Ridgecrest Earthquake Sequence: Engineering Findings and Lessons

Impact on Manufactured Housing

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Locations of Manufactured Homes
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Anatomy of a Manufactured Home

Figure credit: FEMA Training “Improving the Performance of Manufactured Homes”
Anatomy of a Manufactured Home
Scope of Response

- Police
- California Department of Housing and Community Development (HCD)
- Press
- Various observers
Preliminary Findings

-Observed homes were almost exclusively supported on gravity piers only

-Most had no pier fastening to the chassis beam or wood “foundation”

-These homes were highly vulnerable
Preliminary Findings

-The most significant damage was concentrated in older, denser parks with less site preparation and fewer improvements.

-It was most concentrated in older homes in these parks.
Preliminary Findings

- Many homes were observed to have utility hookups within a foot of the home.
- While fire damage in this earthquake was limited to three homes, if homes had fallen in a different direction widespread fire could have resulted.
Preliminary Findings

-A notable number of homes were installed on what appeared to be permanent foundations

-Many were in parks that were identified to have home-owner associations, suggesting home owners also owned the land
Preliminary Findings

-Very newly installed homes (within months of the EQ) were seen to have either wind tie-down systems (above) or improved engineered tie-down systems (ETS) (below)

-Although the likely performance of these in moderate to major EQs is not known, they do represent a step in the right direction
Lessons (Re)Learned

Without intervention we should continue to anticipate similar performance in future earthquakes
Lessons (Re)Learned

-The most significant damage was concentrated in older, denser parks with less site preparation and fewer improvements, and older, smaller homes in these parks
-There appears to be an economic aspect that will need to be addressed to affect change for these homes
Bright Spots for the Future

- Very new installations were seen to have: improved bracing (ETS) devices, wind tie-down systems, permanent foundations

- It might be possible to communicate appropriate criteria for these systems and affect change in future performance
Challenges for the Future

- California's regulations for installation of manufactured homes continue to fall below federal minimum standards and have significant gaps in engineering logic.
- The installation industry is not likely to change significantly until regulations and guidelines can be corrected and improved.
Thank you!

Questions?