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Behaviour of tire shred-sand mixtures

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Abstract: Tire shreds and tire shred - soil mixtures can be used as alternative backfill material in many geotechnical applications. The reuse of tire shreds may not only address growing environmental and economic concerns, but also help solve geotechnical problems associated with low soil shear strength. In this study, an experimental testing program was undertaken using a large-scale triaxial apparatus with the goal of evaluating the optimum dosage and aspect ratio of tire shreds within granular fills. The effects on shear strength of varying confining pressure and sand matrix relative density were also evaluated. The tire shred content and tire shred aspect ratio were found to influence the stress-strain and volumetric strain behaviour of the mixture. The axial strain at failure was found to increase with increasing tire shred content. Except for specimens of pure tire shreds and with comparatively high tire shred content, the test results showed a dilatant behaviour and a well-defined peak shear strength. The optimum tire shred content (i.e., the one leading to the maximum shear strength) was approximately 35%. For a given tire shred content, increasing the tire shred aspect ratio led to increasing overall shear strength, at least for the range of tire shred aspect ratios considered in this study. The shear strength improvement induced by tire shred inclusions was found to be sensitive to the applied confining pressure, with larger shear strength gains obtained under comparatively low confinement.

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