

Mobile Homes in 2020 Magna Earthquake & Implications

Presentation

Utah Seismic Safety Commission

Bruce Maison, S.E.

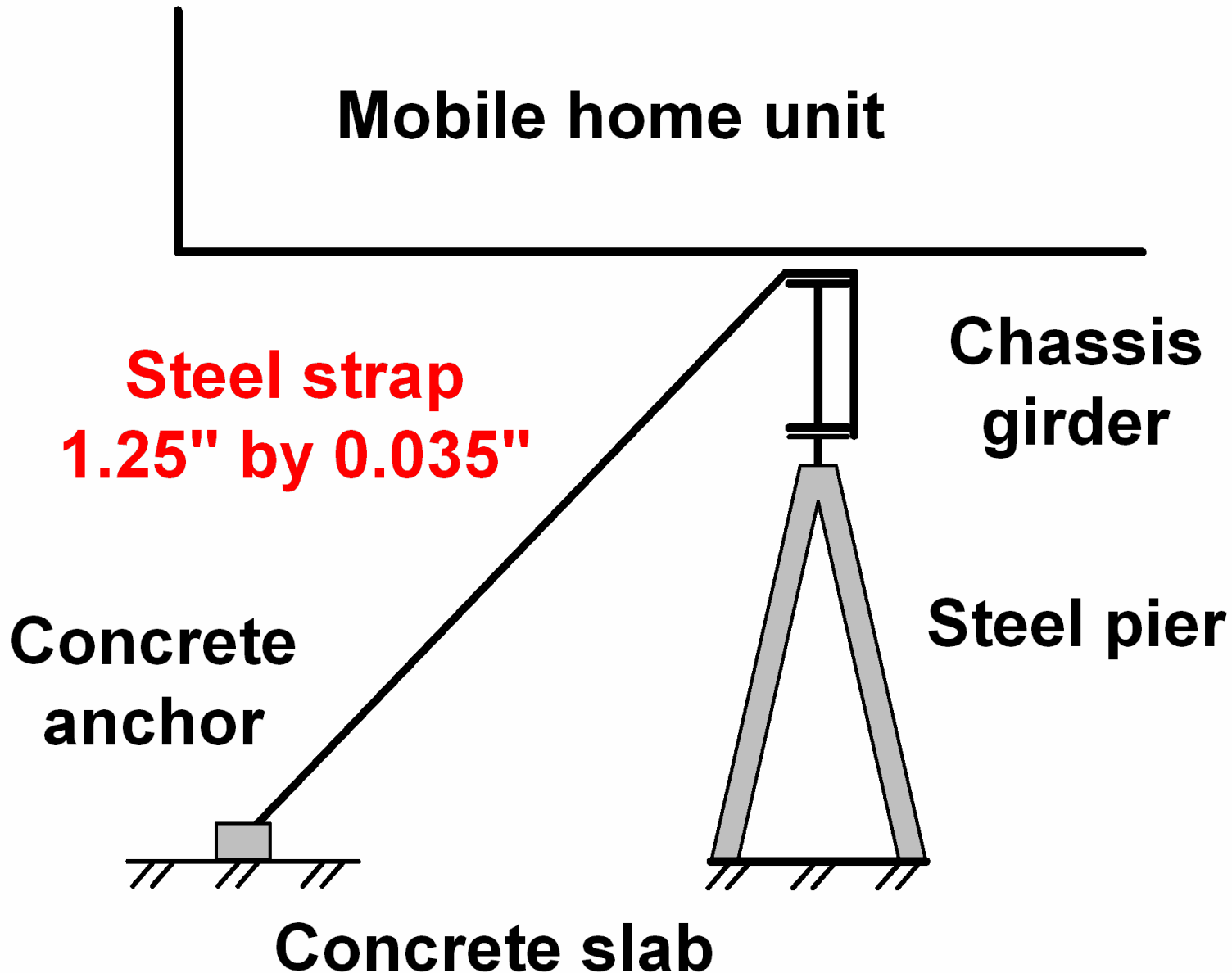
January 21, 2021

What Happened...?

(mobile homes *aka* manufactured homes)

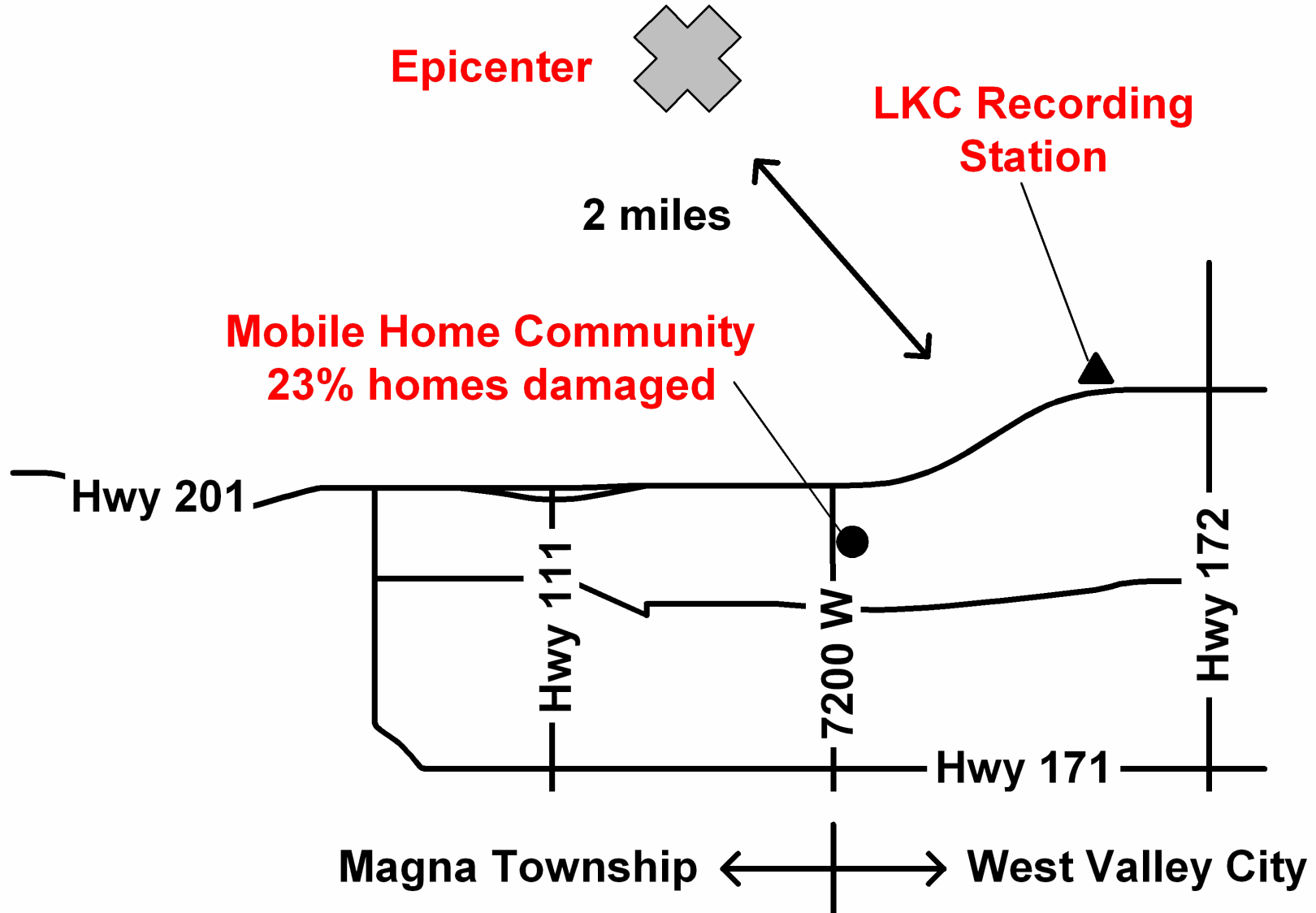
- EQ affected one community severely
- 48 of 206 MHs dislodged = 23%
 - Many fell to ground
 - No fire ignitions from gas leaks
- First EQ with significant damage to MHs having ***tie-down*** anchors
 - CA damage mostly in ***unanchored*** MHs
 - See report:
<https://geodata.geology.utah.gov/pages/view.php?ref=65351>

Tie-Down System



Community Close to Epicenter

Shaking duration 3 sec with high intensity



Double-Wide Home



Underneath Home



Chassis Girder

Girder Slipped Off Piers

Broken Strap

Corrosion Problem

Strap connection to
concrete foundation



Broken Tie-Down Straps





What To Do...?

- Improve Code enforcement
 - Proper tie-down installation
 - Moisture protection
- Understand “High Seismic Risk”
 - Can have big effect via “HUD Code”
 - Decide if needed in Utah

HUD Code

- Dept. of Housing and Urban Development
- Code of Federal Regulations
 - 24 CFR Parts 3285 & 3286
 - Home installation rules
 - <https://www.ecfr.gov/cgi-bin/text-idx?SID=a2c5655a37054c584f7dd6a0ed240fb8&node=pt24.5.3285&rgn=div5>

What About Moisture...?

- §3285.204 Ground moisture control.
 - (a) Vapor retarder. If the space under the home is to be enclosed with skirting or other materials, a vapor retarder **must be installed...**
 - (b) Vapor retarder material. A minimum of six mil polyethylene sheeting or its equivalent must be used.

What About Earthquakes...?

- §3285.2 Manufacturer installation instructions.
 - A professional engineer...must prepare and certify...whenever:
 - (4) Foundation support and anchoring systems are designed for use in areas subject to...**high seismic risk**
- §3285.402 Ground anchor installations.
 - Table 1 to §3285.402—Maximum Diagonal Tie-Down Strap Spacing, Wind Zone I
 - 15. Table does not consider flood or seismic loads and is **not intended** for use in flood or **seismic hazard areas**. In those areas, the anchorage system is to be designed by a professional engineer or architect.

INSTALLATION MANUAL



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9998 Old Placerville Rd.
Sacramento, CA 95827

Revised August 2017

- When an installer does not provide support and anchorage in accordance with the approved manufacturer's installation instructions, or encounters site conditions (such as areas that are subject to flood damage or high seismic risk) or other conditions that prevent the use of the instructions provided in this manual, the installer must obtain special site-specific instructions from the manufacturer or use a design approved by a registered engineer or registered architect.



Need for a stabilizing

system. The manufactured home must be secured against the wind by the use of an anchor assembly or an alternative foundation system. Where site or other conditions prohibit the use of the manufacturer's instructions, a registered engineer or registered architect must design the stabilizing system.

Flood and seismic forces.

The stabilizing system requirements in this chapter do not consider flood or seismic loads and are not intended for use in flood or seismic hazard areas. In those areas retain a registered engineer or registered architect to design the stabilizing system.

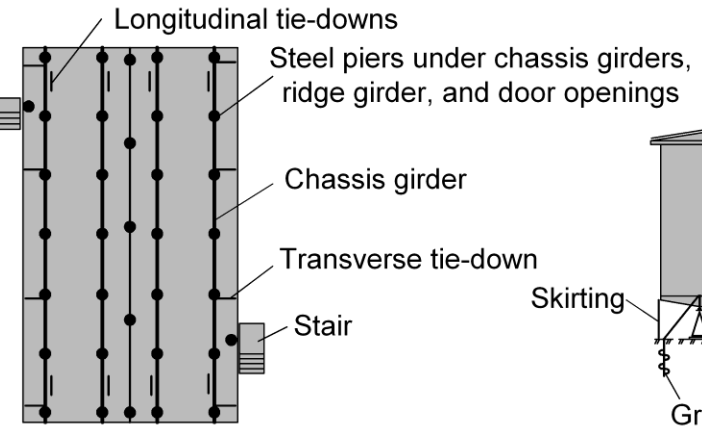


STEP 2. INSTALL GROUND MOISTURE RETARDER

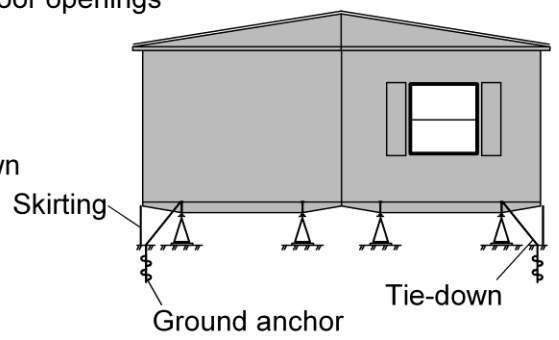
If the space under the home is to be enclosed with skirting or other materials, a ground moisture retarder of a minimum six mil thick polyethylene sheeting or equivalent must be installed covering the ground under the home. Moisture retarders are not required in arid regions (less than 15 inches of rainfall annually) with dry soil conditions. If on-

What About California...?

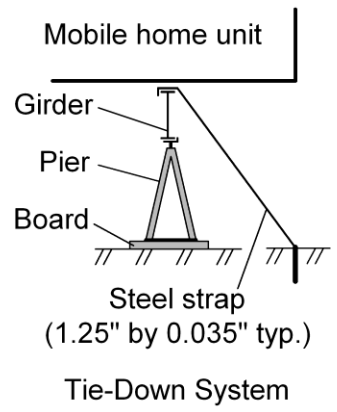
- Engineered Tie-Down Systems (ETS)
 - Designed for wind loading
 - Certified by CA
 - Required
- Earthquake Resistant Bracing Systems (ERBS)
 - Proprietary systems
 - Certified by CA
 - Optional



Plan at Foundation



Elevation



| STATE APPROVAL | |
|------------------------------------------------------------------------------------------------------------------------------|---------------------|
| ENGINEERED TIEDOWN SYSTEM APPROVED | |
| Approved does not authorize or approve any omission or deviation from requirements of applicable State laws and regulations. | |
| State of California Department of Housing and Community Development DIVISION OF CODES AND STANDARDS | |
| By <u>[Signature]</u> | Date <u>7/25/16</u> |
| (Signature) | |
| SPAN NO <u>ETS 107C</u> | |
| This Plan Approval Expires <u>7/24/20</u> | |



Regular: \$5 ea



Locking: \$14 ea



Questions...?

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