Performance Examination - Aggregate

Standard Method of Test for Plastic Fines in Graded Aggregates and Soils by Use of the Sand Equivalent Test (AASHTO T 176-17)

Candidate Name: _____ **NICET ID:** _____

Apparatus	Trial 1	Trial 2
Graduated Plastic Cylinders (at least three recommended) Outside diameter 38.1 mm (1.5 in.) Inside diameter 31.0-32.0 mm (1.25 in.) Inside height 430 mm (17 in.) Graduations at 2.54 mm (0.1 in.), marked up to at least 15 in.		
Rubber Stopper That fits the cylinder		
Satisfactory Siphon Assembly: Irrigator tube with an outside diameter 6.4 mm (¼ in.) and length approximately 510 mm (20 in.). Pinched end with No. 60 holes (1.0 mm diameter) drilled in two places on end		
Weighted foot assembly Weighs 1000 ± 5 g with a guide fixed to the shaft		
Measuring Tin Diameter approximately 57 mm (2 ¼ in.) and capacity of 85 ± 5 ml		
Wide-mouth Funnel, diameter approximately 100 mm (4 in.)		
Clock or Watch Readable in minutes and seconds		
Shaker One of the following: *Note: Mechanical shaker required for referee testing.* **Mechanical:** 1. Operates at 175 ± 2 cycles per minute (127 to 135 cycles during testing period) 2. Securely fastened to firm and level mount **Manually operated:** Securely fastened to firm and level mount **Hand method:** An effective method of determining 9 ± 1 throw length		
Stock Calcium Chloride Solution *Note: Stock solution may be made without using any biocide (formaldehyde, glutaraldehyde, or Kathon), provided the storage time of the stock solution is not sufficient to promote fungi growth.*		
Verified Calcium Chloride Solution: 1. The temperature of the solution is 22 ± 3 °C (72 ± 5 °F). 2. The solution is free of biological growth. 3. Solution discarded if it not clear and transparent. 4. Solution is discarded if more than 30 days old.		
Oven Maintains 110 ± 5 °C (230 ± 9 °F)		
Work Surface Free of vibration and not exposed to direct sunlight		
Sieve 4.75-mm (No. 4)		
Straightedge or Spatula		
Quartering or Splitting Cloth		

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Procedures	Trial 1	Trial 2
Sample Preparation		
1. The sample obtained by T2, pulverized and passed through 4.75-mm (No. 4) sieve		
2. All fines cleaned from the No. 4 particles and included with No. 4 material		
3. The sample split or quartered to yield 500 to 750 g (1.1 to 1.6 lb.) of No. 4 material		
Sample Method 1 – Air Dry		
1. Enough 4.75-mm (No. 4) material split or quartered to fill the 85-ml (3-oz) tin slightly rounded		
2. While filling the measure, tap bottom edge of tin on a hard surface to consolidate material		
3. Tin struck off, level full, with the spatula or straightedge so material is level with top		
Sample Method 2 – Pre-Wet		
1. Moisture condition checked by tightly squeezing small portion in the palm of the hand, forming a cast		
2. Sample at proper water content (cast permits careful handling without breaking) a. If sample too dry (cast crumbles easily), add water and remix b. If sample too wet (shows free water), drain and air dry, mixing frequently		
3. If either (a) or (b) above occurred, the sample placed in the pan, covered with a lid or damp cloth, not touching sample, and allowed to stand for at least 15 minutes		
4. Sample placed on splitting cloth and mixed by alternately lifting each corner of the cloth and pulling it over sample toward the diagonally opposite corner, causing the material to be rolled		
5. When material appears to be homogeneous, mixing finished with the sample in a pile near the center of the cloth		
6. The tin measure pushed through the base of the pile with a free hand against pile opposite the measure		
7. The material fills tin to overflowing		
8. Material compacted into the tin with the palm of the hand		
9. Tin struck off, level full, with the spatula or straightedge so material is level with top		
Sample Method 3 – Reference / Referee Method (Mechanical Shaker required)		
1. The sample obtained by either Method 1 or 2		
2. Sample dried to constant mass at 110 ± 5 °C (230 ± 9 °F), and cooled to room temperature before testing		

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Method Procedures	Trial 1	Trial 2
1. Siphon 101.6 ± 2.5 mm (4 ± 0.1 in.) of working calcium chloride solution into a plastic cylinder		
2. Prepared sample poured from measuring tin into the cylinder using a funnel to avoid spillage		
3. Bottom of cylinder tapped sharply on the heel of hand several times to release air bubbles		
4. Wetted sample allowed to stand undisturbed for 10 ± 1 minute		
5. Stopper placed in cylinder and material loosened from the bottom by shaking using one of the following methods		
Mechanical Shaker Method (Reference Method)		
1. Stoppered cylinder placed in mechanical shaker and timer set		
2. Cylinder and contents shook for 45 ± 1 second (127 to 135 cycles during testing period)		
Manual Shaker Method		
1. Stoppered cylinder secured in hand shaker and stroke counter reset to zero		
2. Fingertips pushed against right-hand spring steel strap, and smooth oscillating motion maintained		
3. Tip of pointer reverses direction within marker limits		
4. Shaking action continued for 100 strokes in 45 ± 5 seconds		
Hand Method		
1. Cylinder held horizontally and shaken vigorously in horizontal linear motion from end to end		
2. Cylinder shaken 90 cycles (one cycle is a complete back and forth motion) in approx. 30 seconds using a throw of 229 ± 25 mm (9 ± 1 in.)		
3. Following shaking, cylinder set upright on the worktable and stopper removed		
Irrigation Method		
1. Irrigator tube inserted in cylinder and material rinsed from cylinder walls as irrigator is lowered		
2. Irrigator forced through the material to the bottom of the cylinder by gentle stabbing and twisting action while solution flows from irrigator tip		
3. Stabbing and twisting motion applied until cylinder filled to 381-mm (15-in.) mark		
4. Irrigator raised slowly without shutting off flow so liquid level is maintained at about 381-mm (15-in.)		
5. Final level shall be between top 2 graduations on tube but not above 381 mm (15 in.) when liquid is read at the bottom of the meniscus		

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Method Procedures (continued)	Trial 1	Trial 2
6. Cylinder and contents allowed to stand undisturbed for 20 minutes ± 15 seconds, timing started immediately after withdrawal of irrigator		
7. After sedimentation, record the level at the top of clay suspension (clay reading) If no clear line of demarcation, sample allowed to stand undisturbed until clay reading can be obtained, record clay suspension level and total sedimentation time If sedimentation time exceeds 30 minutes, rerun test using three individual samples of the same material, and record clay reading requiring shortest sedimentation time		
8. Weighted foot assembly gently lowered into the cylinder, without hitting the mouth of the cylinder		
9. When foot rests on sand, assembly tipped toward cylinder graduations until indicator touches cylinder		
10. Subtract 254 mm (10 in.) from level indicated by the extreme top edge of indicator and record as sand reading		
11. If clay or sand readings fall between 2.5-mm (0.1-in.) graduations, record level of the higher graduation		

Calculations	Trial 1	Trial 2
1. Sand equivalent calculated to 0.1 using the following equation: $SE = \frac{sand\ reading}{clay\ reading} \times 100$		
2. If the sand equivalent is not a whole number, report as next higher whole number		
3. If desired to average sand equivalent values and the average is not a whole number, report as next higher whole number		

First Attempt: Pass: _____ Fail: _____ **Second Attempt:** Pass: _____ Fail: _____

Comments:

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