RE-IMPLEMENTATION AND MATERIAL CHARACTERIZATION OF SJÖBO SAND IN OPENRADIOSS: ENHANCING GROUND SHOCK PREDICTIONS THROUGH TRI-AXIAL AND WAVE VELOCITY TESTING

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This paper presents the re-implementation of a well-established compaction and shear strength model, originally available in AUTODYN and widely cited in the literature [1], into the open-source OpenRadioss solver. This model, essential for accurate predictions of ground shock wave propagation and attenuation, includes detailed material characterization of Sjöbo sand.

Key mechanical properties of Sjöbo sand were determined through tri-axial compression tests with isotropic consolidation, which provided the porous equation of state (EOS). Additionally, measurements of longitudinal and shear wave velocities at various pressure levels enabled the derivation of the elastic bulk sound speed and shear modulus. Tri-axial shear tests further established the pressure hardening yield surface, critical for modelling under different loading conditions. Sjöbo sand, characterized by a medium to coarse grain size distribution with a C60/C10 ratio close to 2, a dry density of approximately 1574 kg/m^3, and an average water content of 6.57%, was central to the validation of this re-implementation. The updated model in OpenRadioss now allows for enhanced accuracy in simulating the effects of buried explosive detonations on protective structures, providing a powerful and accessible alternative to AUTODYN.