tr>
<td>All of Nevada</td>
<td>16,145</td>
<td>98</td>
<td>7,354</td>
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*Includes city and county buildings but not state or federal ones.

#Does not include federal buildings.
The hazard: expressed in terms of probability of an earthquake of a given magnitude occurring within 50 years and within 50 km of the community.

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<tr>
<th>Community</th>
<th>% Probability of magnitude greater than or equal to magnitude</th>
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<tr>
<td></td>
<td>5.0</td>
</tr>
<tr>
<td>Dayton</td>
<td>&gt;90</td>
</tr>
<tr>
<td>Carson City</td>
<td>&gt;90</td>
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<td>Reno</td>
<td>&gt;90</td>
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<td>Sparks</td>
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<tr>
<td>Incline Village</td>
<td>&gt;90</td>
</tr>
<tr>
<td>Stateline</td>
<td>&gt;90</td>
</tr>
<tr>
<td>Fallon</td>
<td>80-90</td>
</tr>
<tr>
<td>Gerlach</td>
<td>40</td>
</tr>
<tr>
<td>Las Vegas</td>
<td>40-50</td>
</tr>
<tr>
<td>Elko</td>
<td>30-40</td>
</tr>
<tr>
<td>Wells</td>
<td>30-40</td>
</tr>
<tr>
<td>Laughlin</td>
<td>10-20</td>
</tr>
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Data are from the USGS at http://eqint.cr.usgs.gov/eqprob/2002/index.php. Values for magnitude 5.5 are extrapolated between 5.0 and 6.0.
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- 31 Residential
- 37 Commercial & Public
- 0 State-owned
- 68 TOTAL
Lander County potential URMs

67 Residential
57 Commercial & Public
0 State-owned
124 TOTAL
White Pine County potential URMs

- 93 Residential
- 138 Commercial & Public
- 1 State-owned
- 232 TOTAL

White Pine County

Ely
Churchill County potential URMs

- 192 Residential
- 177 Commercial & Public
- 0 State-owned
- 369 TOTAL

Churchill County
Fallon
Lyon County potential URMs

- 175 Residential
- 234 Commercial & Public
- 1 State-owned
- 410 TOTAL

Map showing locations in Lyon County, with markers for potential URMs in Wadsworth and Fernley.
Mineral County potential URMs

57 Residential
60 Commercial & Public
1 State-owned
232 TOTAL