Coarse additions affect plasticity and toughness of soil mixtures, Part I: Particle size

last compiled Fri. 2022-08-12, 12:49 PM

# Abstract

Sand-clay mixtures are commonly produced for use on baseball infield skin surfaces. Atterberg plasticity tests may be a useful way to characterize infield soils because the tests directly measure a soil’s response to changing water content.

Atterberg limit protocols mandate that sand >425 μm be removed before testing. This directive makes it difficult to compare mixes with different sand gradations because variation between two soils’ plasticity may be confounded by removing different amounts of sand.

Research was conducted to re-appraise the practice of removing ‘oversize’ particles prior to Atterberg limit testing.

Coarse additions corresponding to five individual mesh sizes of sand (2000-1000, 1000-500, 500-250, 250-150, and 150-53 μm) and silt (<53 μm) were mixed with a kaolinitic clay at 0-80% coarse addition. The liquid limit (LL) and plastic limit (PL) were determined for each mixture.

At low coarse addition contents, LL and PL decreased proportionally with sand or silt content. Mixes containing the largest particles adhered closely to a linear reduction in LL or PL with increasing coarse additions, while finer sands or silt showed elevated LL above 50% and elevated PL above 50%.

This research suggests particles 2000-425 μm should remain in infield mixes before Atterberg limit tests. These particles influence LL and PL less than finer additions which remain in the sample. These findings may improve the utility of Atterberg limit tests for evaluating baseball infield soils.