Silica sand F-65 Ottawa has been chosen as the new standard sand for future centrifuge testing at the UC Davis Center for Geotechnical Modeling. Detailed characterization of the properties of this sand is needed to support numerical simulations of centrifuge test results.

The purpose of this research project is to characterize this sand in the laboratory including index, constant head permeability, one-dimensional compression (1DC), undrained monotonic, cyclic and pre-straining direct simple shear (DSS) tests. Index tests included specific gravity tests, and maximum and minimum dry densities. Constant head permeability tests comprised tests over a range of relative densities; it has been observed that permeability decreased with relative density. 1DC tests are included for loose and dense specimens loaded to different stress levels to study the influence of these two variables in the particle crushing of this sand; particle crushing increases with stress and decreases with density. DSS monotonic tests have been executed showing that dilation tendencies decrease with increasing void ratio and confining stress. DSS cyclic tests have been performed to study the cyclic resistance of this sand in specimens prepared to different initial densities consolidated to different stresses, showing that the cyclic resistance increases with density and decreases with consolidation stress. DSS pre-straining cyclic tests have been conducted by shearing the specimens with unique loading paths, to examine the role of prior loading history and consolidation on cyclic loading responses of Silica sand F-65 Ottawa; loose and dense specimens have been loaded with a cyclic stress ratio (CSR) that causes an accumulation of three percent shear strain in less than ten loading cycles; then, the shearing is stopped and the specimen is reconsolidated; this loading sequence repeats with the same CSR, until the sample accumulates a shear strain smaller than three percent in less than a hundred loading cycles; then, the CSR is increased and the loading process is repeated again. The number of cycles to three percent shear strain decreases with loading stages with the same CSR; however, the sand can accumulate three percent shear strain again when the CSR is increased.