Issue 10: Vertical Shaking

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Current Design Approach

• For Buildings and most nonbuilding structures, vertical shaking accounted for using:

\[ Ev = 0.2 S_{DS} D \]
Current Design Approach

- For Tanks and some nonbuilding structures, vertical shaking can be accounted for using vertical spectra:

![Graph showing design vertical response spectrum.](image)
Importance

• 2015 NEHRP Provisions & ASCE 7-16 require:
  – Evaluation of vertical effects in a more robust manner than applying $E_v$
  – Vertical ground motions required to evaluate discontinuous vertical elements in gravity force-resisting systems in NLRHA
Importance

• Requires vertical ground motion maps (in lieu of site-specific info or approximate methods)
Risks

• Ground motion models (GMMs):
  – available for the western U.S.
  – under development for the eastern U.S

• Limited risk that models will not be available the next generation maps

• Vertical motion parameter maps will add to the volume and complexity of maps
Resources

• Development of vertical ground motion maps is a USGS effort
  – needs to be included in their work plan

• PUC (and an associated IT) needs to develop the necessary requirements to include in the 2020 NEHRP Provisions.
Schedule

• Once the vertical ground motion maps are complete:
  – will take ~12 months to develop the associated design requirements

• Work could be done in parallel once the basic framework of the USGS product is defined