



Performance Examination - Soils

Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils (ASTM D4318-17e1)

Candidate Name: _____ NICET ID: _____

Apparatus	Trial 1	Trial 2
Liquid Limit Device		
Base: hard rubber Resilience rebound of 77 to 90% (7.577 to 8.856 in.) (19.25 to 22.50 cm) Rubber feet hardness, A-durometer < 60 (feet attached to base) Wear of base, spot < 10 mm		
Base Dimensions: 125 ± 2 mm x 150 ± 2 mm x 50 ± 2 mm		
Wear of Cup: > 0.1 mm (0.004 in.) groove		
Wear of Cup Hanger: pivot does not bind, no side to side movement > 3 mm (1/8 in.)		
Wear of cam, not worn to lose contact		
Grooving tool inspected frequently		
Height of Drop: 10 ± 0.2 mm drop height		
Cup, Brass: mass including hanger of 185 to 215 g		
Cam: 180 degree of cam rotation		
Carriage: removable pin		
Motor Drive: 2 ± 0.1 revolutions per second		
Flat Grooving Tool		
Plastic or non-corroding metal		
Tip Width: 1.9 - 2.1 mm		
Depth of Tip: 7.9 - 8.1 mm		
Plastic Limit		
Ground Glass Plate: > 30 mm (12 in.) square, 1 cm (3/8 in.) thick		
<i>Plastic limit rolling device (optional)</i>		
Spatula With blade about 2 cm (3/4 in.) wide and 10-13 cm (4-5 in.) long		
Sieve(s): 200-mm (8-in.) and 425-µm (No. 40) as noted in E11 and having a rim of at least 5 cm (2 in.) above the mesh; (a 2.00-mm (No. 10) sieve with same requirements may also be used)		
Wash Bottle		
Drying Oven: 110 ± 5 °C		
Washing Pan		

Examiner Name: _____ Examiner Signature: _____ Date: _____



Performance Examination - Soils

Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils (ASTM D4318-17e1)

Candidate Name: _____ NICET ID: _____

Procedures	Trial 1	Trial 2
Determining the Liquid Limit of Soils (Wet Preparation)		
1. The specimen consists of 150 to 200 g of material passing the 425- μ m (No. 40) sieve.		
2. Water content adjusted by mixing the sample with a spatula on a glass plate or in mixing dish while adding distilled or demineralized water (sample may be soaked in a dish before mixing).		
3. If using Method A (Multipoint), water content adjusted to 25-35 blow consistency.		
4. If using Method B (One-Point), water content adjusted to 20-30 blow consistency.		
5. If plus 425- μ m material is encountered, particles removed by hand or by pressing through a 425- μ m sieve.		
6. If concretions, shells, or other fragile particles are found, these items removed.		
7. The sample placed in covered storage dish for at least 16 hours and remixed immediately before the test.		
8. Samples containing material retained on 425- μ m (No. 40) sieve (wet preparation)		
9. The specimen consists of enough material to provide 150 to 200 g of material passing the 425- μ m sieve.		
10. The sample placed in pan or dish and distilled or demineralized water added to cover soil.		
11. Sample soaked until all lumps softened.		
12. If a large amount of material retained on 425- μ m (No. 40) sieve; no more than 500 g of soil (mixed in water) poured on a 425- μ m (No. 40) sieve (or 2.00-mm and 425- μ m sieve nest) in a clean pan and washed through a sieve.		
13. Water added to 13 mm (0.5 in.) above sieve wire surface and material retained on 425- μ m.		
14. Material retained on 425- μ m sieve discarded.		
15. Water content reduced to approaching liquid limit by <i>one or more of the following</i> : a. Drying at room temperature or warm air currents (required method for samples containing soluble salts). b. Decanting clear water from the surface of the suspension. c. Filtering in a Buchner funnel, by using filter candles, or draining in a colander or Paris dish.		
16. Water content adjusted by mixing the sample with a spatula on a glass plate or in a mixing dish.		
17. If using Method A (Multipoint), water content adjusted to 25-35 blow consistency.		
18. If using Method B (One-Point), water content adjusted to 20-30 blow consistency.		
19. The sample placed in a covered storage container for at least 16 hours and remixed immediately.		

Examiner Name: _____ Examiner Signature: _____ Date: _____



Performance Examination - Soils

Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils (ASTM D4318-17e1)

Candidate Name: _____ NICET ID: _____

Procedures (continued)	Trial 1	Trial 2
Determining the Liquid Limit of Soils (Dry Preparation)		
1. Dry preparation should only be used when the dry preparation method is specified, otherwise use a wet preparation method.		
2. Specimen sufficient to provide 150 to 200 g of material passing 425- μ m (No. 40) sieve.		
3. Sample dried at no more than 60 °C (140 °F).		
4. Soil pulverized with rubber covered pestle or by other means that does not cause sample particle breakdown.		
5. Sample separated on a 425- μ m (No. 40) sieve and pulverized until all fine material passes through the sieve.		
6. Material retained on 425- μ m (No. 40) sieve soaked in a small amount of water and poured over a 425- μ m sieve, catching the wash water and suspended fines.		
7. Plus 425- μ m material discarded and wash water with suspended fines added to minus 425- μ m dry material.		
8. Water content adjusted by mixing the sample with a spatula on a glass plate or in mixing dish while adding distilled or demineralized water (sample may be soaked in a dish before mixing).		
9. If using Method A (Multipoint), water content adjusted to 25-35 blow consistency.		
10. If using Method B (One-Point), water content adjusted to 20-30 blow consistency.		
11. The sample placed in a covered storage container for at least 16 hours and remixed immediately before the test.		
Method A (Multipoint) Procedure		
1. Liquid limit device previously inspected for wear and height of cup drop checked.		
2. Part of mixture put in a cup and spread with a spatula until 10 mm deep at maximum thickness.		
3. As few strokes of a spatula as possible using care to avoid entrapment of air bubbles.		
4. The unused wet soil in storage dish covered with a wet towel (or other means) during the test.		
5. Flat Grooving Tool: Groove formed in soil by drawing tool, beveled edge forward, through soil on a line joining highest point through lowest point on the rim of the cup or curved grooving tool.		
6. Tearing along groove and slippage of cake avoided. Cup lifted & dropped twice per second until the bottom of groove closes about 13 mm (0.5 in.) in 25 to 35 blows.		
7. If the air bubble caused premature groove closure, soil reformed in the cup, adding soil to fill in the groove, and above procedure repeated number of blows required to close groove recorded.		
8. Container covered and then weighed to 0.01 g.		

Examiner Name: _____ Examiner Signature: _____ Date: _____



Performance Examination - Soils

Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils (ASTM D4318-17e1)

Candidate Name: _____ NICET ID: _____

Procedures (continued)	Trial 1	Trial 2
9. Water content determined according to D2216.		
10. Soil remaining in cup returned to mixing dish.		
11. Steps repeated for closure in 20 to 30 blows.		
12. Steps repeated for closure in 15 to 25 blows.		
13. Lids removed before specimens are placed in the oven to dry.		
14. Water content calculated by the following equation: % moisture = mass of water x 100 mass of oven dry soil		
15. The liquid limit value reported to the nearest whole number.		
Method B (One-Point) Procedure		
1. Liquid limit device previously inspected for wear and height of cup drop checked.		
2. Once testing has begun, no additional dry soil added to the sample.		
3. Part of mixture put in a cup and spread with a spatula until 10 mm deep at maximum thickness.		
4. Care was taken to avoid entrapment of air bubbles and a few strokes of a spatula as possible used.		
5. Excess soil returned to mixing dish.		
6. The unused wet soil in storage dish covered (with a wet towel or by other means) during the test.		
7. The soil in dish divided through the centerline of the follower with no more than six strokes of the curved tool and only last stroke of grooving tool scrape the bottom of the cup.		
8. Tearing along groove and slippage of cake avoided (and no crumbs of soil on the bottom of cup).		
9. Cup lifted and dropped twice per second until the bottom of groove closes about 13 mm (0.5 in.) in 20 to 30 blows.		
10. The base of the device not held with a hand while turning crank.		
11. If the target number of blows is not met, water content adjusted and steps 2 through 10 repeated.		
12. If the groove closes inside the target blow range, number of blows recorded.		
13. After groove closes inside target blow count range, first moisture content is taken - a slice of soil, the width of a spatula, extending across cake at right angles to groove and including the portion that flowed together removed from the dish, placed in a weighed container and covered.		
14. Sample immediately returned to mixing dish and combined with unused soil, with no additional water added.		
15. Soil reformed in cup adding soil to replace that removed.		

Examiner Name: _____ Examiner Signature: _____ Date: _____



Performance Examination - Soils

Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils (ASTM D4318-17e1)

Candidate Name: _____ NICET ID: _____

Procedures (continued)	Trial 1	Trial 2
16. Steps repeated.		
17. Is the test restarted (and closure data/moisture sample discarded)?		
18. Second closure obtained within 2 blows of the first closure.		
19. Second closure obtained is not within the 20 to 30 blow range.		
20. If the second closure is acceptable (the number of blows for the second closure recorded.		
21. Slice of soil, the width of a spatula, extending across cake at right angles to groove and including the portion that flowed together removed from the dish and placed in a container (recorded as second moisture sample).		
22. Container covered and then weighed to 0.01 g.		
23. Lids removed before specimens are placed in the oven to dry.		
24. Water content determined according to D2216.		
25. Water content calculated by the following equation: % moisture = mass of water x 100		
26. Mass of oven dry soil.		
27. Liquid limit calculated.		

Determining the Plastic Limit and Plasticity Index of Soils

1. Sample is 20 g or more of liquid limit material.		
2. Mixed with distilled or demineralized water in a mixing dish.		
3. 1.5 to 2-g portion of the 20-g ball selected and formed into an ellipsoidal mass.		
4. Ellipsoidal mass placed on the bottom plate.		
5. Top plate placed in contact with simultaneous downward force and back and forth motion applied to top plate.		
6. Plate comes in contact with side rails within 2 minutes.		
7. Soil thread not allowed to contact side rails during rolling.		
8. Mass rolled between fingers or palm and plate/paper (or between the top and the bottom plate of rolling device) to form 3.2-mm diameter thread.		
9. The rate of rolling between 80 to 90 strokes per minute (counting stroke as one complete motion of hand forward and back to the starting position.		
10. Mass rolled for no more than two minutes to obtain correct thread diameter.		
11. When thread diameter is 3.2 mm, thread broken into several pieces.		
12. Pieces squeezed together between thumbs and fingers into ellipsoidal mass.		
13. Steps repeated until thread crumbles and soil can no longer roll into a thread.		
14. The operator does not attempt to produce failure at exactly 3.2 mm diameter.		

Examiner Name: _____ Examiner Signature: _____ Date: _____



Performance Examination - Soils

Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils (ASTM D4318-17e1)

Candidate Name: _____ NICET ID: _____

Procedures (continued)	Trial 1	Trial 2
15. Crumbled pieces placed in tared container and container immediately covered.		
16. Steps repeated until two containers each contain at least 6 g of crumbled soil.		
17. Mass of specimen and container determined to 0.01 g.		
18. Specimen dried and water content determined according to D2216.		
19. Plastic limit calculated by the following equation: % moisture = mass of water x 100		
20. Mass of oven dry soil.		
21. Plastic limit calculated by averaging the results of two specimens.		
22. Plastic limit reported to at least the nearest whole number.		
23. Plastic index calculated from: $PI = \text{Liquid limit} - \text{Plastic limit}$.		

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

Exam Administration: Remote _____ In-Person _____

Comments:

Examiner Name: _____ Examiner Signature: _____ Date: _____