



Performance Examination - Soils

Standard Method of Test for Density of Soil In-Place by the Sand-Cone Method (AASHTO T 191-14)

Candidate Name: _____ NICET ID: _____

Apparatus	Trial 1	Trial 2
Density Apparatus		
4 L (1 gal.) jar		
Detachable double funnel top connected by a cylindrical valve with opening 12.7 mm (½ in.) diameter		
Valve has stops preventing rotation past open or closed		
Base plate has a flanged center hole cast to receive a large funnel		
Inside diameter equal to or slightly less than the diameter of the opening of the base plate		
Of a known volume, calibrated according to T 19		
Sand		
Clean, dry, free-flowing, and uncemented, having few particles passing the 0.075-mm (No. 200) OR		
Retained on the 2.00 mm (No. 10) sieves		
Several bulk density determinations made and variation in bulk densities is less than 1%		
Balances		
Class G20 readable to 5 g or better (Class G2 readable to 0.1 g)		
Drying equipment for moisture content: stove, oven, or other suitable equipment.		
Moisture content containers.		

Procedures	Trial 1	Trial 2
Cone Correction Factor		
1. Empty apparatus placed upright on the firm level surface with the valve closed.		
2. Apparatus filled with sand that is dried and conditioned in the same state anticipated during testing (can be filled with or without the funnel attached).		
3. Mass of apparatus with sand determined.		
4. A base plate placed on a clean, level, plane surface.		
5. Sand cone inverted and the funnel seated in the recess of the base plate.		
6. Valve opened fully until sand stops flowing.		
7. Valve closed sharply and mass of apparatus and remaining sand determined.		
8. Mass of sand required to fill cone and base plate. (cone correction) Calculated by subtracting the final mass of apparatus and sand from the initial mass of apparatus and sand. (cone correction $C_C = m_1 - m_2$)		

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Procedures (continued)	Trial 1	Trial 2
9. Maximum variation between any one determination and average does not exceed 1%, average value used in calculations.		
10. Mass of sand required to fill apparatus determined according to Method A for each batch of sand.		
11. The volume of the funnel and base plate determined (volume equals the bulk density of sand divided by cone correction determined in Method A).		
12. Minimum of three determinations performed and the average value calculated.		
13. Maximum volume variation between any one determination and average does not exceed 1%, average value used in test calculations.		
Sand Bulk Density Determination		
Bulk Density Factor		
1. Sand removed during the Cone Correction determination replaced and valve closed.		
2. Mass of apparatus with sand determined (m_3).		
3. Calibration container placed on clean, level plane surface.		
4. A base plate placed on calibration container, apparatus inverted and seated in the recess of base plate.		
5. Valve opened fully until sand stops flowing.		
6. Valve closed sharply and mass of apparatus and remaining sand determined (m_4).		
Bulk Density Calculated as Follows		
7. $D_B = (m_3 - m_4 - C_C) / V_C$ D_B = bulk density of the sand m_3 = initial mass of apparatus and sand m_4 = final mass of apparatus and sand C_C = Cone Correction V_C = volume of calibration container		
8. At least three determinations made, and results averaged.		
9. Each container/bag of sand has unique cone correction and sand calibration factor.		
10. Each sand-cone and matched base plate has unique cone correction and bulk sand densities.		
11. The maximum variation between any one determination and average does not exceed 1%, average value used in calculations.		
Preparation		
1. Apparatus filled with sand that is dried and conditioned in the same state anticipated during testing (can be filled with or without the funnel attached).		
2. Mass of the filled sand cone apparatus determined.		

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Procedures (continued)	Trial 1	Trial 2
Testing		
1. Test location prepared so that it is a level plane and base plate seated on the prepared surface.		
2. Test hole dug inside the opening of the base plate without disturbing the soil that will bound the hole.		
3. All loosened soil placed in a container, loss of material and moisture avoided.		
4. Apparatus placed on the base plate.		
5. Valve opened, sand allowed to fill the hole, base plate, and funnel until sand stops flowing.		
6. Valve closed and mass of apparatus and remaining sand determined.		
7. Mass of moist material removed from test hole determined.		
8. Material mixed thoroughly and a representative sample removed for moisture determination.		
9. Volume of test hole by AASHTO standards.		

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

Exam Administration: Remote _____ In-Person _____

Comments:

Examiner Name: _____ Examiner Signature: _____ Date: _____