The Utah Guide For The Seismic Improvement Of Unreinforced Masonry Dwellings

And

Salt Lake City’s “Fix-The-Bricks”

Presented by Glen E. Palmer, PE, SE
SEAU Annual Conference Feb 2020

Both Share The Overall Concept - “Life Safety Improvement”
Life Safety Improvement

Both the “Utah Guide” and “Fix The Bricks” are intended to educate people, and get them to ask;

1. “How Safe Is A URM Home?”
2. “What Can We Do To Improve It”

The Concept – Life Safety Improvement
Presentation Objectives:

- Provide a brief overview of the basic concepts in the updated 2016 edition of the “Utah Guide”.
- Review the purpose and layout of the “Utah Guide” and discuss it’s intended audience. Also, briefly cover it’s intended use in the process of partial seismic life safety upgrades in URM homes.
- Point out that the “Utah Guide” is being updated to clarify issues and typos, and being reviewed for current best practices.

Additional Presentation Objectives:

- Discuss what the “Fix The Bricks” program in Salt Lake City is, and a little about what they are doing.
- Briefly comment on FEMA’s involvement in approvals & funding.
- Discuss some of the pros and cons the “Utah Guide” and the “Fix The Bricks” program.
- Share some ideas on the future of the “Fix The Bricks” program and the future of the “Utah Guide”.

Palmer Engineering
The Utah Guide For The Seismic Improvement Of Unreinforced Masonry Dwellings

- Update objective was to better target the intended audience of Home Owners & small residential remodel Contractors, with the hope it could help improve life safety in older URM homes.
- It was a major volunteer effort between SEAU and USSC within a joint “Existing Buildings Committee”, with great help from both Utah State DEM & FEMA.

Chapter 1 – Introduction

Chapter 1 is a general introduction and gives some general history of URM home construction in Utah. It also discusses how these homes perform very poorly in earthquakes.

Chapter 1 also introduces the very basic topics of each later chapter in the book, helping to define the layout & concepts of the “Utah Guide” book.
Chapter 2 – How to Use This Guide

- Chapter 2 provides directions for using the Utah Guide, how to select the most important areas for improvement, and how to plan out and implement the actual upgrades.
- The Guide suggests prioritization to cover the most helpful & life safety critical items first. The goal is Life Safety Improvement over time, not undue speed at any cost! It is recommended that the Owner carefully consider budgets and timing so they do not exceed their resources.
- Chapter 2 includes a flowchart to help the user of the “Utah Guide” to correctly implement the Life Safety Improvement concepts within time and budget constraints.

Chapter 2 - Flowchart
Chapter 3 – Building Dynamics and Earthquake Forces.

- This chapter gives some Utah earthquake history and details of Utah’s seismic activity.
- It describes the general structural elements of a home that distribute and resist earthquake forces.
- Provides some background on why URM dwellings can have problems during earthquake events.

Chapter 3 discusses earthquakes in Utah, the size & location of previous earthquakes, and the likelihood of risk to URM dwellings in Utah from earthquakes.
Chapter 3 very briefly discusses typical structural support elements of a URM home, and how vertical & lateral force resisting elements work together for dwelling support.

Chapter 4 – Typical Features of Unreinforced Masonry Construction.

- Provides some explanation of more specific features & details of URM home construction.
- It helps explain how older URM homes were designed quite differently than newer homes.
- Gives some description of the weak structural features of URM home construction.
Chapter 4 - Features & Problems in URM Construction.

Figure 19  In-plane failure  Figure 20  Out-of-plane failure

Figure 21 a) Wood post support  b) Floor/roof support

Chapter 4 - Typical Features of Unreinforced Masonry Dwellings.

Figure 24 a) Parapet  b) Chimney  c) Gable End Wall  d) Corner Window
Chapter 5 – Typical Unreinforced Masonry Dwelling Types & Seismic Deficiencies

Chapter 5 goes over the following:

- Describes each of several “Model” types that are used for URM dwellings, including a photo of the home types.
- Provides a table of Seismic Deficiencies and a ranking of deficiency types in order of priority for risk for each deficiency.
- Describes deficiencies in each “Model” type of URM dwellings.

Table 1 gives Model Dwelling Types and defines priorities of “Seismic Deficiencies”
Chapter 5 identifies Model Dwelling Types;

- Type A
- Type C
- Type E
- Type G

The end of Chapter 5 gives wall sections that help to illustrate the construction methods likely found in each model type. The wall sections then reference specific details shown at the end of Chapter 6 for use in simple upgrades for each connection location.

Identify - Model Type “A”:

Single Story Double Wythe Brick with Basement.
Identify - Model Type “A”:

Two Wythe Single Story Brick with Basement →

Identify - Model Type “B”:

Single Story Two Wythe Brick with Shelf Basement & Attic
Identify - Model Type “B”:

Two Wythe Single Story with Shelf Basement and Attic →

Gable End Walls Can Be Wood or URM →

Two Wythe Single Story with Shelf Basement and Attic
Identify - Model Type “C”:

Two Story Stucco-Covered Brick with Shelf Basement.

Identify - Model Type “C”:

Two Story Two Wythe Brick →
Identify - Model Type “D”:

Two Story Double Wythe Brick w/ Shelf Basement & Attic.

Identify - Model Type “D”:

Two Story Two Wythe Brick with Shelf Basement and Attic →
Identify - Model Type “E”:

Single Story Single Wythe Brick with Full Basement.

Identify - Model Type “E”:

Single Story Single Wythe Solid Brick with Full Basement →
Identify - Model Type “F”:

Single Story Conc/Cinder Block with Basement & Flat Roof.

Identify - Model Type “F”:

Single Story Concrete/Cinder Block w/ Basement & Flat Roof →
Identify - Model Type “G”:

Single Story Concrete/Cinder Block with Brick Veneer and Full Basement and Low Sloped Roof.

Identify - Model Type “G”:

Concrete Block & Brick Veneer
Identify - Model Type “G”:

Single Story
Concrete/Cinder Block
w/ Brick Veneer and
Basement with Low Sloped Roof

Chapter 5 also discusses Special Features used in URM dwellings:

“Special Features” are typically very dangerous elements that are not present in all URM homes, although the chimney is listed as a Special Feature and is present in most URM dwellings.
- Special Features – Unreinforced Masonry Parapets

Special Feature – Unreinforced Masonry Chimneys
- Special Feature – URM Gable End Walls

- Special Features – Corner Windows
Chapter 6 – Seismic Mitigation of URM Structures.

- This chapter discusses some partial mitigation and retrofit work that can be done, the tools needed and problems that may confront the Owner, along with some of the other construction considerations.

- This Chapter also provides many details that help define the correction of many seismic deficiencies found in Utah homes.
Chapter 6 – Important Considerations:

As noted in Chapter 2, all cannot likely be done by the Owners at once. Plan & phase the work!

- Create a plan and more forward.
- Not all must be done now, the risk is not likely tomorrow. But work toward improving Life Safety!
- Be reasonable, do what is possible. Don’t take on too much as an Owner.
- Prepare & follow a time & cost budget!

The advice given is to Start Now!

Chapter 6 – Important Considerations:

- Remember - Each home is likely to be a variation of several Repair Details from different Model Types!
- Be ready to mix & match the various “Repair Details” given in Chapter 6 between the different Model Dwelling Types selected from Chapter 5. The dwelling types are not without a lot of shared details home type to home type.
- The details at the end of this Chapter will be discussed later!
Chapter 7 – Non-Structural Seismic Hazards: Anchorage and Bracing.

This chapter discusses non-structural safety & protective steps that can be taken, including the following:

- Anchorage of water heaters & book shelves.
- Tie down of computers and TVs.
- Anchorage of filing cabinets and clothes dressers.

This Chapter includes many FEMA details that can help home Owners correct these and many other seismic hazards.

Now let’s quickly look at a few Chapter 6 details & concepts in the order of the Table 1 listed priorities.

- Start at the top of the Chapter 5 “Table 1”, which shows the general seismic deficiencies in order of priority.
- Notice that the details in Chapter 6 are organized to follow this same listed order of importance and priority.
- Details are Very basic and prescriptive due to the intended audience, and need to be completed with specific call outs and information so the Contractor knows what to do!
First Priority – “Special Features”

“Special Features” in the Utah Seismic Guide;

- Parapets are very susceptible to seismic damage!
- URM Gable End Walls present a very tall projection that can easily tip & fall.
- Chimneys in URM Dwellings are very brittle due to no reinforcing inside the masonry.
- Corner Windows create a weak point in URM homes.
- Special Features are Very unstable in earthquakes – many can fall to the ground in dangerous pieces!
Providing “Parapet Bracing”

Parapet Bracing;

Uniform and Level Line of Bolting Plates Req’d→

Bolting Plates can also be a Continuous Band of Steel Plate if Appropriate.
Providing “Gable End Wall” Bracing

Gable End Wall Bracing;

Drilling Must Be Done Very Carefully to Avoid Damage to Bricks→

Visible Impact is Critical on Historic Dwellings!
Gable End Wall Bracing;

Some Gable End Walls are Short, and Unique Details may Needed →

Again - Visible Impact is Critical!

Providing “Chimney Bracing”
Consistent Vertical Strap Spacing is Important for Bracing & Appearance!

Watch To Avoid Extra Roof Penetrations & Patch Very WELL!

Chimney Bracing;

Steel Bands and Straps Must Be Snug to the Masonry to provide Proper Bracing →

Careful Work is Critical on Older Historic Dwellings!
Provide “Corner Window” Strengthening

Corner Window Strengthening;

Drilling Must Be Done Very Carefully to Avoid Damage to Bricks→

Better Tie-In Can Significantly Help Reduce Failures!
Second Priority - Roof to Wall Anchorage. Details Can Apply at all Model Dwelling Types

<table>
<thead>
<tr>
<th>Seismic Deficiencies</th>
<th>Model Dwelling Types</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roof to URM Wall Anchorage</td>
<td>Details 30 through 40</td>
</tr>
<tr>
<td>Floor to URM Wall and Foundation Wall Anchorage</td>
<td>Details 50 through 56, and Detail 38</td>
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<tr>
<td>URM Wall Strengthening</td>
<td>Details 70 through 74</td>
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<tr>
<td>Roof Diaphragm Strengthening</td>
<td>Details 75 and 76</td>
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<tr>
<td>Floor Diaphragm Strengthening</td>
<td>Detail 57</td>
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<tr>
<td>Strengthening of Major Interior Bearing Elements</td>
<td>Details 77 through 82</td>
</tr>
<tr>
<td>Foundation Wall Strengthening</td>
<td>Detail 90</td>
</tr>
<tr>
<td>Non-Structural Strengthening and Anchorage</td>
<td>For bracing and anchorage of non-structural items, including water heaters, furnaces, cabinets, equipment, etc., see details 150 and higher.</td>
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Roof to Wall Connection Seismic Deficiencies

- Roof Tie-In at walls are critical to improved Seismic Safety in URM dwellings.
- URM walls in dwellings usually have NO connection at the wall-to-diaphragm interface! Commercial buildings often have some interface anchorage, but not homes!
- Roof Anchorage at walls may reduce “flex” in the walls, thus reducing cracking and risk of collapse.
Providing Roof to URM Wall Anchorage Improves the Life Safety against collapse!

Roof to URM Wall Anchorage;

Exterior Roof to Wall Connections

Chapter 5 - Wall Sections can be a Guide to Details that Apply to each dwelling.
Roof to Wall Anchorage;

Interior URM Wall Bracing

Interior URM Wall bracing is less impactful than the exterior tie-ins, but is still very helpful!

→ Roof to Wall Anchorage;

Tall Support Pony Walls should Be Sheathed to Provide Shear Bracing →

The roof is usually opened up to do this roof to wall connection.
Roof to Wall Anchorage;

2x Blocking can be used to Brace the Roof Rafters against roll →

This Detail Seems to be the Most Common Variation in URM Dwellings!

Roof to Wall Anchorage;

The Helical Pins May Not Be as Effective due to Voids in Block Cells →

This Detail shows an 8” Single Wythe Cinder Block Wall.
Interior Roof to Wall Anchorage & Bracing

Roof to URM Wall Anchorage at Wood Gable End Walls
Roof to URM End Wall Anchorage & Bracing;

Brace the Top of URM Walls at Wood Gable End Walls when Possible →

Reduced Visible Impact can be Critical on Historic Dwellings!

Anchor the Bracing Well with Framing Anchors and Proper Nailing →

Epoxied-In Anchor Bolts can be helpful in Cinder Block Walls.
Roof to URM End Wall Anchorage & Bracing:

Provide 2x Continuous when Kicker Lengths get long →

Use of a Continuous Concrete Wall Cap Can Help on Damaged Walls!

Third Priority – Floor to URM Wall & Foundation Anchorage – Details may Apply to all Dwellings
How Do We Provide Anchorage from the Floor to URM Walls?

Floor to URM Wall Anchorage;

Some Lower Level Exterior Walls of two story Dwellings may have (3) Wythe’s of Brick!

All levels of anchorage can improve the safety of a URM dwelling. Important – start at the top and work down!
Floor to URM Wall Anchorage;

Drilling Must Be Done Very Carefully to Avoid Damage to Bricks →

The ceiling is usually opened up to do this floor to wall connection.

Floor to URM Wall Anchorage;

Second Floor may be Wood Frame and Require Opening up the Floor Sheathing for Access →

Lower Walls may also be Two Wythe Brick or Brick on CMU
Floor to URM Wall Anchorage;

Often upper Walls are Stepped Out Over Porches and Require Two locations of Blocking →

Bolts into CMU may be an Alternative at Brick on CMU

Wood Floor Framing Set into URM Wall

Providing Floor to Foundation Wall Anchorage
Anchor Floor to Foundations

Typ Concrete Foundation Wall

Typ Concrete Shelf Basement

Typ Concrete Shelf Basement

Steep Stairs are Common

Floor to Foundation Wall Anchorage;

Exterior Single Withe CMU Wall Anchorage →

Lowest level Foundation Wall Anchorage is less Impactful than the Top Level Tie-Ins, but it is still helpful!
Wall to Foundation Anchorage;

2x Blocking can be used to Brace the Floor Joists against roll →

Sometimes Tie-In of Floor Beams may be Needed →

Remember to Keep the Bolt Line True and Level and Spaced Equally for Appearance!
Wall to Foundation Anchorage;

The Vertical Angles provide Holdown Strength at Perimeter →

4th Priority – Strengthening Structural Elements – Most Details Apply to any “Model Dwelling Type”

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The Diagrams for the Strengthening of Unreinforced Masonry Dwellings
Seismic Deficiencies of Structural Elements – Covering 5 of the lines in Table 1

We will cover these Topics in Four Parts;

1. URM Walls are not Reinforced with Rebar and are very Brittle, they crack & break up relatively easily.
2. URM Dwellings usually have rather weak and non-continuous floor & roof sheathing diaphragms.
3. Interior Wood Bearing Walls and other Elements are not tied together well and can be weak.
4. Foundation Walls are often stacked up rock, with or without mortar, or are URM. These can be weak.

1 - URM Wall Strengthening;

Exterior Wall Wythe tied to Inner Wythe of Brick →

Helical Mechanical Anchors Wythe to Wythe can help the Wall “Act” thicker and more Stable.
1 - URM Wall Strengthening;

Some Walls may have One Wythe of Brick & one Wythe of Cinder Block.

Helical Mechanical Anchors can again be used to tie the outer Brick to the Inner CMU Wythe for more Stability.

Shotcrete Overlay can also work with larger Hooked Rebar in place of the Helical Mechanical Anchors.

With the Larger Drills and Larger Rods, use even greater care in Drilling the holes to avoid Damage to the Wall.
1 - URM Wall Strengthening;

Metal studs with Bolts or Helical Mechanical Anchors can also work with Drywall or OSB Sheathing to Increase Strength!

Helical Anchors can be Clinched or can be Screw-Anchored to Metal Studs.

1 - URM Wall Strengthening;

CMU (or Cinder Block) Walls can be Strengthened by Grouting in Anchors and using Shotcrete Overlay.

Use Welded Wire Fabric in all Shotcrete Overlays.
1 - URM Wall Strengthening;

Re-Grouting Rebar into the cores of URM walls can also be done.

Saw-Cuts for this type of Strengthening will need to be done Carefully to Avoid Damage to Electrical or Piping or other embedded items.

OSB over 1x Sheathing →

Wood Slat Floor Sheathing ←

2- Roof & Floor Diaphragm Strengthening
2 - Roof Diaphragm Strengthening;

Original Roof is usually 1x Spaced Sheathing →

Installation of OSB over the 1x Slats and adding 2x Blocking Ties everything together Better!

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2 - Roof Diaphragm Strengthening;

Blocking with 2x4’s and Providing an Anchored Metal Valley Also Ties the roof together Better →

Similar Blocking and Metal Ridge Cap can also help Shear Transfer and tie things together.
2 - Floor Diaphragm Strengthening;

Floor Sheathing Diaphragms can also be Improved →

Better Sheathing with Gluing, Nailing and Blocking is again very helpful!

3 – Roof & Floor Diaphragm Edge Blocking for Strengthening.
2 - Roof & Floor Diaphragm Strengthening;

Edges and Bearing Point Blocking can also help at all Diaphragms →

Different Blocking Methods work for Various Heights.

3 - Strengthening of Major Interior Bearing Elements.
3 - Interior Wood Bearing Wall Strengthening;

Old Frame Bearing Walls are normally left with almost no Anchorage →

Be careful not to “Blow Out” the bottom of Slabs or Footings in this Process!

Column & Post Anchorage is also Important →

Fabricated Base Brackets or Proprietary Base Brackets can be used.
3 - Interior Wood Bearing Wall Strengthening;

Low Cost Interior Floor Blocking & Framing Anchors can be a Major Help →

Don’t forget the help that Hold-Down Anchors can add in the right places.

Interior Wood Bearing Wall Strengthening;

Adding Blocking → Above Beam Lines is also very Important

Don’t miss the Post Cap to tie the post to the Beam!
4 - Foundation Wall Strengthening

Stone Foundation → Cut Stone Foundation

Add Concrete Overlay to Protect and Tie Foundation Walls Together →

Be Sure to Coat the Surface of Rock to Reduce Chemical Degradation between old Rock & new Concrete!
URM Foundation Wall Strengthening;

CMU (or Cinder Block) Fnd Walls can be Strengthened by Grouting in Anchors and using Shotcrete Overlay.

Use Welded Wire Fabric in all Shotcrete Overlays.

Non-Structural Bracing and Anchorage – This Applies to any Home!
Non-Structural Items;

- This is important enough to warrant it's own chapter!
- TV's, Items on Shelves, Entertainment Centers, Pictures on Walls, etc.
- Bookshelves & Tall Furniture.
- Water Heaters, Air Conditioners, Cabinets.
- This can be similar to Baby Proofing a home!
- There is a lot the Owner can do to improve this a lot!

Non-Structural Bracing and Anchorage;

Anchor Water Heaters & Water Softeners

Water Heater Bracing
Detail 100
Non-Structural Bracing and Anchorage;

Bookshelves & Dressers →

Bookshelves Against Walls
Detail 104

Non-Structural Bracing and Anchorage;

Desktop Item Support →

Restraining Brackets & Straps
Detail 109
Non-Structural Bracing and Anchorage;

Protect or Anchor Things Sitting on Shelves →

Anchor Glassware and Fragile Art Work

Salt Lake City Emergency Management

“FIX THE BRICKS”

SLC Program Purposes:

- “Prevent collapse to reduce the number of deaths and injuries during the expected 7.0 earthquake by seismically retrofitting masonry homes in the Salt Lake City boundaries”.
- “Achieved by completing top life safety priority details – Roof-to-Wall attachments and Chimney Bracing”.

Figure 4.3.4.1-6  Shelf-mounted Items (NE)
FIX THE BRICKS

Grant Phases:

- Pre Application & Reviews
  - Scopes of Work
  - Seismic EHP (Environmental Historic Preservation)
  - BCA (Benefit/Cost Analysis)
- PDM (Pre-Disaster Mitigation) Application / Award
- Pre Construction / Bids / Homeowner Contract
- Construction / Documentation
- Closeout / FEMA Reimbursement

Pre-Application:

- SLC RESIDENTS SUBMIT REQUEST TO PARTICIPATE IN PROGRAM VIA WEBSITE
  - DURING CERTAIN TIMES OF THE YEAR, APPLICATIONS PEAK
    - EARTHQUAKE OCCURRENCE (UTAH OR THE WORLD)
    - NATIONAL PREPAREDNESS AWARENESS MONTHS APRIL/SEPTEMBER
- APPLICANTS NOT IN SLC BOUNDARIES ARE MAINTAINED FOR OTHER CITY’S IF THE CITIES LATER CHOOSE TO IMPLEMENT PROGRAM
- APPLICANTS NEVER DELETED
- MAINTAIN LISTS FOR APARTMENTS AND COMPLEXES
Scope of Work – FEMA Seismic Upgrade Plans

Prelim Plan issued after brief site visit.

Preapproved Details
From Utah Guide

Prelim Plan issued after brief site visit.
FIX THE BRICKS

Seismic EHP

Local

- Go through planning division to get Certificate of Approval
- Local historic preservation board has accepted details as outlined in SHPO agreement, although approved separately
- Requires extra documentation

National

- Go through housing and neighborhood development
- Details reviewed against are details based upon SHPO agreement with the State of Utah

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Bids and Contracts:

- The City notifies participants when they can begin looking for bids.
- Contractors competitively bid on partial seismic upgrades to the homes.
- Homeowner picks Contractor
- Contractor bid compared to Program formulated BCA.
FIX THE BRICKS

Construction & Documentation:

- Once required documentation is submitted, homeowners move forward with construction.
- Contractors documentation requirements:
  - Obtain stamped engineering drawings.
  - Obtain building permits.
  - Photos - seismic upgrade work during & after work
  - Invoicing.
  - Issue lien releases.

Stamped Construction Drawings

Issued with disclaimer limiting liability & noting limited scope.
Stamped Construction Drawings

Issued with disclaimer – later site visit may be needed to verify conditions.
Stamped Construction Drawings

Issued with disclaimer – later site visit may be needed to verify conditions.

FIX THE BRICKS

Photo documentation by Contractor

Chimney Bracing

Construction Photos – Chimney Bracing
Construction Photos – Roof to Wall Connections

FIX THE BRICKS

Closeout and Reimbursement:

- The City and Homeowner and Contractor conduct a closeout meeting.
- City check is given to Homeowner.
- Homeowner signs check over to Contractor.
- Exchange of invoices, receipts, and lien release.

FEMA & FIX THE BRICKS are trying to expand & fine tune the process, hoping to move into more complex multi-family.
Concerns & Other Issues:

Contractors are nervous;

- Liability issues for Contractors, concerns on 1 yr warrantee.
- What if the work does not do enough during an earthquake, and the Owner is unhappy?
- If cracks occur after upgrades complete, that are unrelated?
- What if they uncover work that makes it much more difficult and expensive to do the framing work?
- SLC has tried to teach the Owners that it’s only a hope for getting out of the home, not to save the home for future use!

Owners need to know this work is not earthquake proof!

Concerns & Other Issues:

Engineers are nervous;

- Liability is a difficult thing to pinpoint for Engineers. Keep a good disclaimer on the drawings to specify the limit of the scope of work and the liability limit.
- Make sure the Owner is aware of what they are buying!
- Be ready for a fast response for a site visit after the roof is open. Wet weather can raise havoc with an open roof!
- SLC has tried to teach the Owners that it’s only a hope for getting out of the home, not to save the home for future use!

Owners need to know this work is not earthquake proof!
Concerns & Other Issues:

Codes and Standards are being reviewed;

- Some concepts in the “Utah Guide” are being questioned due to poor performance of partially retrofit buildings in Christ Church and other relatively recent seismic events.
- This question raises the issue of whether the concept of “Voluntary Partial Seismic Upgrades” are valuable, and if the cost is better put into a full upgrade or a new building.
- The codes still allow such “stepped” upgrades within limits, but are more stringent changes coming?

  My opinion – I think stepped upgrades have their place, but more research and analysis is needed!

Concerns & Other Issues:

Codes and Standards are being reviewed;

- FEMA pre-standard P-1100 (updated in Oct 2019) calls for removal of URM chimneys in old wood frame homes, and if the chimneys are to stay then P-1100 calls for replacement with new framed units with brick veneer.
- This prestandard does not actually apply to URM dwellings, but as a pre-standard it may indicate where the concept is headed for URM homes.

  I wholeheartedly agree with this one! Tall and massive URM chimneys are at best a “Shaky” proposition!
Concerns & Other Issues:

Codes and Standards are being reviewed;

- The “Utah Guide for the Seismic Improvement of Unreinforced Masonry Dwellings” is currently under review and update to clarify several details and to correct several typos, etc.
- May be expanded to include one new home type, to increase consideration of additional non-structural issues, etc.

Use of the Utah Guide:

Both the “Utah Guide” & “Fix The Bricks” are only partial & limited voluntary upgrades!

- The “Utah Guide is only prescriptive details that need to be completed to give full data.
- Work top down in the Benefit/Cost & safety priorities.
- Verify the plan w/ Municipal Agencies for approval, but be ready for updates during construction.
- Suggest Owners prepare & follow a time & cost budget!

Remember – This is very limited, and not earthquake proof!
Summary -
Implement - What Can Be Done?

Take Down or Brace URM Parapets and other Special Features.

Implement - What Can Be Done?

Take Down or Brace URM Chimneys.
Implement - What Can Be Done?

Anchor URM Walls to Roofs and Floors and Anchor Walls to Foundations!

Many items Owners can do:

- Anchor Shelves & Entertainment Centers
- Anchor Bookshelves and Tall Furniture.
- Anchor Water Heaters.
- Anchor TVs and Computers.
Summary – Structural Upgrades and Strengthening for URM Dwellings;

- Weak structural items in URM dwellings create a real risk for occupants and other people.
- Only a very basic overview of typical seismically deficient URM dwellings are covered in the “Utah Guide”.
- Details from Chapters 5 & 6 offer typical generic types of strengthening of structural elements. It is very basic!!
- Permit plans need a lot of added content!
- Work with Owner’s budgets and needs!
- Do not overstate the value of the upgrades!

End of Presentation!

Our DESIRED OUTCOME – Improved Safety and Lower Risk of Collapse!

These improvements **DO NOT** bring the home up to current code, it provides only Partial Seismic Upgrades!

We want Owners to ask the Question;

Are you safe and comfortable when you land at home?