

# **Chimney Performance 2019**

## **Searles Valley Earthquakes**

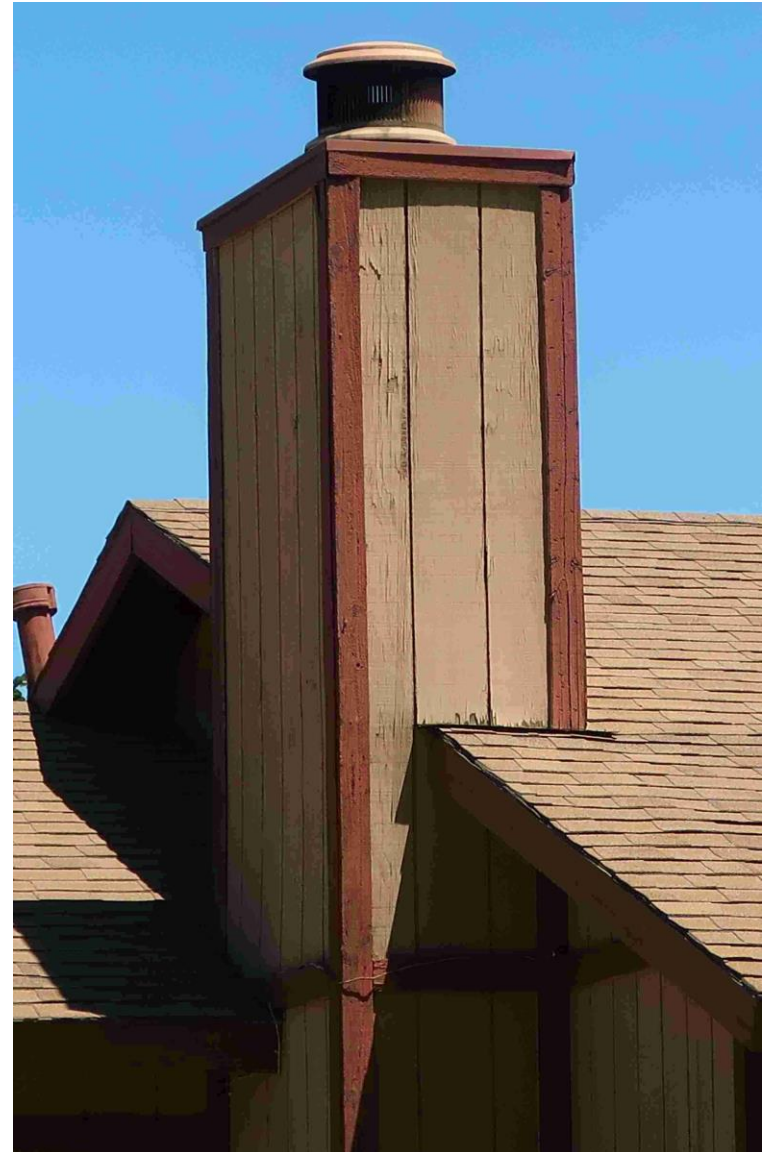
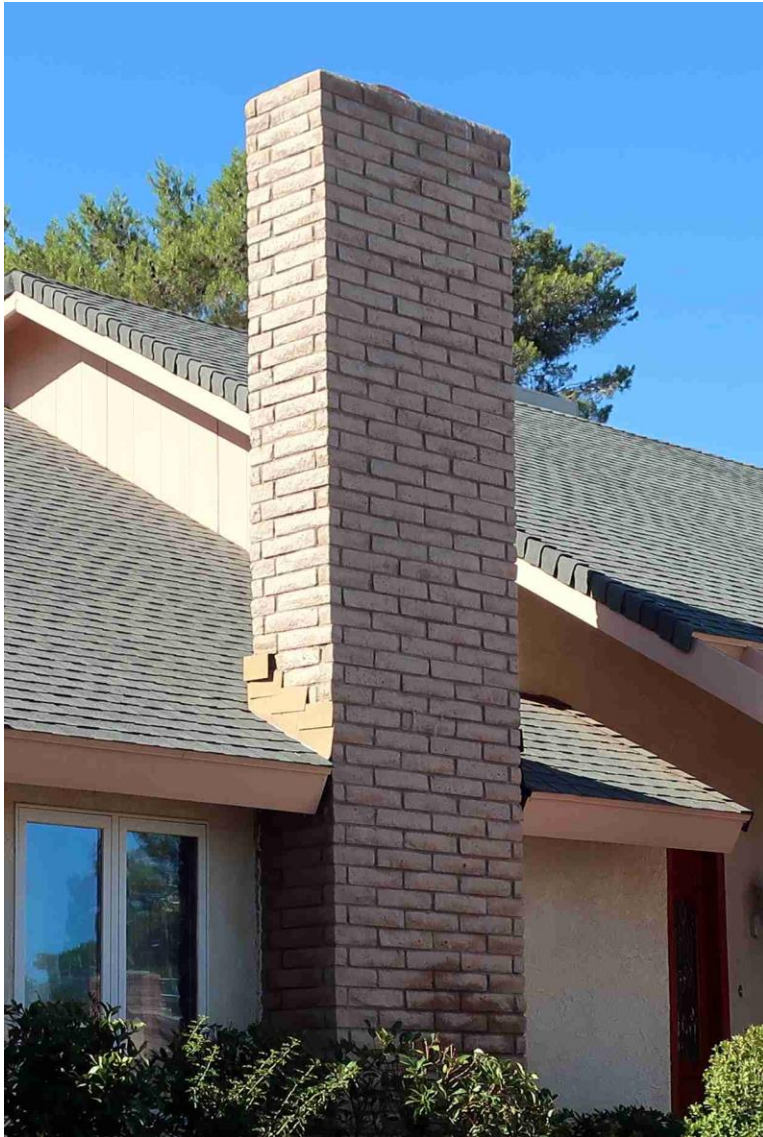
Bruce Maison, S.E.

August 2019

# Ridgecrest Chimneys

- Housing stock = 13,000 units
  - 75% built after 1970
  - Metal and masonry chimneys popular
- Metal-in-wood-chase
  - Very rugged...no damage
- Masonry
  - Code required reinforcement & strapping
- Some masonry chimneys damaged
  - Due to low quality construction

# Ridgecrest Chimneys



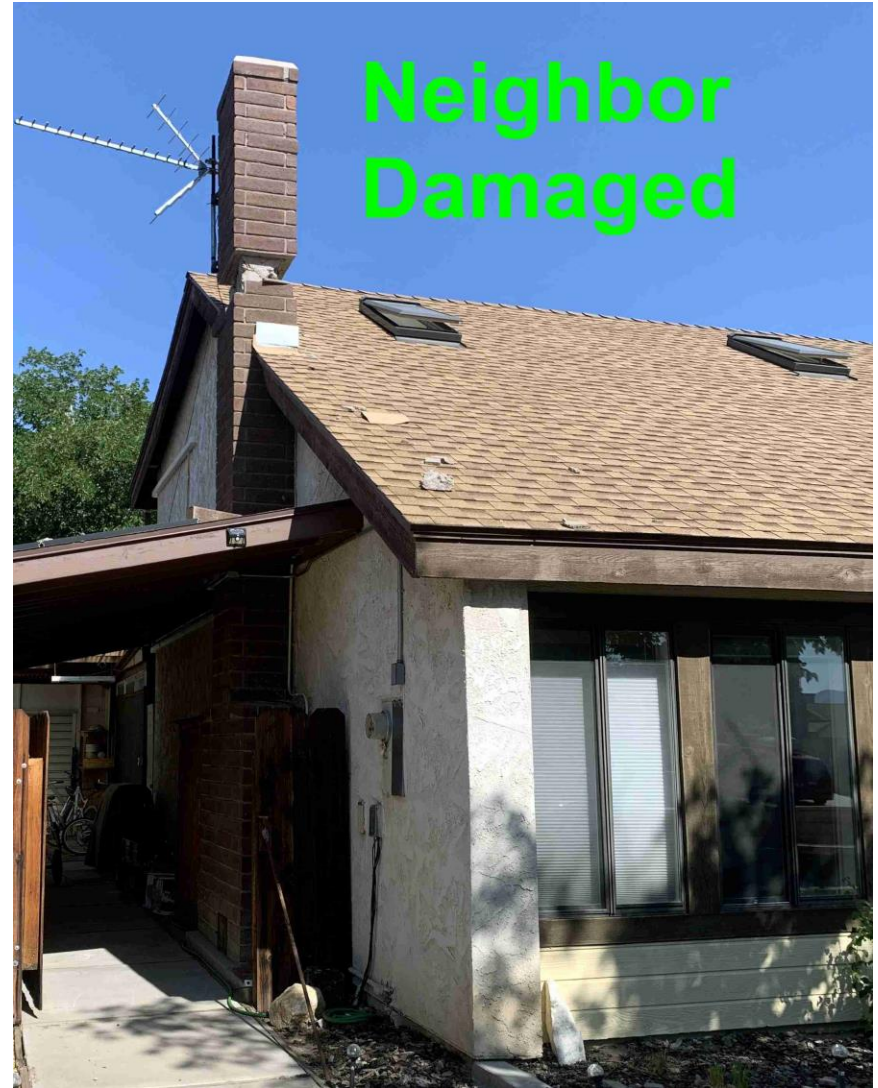
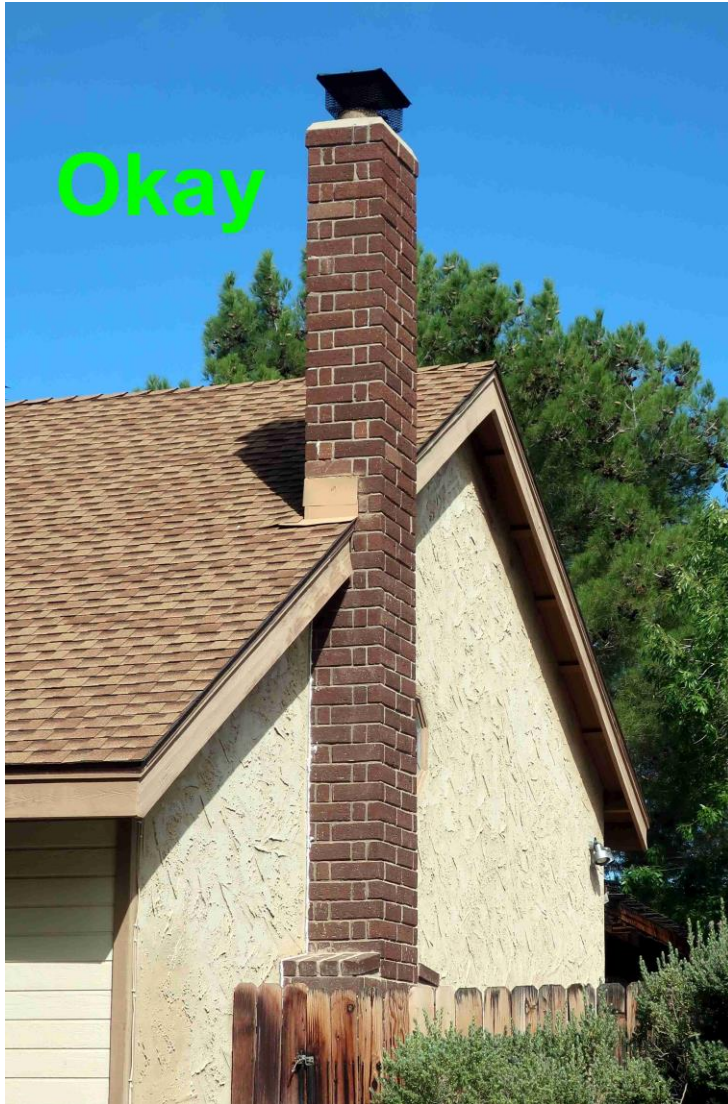


# Ridgecrest Chimneys





# Ridgecrest 1982 Tract Homes

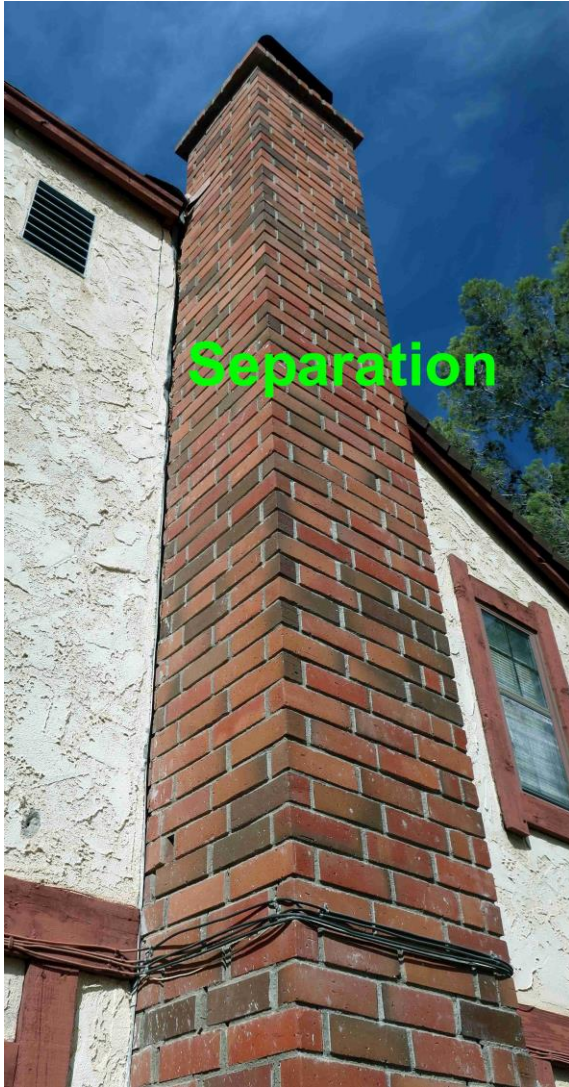


# Poor Grouting





# Chimney Pull-Away (Inadequate Strapping Likely)

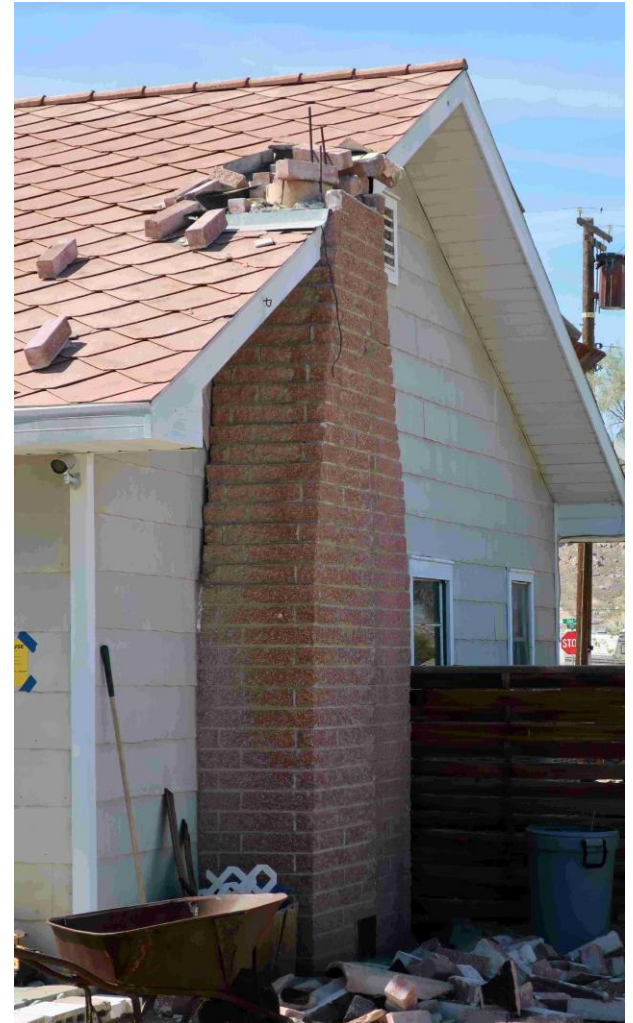
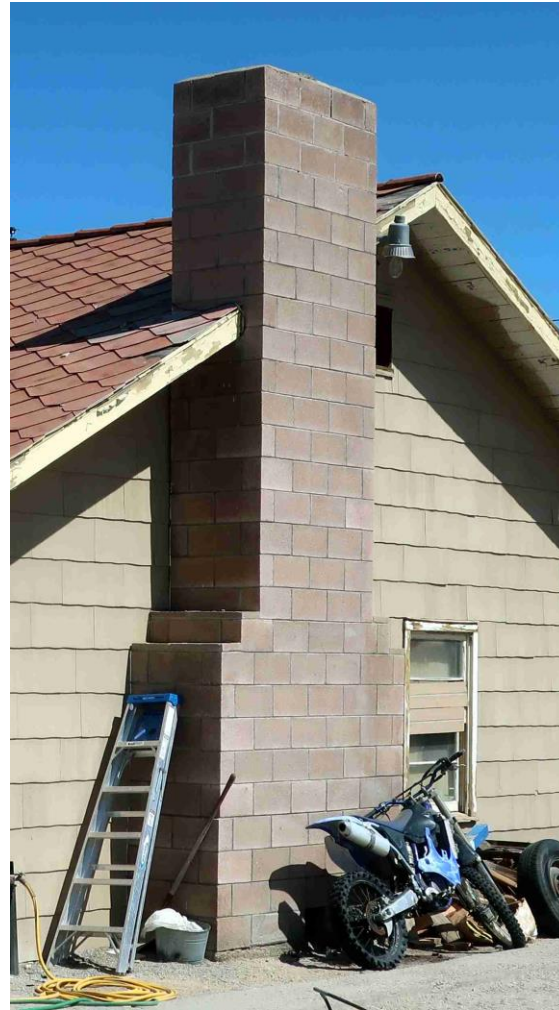


# Trona Chimneys

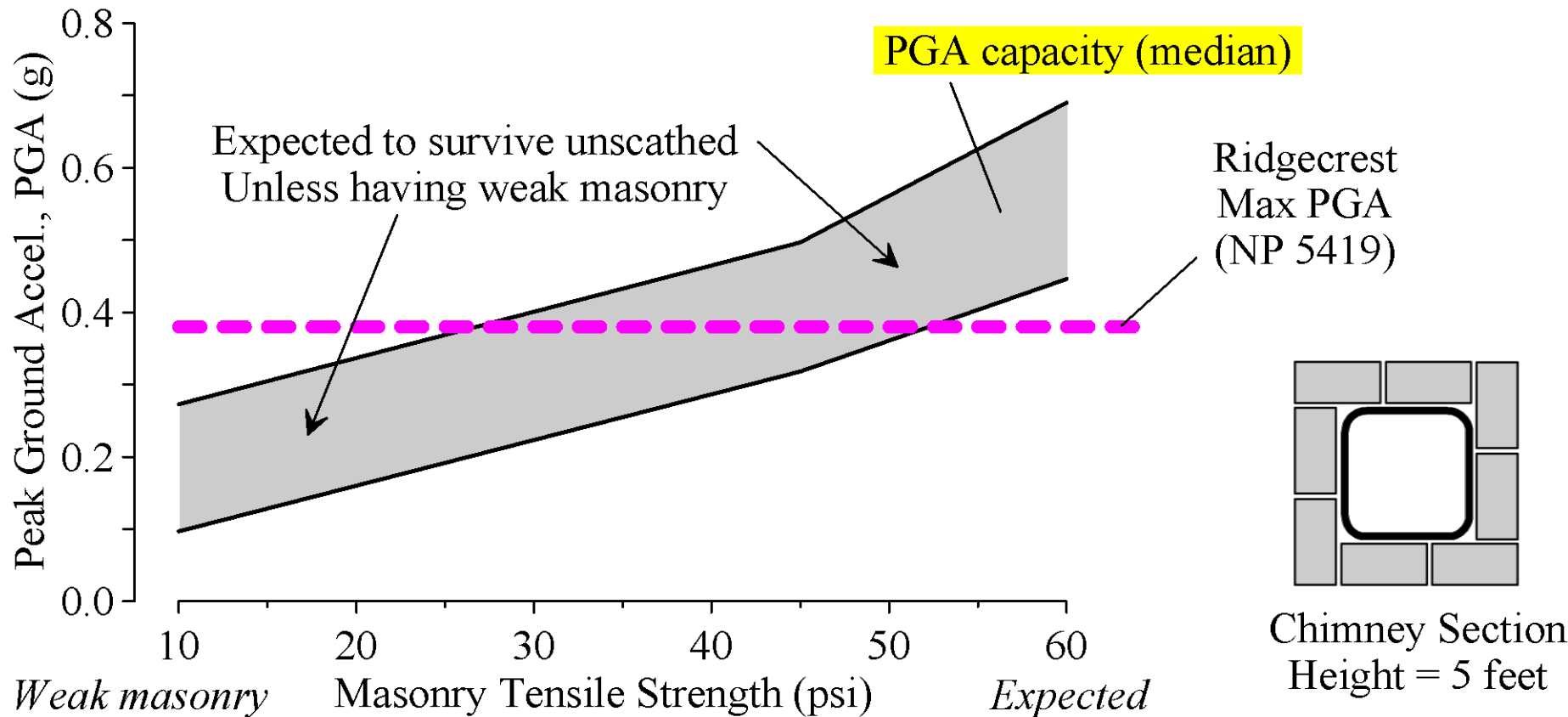
- Housing stock about 500 units
  - Many built in 1940s
  - Clay brick and concrete block chimneys
- Some chimneys collapsed
  - Rebar sticking out
  - Inadequate (or no) grouting
- Construction quality issue
  - Reinforced chimney should be unscathed



# Trona Chimneys

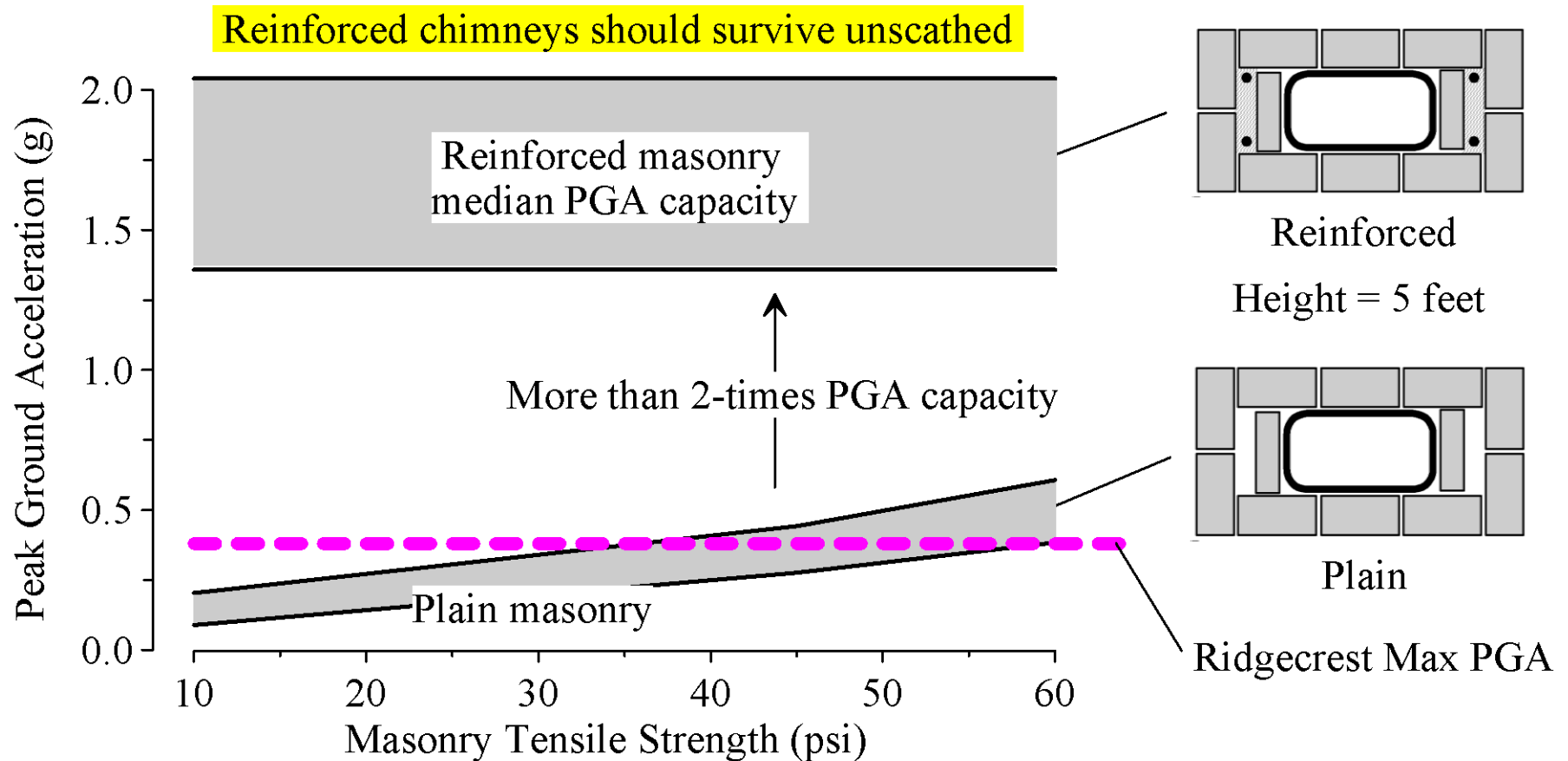


# Plain Masonry Fragility





# Reinforced Masonry Fragility



Maison & McDonald, 2018, Fragility Curves for Residential Masonry Chimneys, *Earthquake Spectra*, Aug

# Questions...?

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