# EFFECT OF SOIL REINFORCEMENT ON THE LIQUEFACTION POTENTIAL OF SATURATED SAND

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by

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# ABSTRACT

The objective of this study was to investigate the effect of soil reinforcement on the liquefaction resistance of saturated sand. A literature survey was made on the subjects of sand liquefaction and the general behavior of reinforced soil. It was concluded that no previous work existed regarding the dynamic behavior of reinforced sands. In order to investigate the dynamic behavior of a composite material consisting of sand and reinforcement inclusions, two hundred six cyclic triaxial tests were performed both on unreinforced Monterey No. 0 sand specimens and on specimens reinforced with four commercially available products used as inclusions. The four reinforcement materials were used in nine different configurations within the reinforced specimens. These configurations ranged from four discrete layers of fabric disks, to fifteen layers of fabric strips, to randomly distributed polymeric fibers. Detailed test methods and procedures are presented in the chapter on experimental procedure. The data and analysis of the cyclic triaxial tests are presented in the chapter on results.

On the basis of the results of the cyclic triaxial tests the following conclusions can be made:

1. Specimens reinforced with widely spaced (four layers in 18 centimeters) discrete layers of polypropelene fabric exhibited no significant increase in resistance to liquefaction. Specimens reinforced with widely spaced, discrete stainless steel mesh disks exhibited some

increased resistance to liquefaction at high stress ratios but no significant effect at low stress ratios.

2. Specimens reinforced with 0.38% by weight closely spaced (15 layers in 18 centimeters) discrete layers of polypropelene fabric strips exhibited some increased resistance to liquefaction at all stress ratios tested.

3. Specimens reinforced with 0.38% by weight randomly distributed polypropelene fibers exhibited a marked increase in resistance to liquefaction.

4. The more evenly distributed a reinforcement is throughout a specimen, the more effective it is in increasing the specimen's resistance to liquefaction.

5. For a given stress ratio and a given number of cyclic load applications, the axial strain in reinforced specimens was lower than in unreinforced specimens. In addition, the axial strain at initial liquefaction of reinforced specimens was lower than in unreinforced specimens.

6. Beyond initial liquefaction, randomly distributed fiber reinforced specimens withstood several additional cycles at high stress ratios compared to unreinforced specimens.