

STRESS LIMIT ANALYSIS SOLUTIONS FOR STATIC AND SEISMIC EARTH PRESSURES

Speaker

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Abstract

A family of closed-form stress plasticity solutions are presented for predicting static and seismic earth pressures on gravity retaining walls. The solutions are based on discontinuous stress fields and account for the following key parameters: (1) weight and friction angle of the soil material, (2) wall inclination, (3) backfill inclination, (4) wall roughness, (5) surcharge at soil surface, and (6) horizontal and vertical seismic acceleration. Both active and passive conditions are considered by means of different inclinations of the stress characteristics in the backfill. Although the formulation does not perfectly satisfy equilibrium at all points in the soil medium (and hence cannot be classified as a pure lower bound approach), extensive comparisons against more rigorous numerical results indicate that it consistently overestimates active pressures and under-predicts the passive so it is an approximate lower-bound approach rather than a mere predictor of soil thrust. Compared to the Coulomb and Mononobe-Okabe equations, the proposed theory is simpler, more accurate (especially for passive pressures) and conservative. Moreover, contrary to the aforementioned solutions, the formulation is symmetric as it can be expressed by a single equation describing both active and passive pressures using pertinent signs for the friction angle and wall roughness. The special case of Rankine stress fields involving straight stress characteristics is discussed.

Biography

Dr George Mylonakis is Professor of Civil Engineering at Khalifa University and the University of Bristol, U.K. specializing in geotechnical earthquake engineering and soil-structure interaction. He holds a Diploma in Civil Engineering from the NTUA, Greece (1993) and a Ph.D. from SUNY-Buffalo (1996). He is recipient of the Shamsheer Prakash Research Award (2002), the City University of New York's Performance Excellence Award (1999) and has been a Nominee for the 2001 Best Paper Award of the Japanese Geotechnical Society (2001). He has also supervised two research papers that won back-to-back best student paper awards by DFI in USA (2018, 2019). He has authored over 300 scientific publications (over 100 in peer-reviewed journals), delivered more than 50 invited talks around the world and refereed for 40 international journals. His work has attracted over 5000 citations by independent researchers. He has also served as Coordinator, Researcher and Reviewer in over 30 research projects sponsored by the National Science Foundation (NSF), the Multidisciplinary Center for Earthquake Engineering Research (MCEER), the Shimizu Corporation, the General Secretariat for Research and Technology and the Ministry of Education of Greece. He has served or currently serving as Editorial Board Member in the Journal of Geotechnical and Geoenvironmental Engineering, ASCE, the Journal of Earthquake and Structures, the Journal of Environmental Geotechnics, in Soil Dynamics and Earthquake Engineering, and in Géotechnique. Since 2021 he is the founding Editor-in-Chief in Geotechnics Journal.



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