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# EFFECT OF STATIC SHEAR STRESS ON THE CYCLIC RESISTANCE OF SANDS IN SIMPLE SHEAR LOADING

by

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**Abstract:**

An experimental study of the effect of (initial) static shear stress on the undrained simple shear response of sands is presented. Liquefaction resistance of two sands, one generally contractive and the other dilative over a wide range of density and effective stress levels, were evaluated at various density and stress states. At a given density, the effect of static shear on the cyclic resistance of sands is dependent on the type of stress-strain response that ensues during the loading.

The general notion that static shear increases the cyclic resistance of sands at relatively high densities is not valid if the sand is contractive at the denser state. The $K_\alpha$ correction factor for sand at 80% relative density may be as low as about 0.6 for strain softening sand depending on the initial stress state. Routine industry practice of disregarding the $K_\alpha$ factor in dense sands may thus lead to unsafe designs in such materials.

The $K_\alpha$ values measured under cyclic simple shear loading are compared to the $K_\alpha$ values reported in the literature based on cyclic triaxial tests. Test results clearly indicate that $K_\alpha$ is also dependent on the loading mode. $K_\alpha$ correction factors proposed in the literature, in general, have been derived either from empirical data or from laboratory tests under triaxial loading mode. Extra attention is required when using those correction factors, since they may not appropriately account for the loading mode effects.

**Keywords:**

Cyclic resistance, Static shear, Liquefaction, Strain softening, Experimental soil mechanics, Geotechnical earthquake engineering.