

**A Numerical Model for Estimating Seismic Displacements
of Reinforced Steep Slopes**

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Abstract

A Numerical Model for Estimating Seismic Displacements of Reinforced
Steep Slopes

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Mechanically stabilized earth (MSE) structures such as retaining walls and steep slopes are becoming increasingly popular in the United States. Their use in seismically active areas, however, has been slowed by the lack of reliable procedures for prediction of their performance during earthquakes. Because the serviceability of such structures is closely related to the level of permanent deformation they experience, procedures for estimation of such deformations are needed.

This research project involved the development, calibration, and validation of a practical model for estimation of permanent displacement of MSE slopes. A modified Newmark-type model, referred to as the Reinforced Modified Newmark Model (RMNM), was developed to represent the main mechanisms by which permanent displacements can occur - soil shearing, reinforcement stretching, and pullout – using simple rheological elements. Experimental data, from previous shaking table and

centrifuge investigations conducted at the University of Washington and elsewhere, and the results of previous analytical studies were used to calibrate the RMNM. The resulting model, implemented in the computer program SPSLOPE, was shown to produce good predictions of experimental yield accelerations and permanent displacements for a wide range of reinforced slope conditions. The RMNM should be a useful tool for reinforced slope design.

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