Reliability Analysis of Counterfort Retaining Walls

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ABSTRACT: Traditionally, a constant factor of safety (usually 1.5) is adopted in the design of counterfort re-taining walls against instability failure, regardless of the actual uncertainties in the various design variables. This constant factor of safety may not be able to quantify the uncertainties associated with the random varia-bles. This paper presents the stability analysis of a typical counterfort retaining wall, accounting for uncertain-ties in the 'design variables' in the framework of probability theory. The first order reliability method (FORM), second order reliability method (SORM) and Monte Carlo Simulation (MCS) method are used in this study to evaluate the probability of failure associated with the various modes (both geotechnical and structural) of a typical counterfort retaining wall. Sensitivity analysis reveals that the angle of internal friction of the soil, is the most sensitive random variable, which affects all the modes of failure. Plots of reliability in-dex and factor of safety are generated for critical modes of failure, where the constant factor of safety (as rec-ommended in various design codes) is not able to get a desired reliability index/probability of failure.