



Standard Test Method for Measuring the Shear Stresses of Powders Using the Peschl Rotational Split Level Shear Tester¹

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1. Scope

1.1 This test method is applied to the measurement of the mechanical properties of powders as a function of normal stress.

1.2 This apparatus is suitable measuring the properties of powders and other bulk solids, up to a particle size of 5000 micron.

1.3 This method comprises four different test procedures for the determination of powder mechanical properties.

Test A—Measurement of INTERNAL FRICTION as a function of normal stress.

Test B—Measurement of WALL FRICTION as a function of normal stress.

Test C—Measurement of BULK DENSITY as a function of normal stress and time.

Test D—Measurement of DEGRADATION as a function of normal stress.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:

D 653 Terminology Relating to Soil, Rocks, and Contained Fluids²

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *adhesion*—shear stress between the wall sample and powder at a normal stress of zero.

3.1.2 *consolidation normal stress*—the maximal normal stress applied to the specimen for executing an yield locus.

3.1.3 *consolidation step*—shearing repeated under the consolidation normal stress until the shear stress reaches a maximum τ_m value followed by a steady state value τ_s . This step is performed before each shear step.

3.1.4 *degradation*—change of particle size as result of shearing.

3.1.5 *dynamic wall friction*—calculated from the measured normal stress and the steady state shear stress after certain shearing.

3.1.6 *dynamic yield locus*—line calculated from measured values of normal stress and steady values of the shear stress.

3.1.7 *peak shear stress* (τ_m)—maximum shear stress at the beginning of yield - at the transition between elastic and plastic deformation.

3.1.8 *pre-consolidation normal stress* (σ_{np})—normal stress applied during the first part of the test in order to densify the specimen.

3.1.9 *shear step*—shear after the consolidation step, performed under the normal stress which is equal to or lower than the consolidation normal stress, until the shear stress reaches the peak value followed by a steady state value τ_s .

3.1.10 *split level*—level between the bottom and top cover of the shear cell defined by the transition of the cell base and ring where in the specimen the shear plane occurs.

3.1.11 *static wall friction*—calculated from the measured normal stress and the maximum shear stress at the beginning of yield.

3.1.12 *static yield locus*—line calculated from measured values of normal stress and peak values of the shear stress.

3.1.13 *steady shear stress* (τ_s)—steady state shear stress during the steady state (plastic) deformation.

4. Summary of Test Method

4.1 Measurement of Internal Friction as a Function of Normal Stress:

NOTE 1—Sequence of a standard shear test (Fig. 3):

(a) The upper graph shows the change of normal stress as a function of time. Before each shear step, a consolidation normal stress σ_n is applied to the specimen, to reestablish the consolidation condition.

(b) The next graph shows the change of shear stress during the consolidation step and the shear step.

(c) The next graphic shows the expansion and contraction of the specimen during various test stages.

(d) The lowest graph shows the change of rotational movement of the shear tester as function of time.

4.1.1 For each individual test, the powder is compacted with the pre-consolidation normal stress. It is then pretreated by

¹ This test method is under the jurisdiction of ASTM Committee D18 on Soil and Rock and is the direct responsibility of Subcommittee D18.24 on Characterization for Handling of Bulk Solids.

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² *Annual Book of ASTM Standards*, Vol 04.08.