SEISMIC EARTH PRESSURES ON RETAINING WALLS

The following provides clarification on the County’s policy regarding the calculation of seismic earth pressures on retaining walls.

The total seismic load is the sum of the static and dynamic load increments:

\[ P_{ae} = P_{static} + \Delta P_{ae} = F_1 + F_2 \]

\( P_{static} \) is determined based on active or at-rest conditions. The dynamic load increment, \( \Delta P_{ae} \), shall be determined using the following equations for different wall type and backfill conditions (after Agusti and Sitar, 2013):

- Basement (restrained) walls with level backfill:
  \[ \Delta P_{ae} = \frac{1}{2} \gamma H^2 (0.68 PGA_M/g) \]

- Cantilever (unrestrained) wall with level backfill:
  \[ \Delta P_{ae} = \frac{1}{2} \gamma H^2 (0.42 PGA_M/g) \]

- Cantilever (unrestrained) wall with sloping backfill*:
  \[ \Delta P_{ae} = \frac{1}{2} \gamma H^2 (0.70 PGA_M/g) \]

*Applicable for sloping backfill that is no steeper than 2:1 (horizontal:vertical).

Peak ground acceleration, \( PGA_M \), shall be determined using the U.S. Geological Survey Seismic Design Map web tool available at the following link: [http://earthquake.usgs.gov/designmaps/us/application.php](http://earthquake.usgs.gov/designmaps/us/application.php). Note that \( PGA_M \) shall not be reduced when using the above equations.

For retaining walls with sloping backfill conditions, seismic slope displacements must also be evaluated to determine acceptable performance (computed displacement of 5 cm or less). The seismic displacement may be computed as the average of the methods of Bray and Travasarou (2007), Rathje and Antonakos (2011), and Song and Rodriguez-Marek (2015).

For cohesionless soils, the point of application of the dynamic load increment is at 1/3H, where H is the retained height. For soils with cohesion, the point of application may vary between 0.37H to 0.40H; for additional information, see Agusti and Sitar (2013) listed in the references.
REFERENCES


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