GEESD V Final Reference/Title/Abstract:

Wagner, N., Sitar, N. "Comparison of Pseudo-Static Limit Equilibrium and Elastic Wave Equation Analyses of Dynamic Earth Pressures on Retaining Structures", Proc. of the 5th Geotechnical Earthquake Engineering and Soil Dynamics, ASCE Geotechnical Special Publication No. 292, Brandenberg, S., Manzari, M. Ed., June 10-13, 2018, Austin, TX. DOI: https://doi.org/10.1061/9780784481479

Comparison of Pseudo-Static Limit Equilibrium and Elastic Wave Equation Analyses of Dynamic Earth Pressures on Retaining Structures

The seismic earth pressure increment is typically computed using either pseudo-static limit equilibrium methods or elastic wave equation analyses of the interaction between a retaining structure and backfill material, yet current interpretations of the two methods provide conflicting recommendations. The focus of this study is to compare the seismic earth pressure increment computed using the two methods. This approach is demonstrated by subjecting an initially uniform prototype site selected from standard site classifications to harmonic excitation in one-dimensional equivalent linear analyses. Then, the seismic earth pressure resultant for a rigid wall is computed using the two methods. The limit equilibrium approach utilizes the acceleration records from the equivalent linear analysis to compute a seismic coefficient, whereas the elastic solution incorporates the reduced modulus and damping from the final iteration of the analysis, as well as the relative displacement records. The results presented herein corroborate the findings of recent centrifuge experiments and associated analyses.

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Comparison of Analytic Methods for Dynamic Earth Pressures on Retaining Structures

The seismic earth pressure increment is typically computed using either pseudo-static limit equilibrium methods or elastic wave equation analyses of the interaction between a retaining structure and backfill material, yet current interpretations of the two methods provide conflicting recommendations. The focus of this study is to compare the seismic earth pressure increment computed using the two methods. This is demonstrated by subjecting an initially uniform prototype site selected from standard site classifications to harmonic excitation in one-dimensional equivalent linear analyses. Then, the seismic earth pressure resultant for a rigid wall is computed using the two methods. The limit equilibrium approach utilizes the acceleration records from the equivalent linear analysis to compute a seismic coefficient, whereas the elastic solution incorporates the reduced modulus and damping from the final iteration of the analysis, as well as the relative displacement records. The results herein corroborate the findings of recent analytical studies as compared to centrifuge experiments.