



Performance Examination - Soils

Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³))¹ (ASTM D1557-12e1)

Candidate Name: _____ NICET ID: _____

Apparatus	Trial 1	Trial 2
Manual Rammers		
Circular Face -2.5-kg (5.5-lb), with 4 vent holes approximately 19 mm from each end		
Ram Mass 5.48 – 5.52 lb (2.472 – 2.518 kg)		
Face Diameter 1.990 – 2.010 in. (50.55 – 51.05 mm)		
Drop Height 11.95 – 12.05 in. (303.8 – 305.8 mm)		
Mechanical Rammers		
Circular Face -2.5-kg (5.5-lb), 305 mm (12 in.) drop height		
Face Diameter 1.990 – 2.010 in. (50.55 – 51.05 mm)		
Mechanical Rammer-Sector Face -2.5-kg (5.5-lb), 305 mm (12 in.) drop height		
Face Dimensions radius 2.88 – 2.92 in. (73.2 – 74.2 mm)		
Metal Straightedges		
Beveled Edge scraping edge beveled if thicker than 1/8 in. (3 mm) Planar total length plane to 0.005 in. (0.1 mm) Length at least 250 mm (10 in.) long		
Sieves 19 mm (3/4 in.) and 4.75 mm (No. 4) and 3/8 in. (9.5mm)		
Sample Extruder <i>optional</i>		
Compaction Base Concrete Block (at least 90 kg or 200 lb) or concrete floor		
Balances Readable to 1 g, Class GP5		
Drying Oven At 110 ± 5 °C (230 ± 9 °F)		
Manual Rammers		
Circular Face -4.54-kg (10-lb), with 4 vent holes approximately 19 mm from each end		
Ram Mass 9.98 – 10.02 lb (4.527 – 4.545 kg)		
Face Diameter 1.990 – 2.010 in. (50.55 – 51.05 mm)		
Drop Height 17.95 – 18.05 in. (455.9 – 458.5 mm)		
Mechanical Rammers		
Circular Face 4.54-kg (10-lb), 457 mm (18 in.) drop height		
Face Diameter 1.990 – 2.010 in. (50.55 – 51.05 mm)		
Mechanical Rammer -4.54-kg (10-lb), 457 mm (18 in.) drop height		
Face Dimensions radius 2.88 – 2.92 in. (73.2 – 74.2 mm)		

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Apparatus (continued)	Trial 1	Trial 2
4-Inch Molds		
Detachable Collar detachable collar fits mold		
Internal Diameter 101.19 – 102.01 mm (3.984 – 4.016 in.)		
Height of Mold 4.566 – 4.602 in. (115.9 – 116.9 mm)		
Base Plate detachable, planar		
Diameter 100.99 - 102.21 mm (3.976 - 4.024 in.)		
Height 116.23 - 116.64 mm (4.576 - 4.592 in.)		
6-Inch Molds		
Internal Diameter 151.74 – 153.06 mm (5.974 – 6.026 in.)		
Height of Mold 4.566 – 4.602 in. (115.9 – 116.9 mm)		
Base Plate detachable, planar		
Diameter 151.41 - 153.39 mm (5.961 - 6.039 in.)		
Height 116.23 - 116.64 mm (4.576 - 4.592 in.)		
<i>Alternative type molds, volumes of 1/30 or 1/13.33 ft³ are acceptable if comparative tests are made against conforming cylindrical molds</i>		
<i>Split molds and tapered molds are acceptable. Split molds must meet specs when locked. Tapered molds, internal diameter no more than 0.200 in./linear foot of mold height</i>		

Procedures	Trial 1	Trial 2
1. First sample removed from sample container after appropriate standing time (see table)		
2. Mass of mold (and baseplate, if not trimming bottom) recorded		
3. Layer of soil placed in mold and soil lightly tamped with manual rammer or 2-in. diameter similar device until it is not in a fluffy or loose state (prior to compaction)		
4. Circular face mechanical rammer NOT used with 6-in. mold unless the mechanical compactor is designed to distribute the blows uniformly over the surface of the specimen		
5. Soil compacted with appropriate number layers and blows for method selected		
6. Following compaction of each of first four layers, any excess soil on mold walls trimmed. Trimmed soil must be discarded		
7. If top of soil after compaction is more than ¼ in. above rim of mold, is sample discarded		
8. If top of soil after compaction is below rim of mold, is sample discarded		
9. Collar (and base plate if applicable) removed and soil trimmed to top of mold with straightedge		
10. Any holes in top surface filled in with unused or trimmed soil		

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Procedures (continued)	Trial 1	Trial 2
11. Bottom of specimen trimmed (if mold volume was determined without base plate)		
12. Mold and contents weighed to nearest 5 g (0.01 lb) and wet density calculated		
13. Soil removed from mold, water content determined according to Table 1, Method B from D2216, whole sample is preferable [Min sample mass: (A): -No. 4 (100 g), (B): - ³ / ₈ in. (500 g), (C): - ³ / ₄ in. (2.5 kg)], samples less than 200 g must be weighed to within 0.01 g		
14. Samples placed in covered containers and allowed to stand for at least 12 hours		
15. Next prepared sample at 2% higher water content removed from container and used for testing		
16. Previously compacted soil not re-used for testing (may give an artificially higher unit weight)		
17. Steps 3 through 13 repeated for each increment of water until wet unit mass either decreases or stabilizes		
18. Water content and oven-dry unit mass calculated for each sample		
19. Unit weight to nearest 0.1 lb/ft ³ or 0.2 kN/m ³ , plotted on ordinate, water content to nearest 0.1% plotted on abscissa, and points connected with curve		
20. Water content at peak of curve taken as optimum water content		
21. Samples placed in covered containers and allowed to stand for at least 12 hours		
22. Next prepared sample at 2% higher water content removed from container and used for testing		
23. Previously compacted soil not re-used for testing (may give an artificially higher unit weight)		
24. Steps 3 through 13 repeated for each increment of water until wet unit mass either decreases or stabilizes		
25. Water content and oven-dry unit mass calculated for each sample		
26. Unit weight to nearest 0.1 lb/ft ³ or 0.2 kN/m ³ plotted on ordinate, water content to nearest 0.1% plotted on abscissa, and points connected with curve		
27. Water content at peak of curve taken as optimum water content		
28. Dry unit mass at optimum reported as maximum density, to nearest 0.1 lb/ft ³ (0.02 kN/m ³)		
29. 100% saturation curve plotted		
30. Water-filled volume of mold, linear volume, or average of the two used in calculations		
31. First sample removed from sample container after appropriate standing time (see table)		
32. Mass of mold (and baseplate, if not trimming bottom) recorded		
33. Layer of soil placed in mold and soil lightly tamped with manual rammer or 2-in. diameter similar device until it is not in a fluffy or loose state (prior to compaction)		
34. Mold rests on rigid and stable foundation during compaction		

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Procedures (continued)	Trial 1	Trial 2
35. Circular face mechanical rammer NOT used with 6-in. mold unless the mechanical compactor is designed to distribute the blows uniformly over the surface of the specimen		
36. Soil compacted with appropriate number layers and blows for method selected		
37. Following compaction of each of first four layers, any excess soil on mold walls trimmed. Trimmed soil must be discarded		
38. If top of soil after compaction is more than ¼ in. above rim of mold, is sample discarded		
39. If top of soil after compaction is below rim of mold, is sample discarded		
40. Collar (and base plate if applicable) removed and soil trimmed to top of mold with straightedge		
41. Any holes in top surface filled in with unused or trimmed soil		
42. Bottom of specimen trimmed (if mold volume was determined without base plate)		
43. Mold and contents weighed to nearest 5 g (0.01 lb) and wet density calculated		
44. Soil removed from mold, water content determined according to Table 1, Method B from D2216, whole sample is preferable [Min sample mass: (A): -No. 4 (100 g), (B): - ³ / ₈ in. (500 g), (C): - ³ / ₄ in (2.5 kg)], samples less than 200 g must be weighed to within 0.01 g.		
45. Next prepared sample at 2% higher water content removed from container and used for testing		
46. Previously compacted soil not re-used for testing (may give an artificially higher unit weight)		
47. Steps 3 through 13 repeated for each increment of water until wet unit mass either decreases or stabilizes		
48. Water content and oven-dry unit mass calculated for each sample		
49. Unit weight to nearest 0.1 lb/ft ³ or 0.2 kN/m ³ plotted on ordinate, water content to nearest 0.1% plotted on abscissa, and points connected with curve		
50. Water content at peak of curve taken as optimum water content		
51. Dry unit mass at optimum reported as maximum density, to nearest 0.1 lb/ft ³ (0.02 kN/m ³)		
52. 100% saturation curve plotted		
53. Water-filled volume of mold, linear volume, or average of the two used in calculations		

Classification	Minimum Standing Time, h
GW, GP, SW, SP	No requirement
GM, SM	3
All other soils	16

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Candidate Name: _____ NICET ID: _____

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

Exam Administration: Remote _____ In-Person _____

Comments:

Examiner Name: _____ Examiner Signature: _____ Date: _____