



Central Mix Aggregate Technician Proficiency Test

Student Name (print) _____

Company Name (If VDOT- Dist./ Div.) _____

Company Address _____

Employer's Phone No. _____

Email Address _____

Certification _____ Recertification _____ Check whichever applies.

		Test		Retest	
		P	F	P	F
AASHTO T2	Sampling Aggregates	___	___	___	___
AASHTO T248	Reducing Samples of Aggregate to Testing Size	___	___	___	___
AASHTO T255	Total Moisture Content of Aggregate by Drying	___	___	___	___
AASHTO T27	Sieve Analysis of Fine & Coarse Aggregate	___	___	___	___
AASHTO T11	Materials Finer than No. 200 in Mineral Aggregates by Washing	___	___	___	___
AASHTO T89	Determining the Liquid Limit of Soils	___	___	___	___
AASHTO T90	Determine Plastic Limit & Plasticity Index of Soils	___	___	___	___
AASHTO T19	Unit Weight and Voids in Aggregate	___	___	___	___

Comments: _____

Student signature _____

Date _____

Proctor's signature _____

Date _____

(proctor submitting this form)

Proctor's name (print) _____

**AASHTO T2-91
SAMPLING OF AGGREGATES**

PROCEDURE		
Selection of Method – Student must demonstrate one method and be able to list the remaining methods for the proctor.	Test	Retest
Sampling from Stockpiles – If the student chooses this method they must demonstrate sampling each of the following materials listed below. (Coarse aggregate, fine aggregate and coarse and fine aggregate).		
<i>Coarse aggregate:</i>		
Board shoved vertically into the stockpile just above sampling point?		
Increments taken from the top third, mid-point, and bottom third of the volume of the pile?		
<i>Fine aggregate:</i>		
Outer layer removed and sample taken from underlying material?		
Appropriate sampling tube randomly inserted to obtain increments?		
Minimum of five increments taken?		
<i>Coarse and Fine Aggregate:</i>		
Increments combined to form field sample?		
Size of field sample equals or exceeds minimum mass needed or stated in Table 1?		
Sampling from Roadway (Base and Subbase)		
Samples taken randomly using a method such as Practice D 3665?		
Specific areas clearly marked from which each increment will be removed? (a metal template placed over the area is helpful)		
At least three approximately increments taken from roadway at full depth?		
Care taken to exclude any underlying material not part of material being sampled?		
Increments combined to form field sample?		
Minimum size of field sample equals or meets minimum mass needed or as determined from Table 1?		

**AASHTO T2-91
SAMPLING OF AGGREGATES**

PROCEDURE		
	Test	Retest
Sampling from Transportation Units		
<i>Coarse Aggregate:</i>		
Three or more trenches made across the unit at points that will, from visual appearance, give a reasonable estimate of the characteristics of the load?		
Trench bottom is approximately level and at least 0.3 m (1 ft) in width and in depth below the surface?		
Minimum of three increments taken from approximately equally spaced points along each trench?		
Material obtained by pushing a shovel downward in to the material?		
<i>Fine Aggregate:</i>		
Appropriate sampling tube inserted to remove the predetermined number of increments?		
<i>Coarse and Fine Aggregate:</i>		
All increments combined to form a field sample?		
Minimum size of field sample equals or meets minimum mass needed or as determined from Table 1?		
Sampling from a Flowing Aggregate Stream (Bins or Belt Discharge)		
Sampling from the Conveyor Belt		

**AASHTO T2-91
SAMPLING OF AGGREGATES**

TABLE 1 Size of Samples	
Maximum Nominal Size Of Aggregates^A	Approximate Minimum Mass of Field Samples, lb (kg)^B
<i>Fine Aggregate</i>	
No. 8 (2.36 mm)	25 (10)
No. 4 (4.75 mm)	25 (10)
<i>Coarse Aggregate</i>	
3/8 in (9.5 mm)	25 (10)
1/2 in (12.5 mm)	35 (15)
3/4 in (19.0 mm)	55 (25)
1 in. (25.0 mm)	110 (50)
1 1/2 in (37.5 mm)	165 (75)
2 in. (50 mm)	220 (100)
2 1/2 in. (63 mm)	275 (125)
3 in. (75 mm)	330 (150)
3 1/2 in. (90 mm)	385 (175)

^A For processed aggregate the nominal maximum size of particles is the largest sieve size listed in the applicable specification, upon which any material is permitted to be retained.

^B For combined coarse and fine aggregate (for example, base or subbase) minimum weight shall be coarse aggregate minimum plus 25 lb (10 kg).

Date Tested: _____

Proctor: _____

Retest Date: _____

Proctor: _____

**AASHTO T248-02
REDUCING SAMPLES OF AGGREGATE
TO TESTING SIZE**

PROCEDURE		
Selection of Method – Student must demonstrate one of the test methods and be able to list the remaining two methods for the proctor.	Test	Retest
<u>Method A - Splitting</u>		
1. Material spread uniformly on feeder?		
2. Rate of feed slow enough so that sample flows freely through chutes?		
3. Material in one pan re-split until desired weight is obtained?		
Method B - Quartering		
1. Sample placed on clean, hard, and level surface? (See Note below)		
2. Mixed by turning over 3 times with shovel or by raising canvas and pulling over pile?		
3. Conical pile formed?		
4. Pile flattened to uniform thickness and diameter?		
5. Diameter about 4 to 8 times thickness?		
6. Divided into 4 equal portions with shovel or trowel? See Note below)		
7. Two diagonally opposite quarters, including all fine material, removed?		
8. Cleared space between quarters brushed clean?		
9. Process continued until desired sample size is obtained?		
Note: The sample may be placed upon a canvas quartering cloth and a stick or pipe may be placed under the cloth to divide the pile into quarters.		
Method C - Miniature Stockpile Sampling (Fine Aggregate Only)		
1. Sample placed on clean, hard, and level surface?		
2. Material thoroughly mixed by turning over three times?		
3. Small stockpile formed?		
4. At least 5 grab samples taken at random with sampling thief, small scoop, or spoon?		

Date Tested: _____

Proctor: _____

Retest Date: _____

Proctor: _____

AASHTO T255-00
TOTAL EVAPORABLE MOISTURE CONTENT OF AGGREGATE BY DRYING

APPARATUS		
	Test	Retest
1. <u>Source of heat</u> : A. If close temperature control <u>is</u> required: (1) Ventilated oven, maintains 110±5°C (230±9°F) B. If close temp. control <u>is not</u> required (One of the following): (1) Electric or gas hot plate? or (2) Electric heat lamps? or (3) Ventilated microwave oven?		
2. <u>Sample container</u> : (a) Not affected by heat? (Nonmetallic for microwave use) (b) Of sufficient volume? (c) Of such shape that depth of sample does not exceed 1/5 of least lateral dimension?		
3. <u>Stirrer</u> , metal spoon or spatula of convenient size?		
4. <u>Balance</u> , readable to 0.1% of sample mass or better?		
PROCEDURE		
	Test	Retest
1. Representative test sample obtained?		
2. Test sample mass conforms to following: No. 4 - .5 kg, 3/8 in. - 1.5 kg, 1/2 in. - 2 kg, 3/4 in. - 3 kg, 1 in. - 4 kg, 1 1/2 in. - 6 kg, 2 in. - 8 kg, 2 1/2 in. - 10 kg		
3. Mass determined to nearest 0.1 percent of original dry mass?		
4. Loss of moisture avoided prior to determining the mass?		
5. Sample dried by a suitable heat source? Heat source: _____		
6. If heated by means other than a controlled temperature oven, is sample stirred to avoid localized overheating? (Stirring optional for microwave use)		
7. Sample dried to constant mass and mass determined to nearest 0.1 percent of the total original dry sample mass?		

Date Tested: _____

Proctor: _____

Retest Date: _____

Proctor: _____

**AASHTO T27-99
SIEVE ANALYSIS OF FINE
& COARSE AGGREGATE**

APPARATUS			Test	Retest
1. <u>Sieves</u> - See General Apparatus sieve page.				
2. <u>Balance</u> : AASHTO: Readable to 0.1% of sample mass?				
3. <u>Mechanical sieve shakers</u> (Optional), meet adequacy of sieving requirements?				
4. <u>Oven</u> , maintains $110 \pm 5^\circ \text{C}$ ($230 \pm 9^\circ \text{F}$)?				
PROCEDURE				
Student does not have to demonstrate shaker time efficiency check. Student will describe the procedure to proctor. <u>It is suggested that student run base mix sample.</u>			Test	Retest
<u>Mixtures of Fine and Coarse Aggregate</u>				
Sample size the same as sample for coarse aggregates?				
Fine Aggregate	Initial mass:	Final mass:		
1. Sample obtained by T248?				
2. Minimum sample mass 300 g?				
3. (Optional) If T11 is used, does the dry nest include a 75- μm (No. 200) sieve?				
4. Sample dried to constant mass at $110 \pm 5^\circ \text{C}$ ($230 \pm 9^\circ \text{F}$)?				
5. AASHTO: Mass determined to nearest 0.1 percent of original dry mass? Note: If specimen consists of material leftover after T11 then Step 5 does not apply because it is assumed that total specimen mass was determined as part of that test.				
6. AASHTO: Sieving continued until not more than 0.5% by mass of the total specimen passes a given sieve during one minute of continuous hand sieving?				
Sieve size:	Mass retained on sieve:	Mass passing sieve:		
7. Residue on each sieve weighed to 0.1% of original dry mass?				
8. Sieves not overloaded - mass of residue on each sieve [finer than 4.75-mm (No. 4) sieves] less than 7 kg/m^2 of sieving surface (200 g for 8" diameter sieve, 511 g for 12" diameter sieve)				
9. Total mass of material after sieving agrees with mass before sieving to within 0.3% (If not, do not use for acceptance testing)?				
10. Percentages calculated to the nearest 0.1% and reported to the nearest whole number (except 75- μm - if less than 10%, percentages reported to nearest 0.1%)?				
11. Percentage calculations based on <u>original</u> dry sample mass, <u>including</u> the passing 75- μm fraction (if T11 was used)?				

**AASHTO T27-99
SIEVE ANALYSIS OF FINE &
COARSE AGGREGATE**

PROCEDURE			Test	Retest
Coarse Aggregate	Initial mass:	Final mass:		
1. If whole field sample is not used, is test sample obtained by T248?				
2. Sample dried to constant mass at $110 \pm 5^\circ \text{C}$ ($230 \pm 9^\circ \text{F}$)?				
3. AASHTO: Mass determined to nearest 0.1 percent of original dry mass? Note: If specimen consists of material leftover after T11 then Step 3 does not apply because it is assumed that total specimen mass was determined as part of that test.				
4. Minimum sample mass: 3/8 in. - 1 kg; 2 in. - 2 kg; 3/4 in. - 5 kg; 1 in. - 10 kg; 1 1/2 in. - 15 kg; 2 in. - 20 kg; 2 1/2 in. - 35 kg; 3 in. - 60 kg; 3 1/2 in. - 100 kg?				
5. If hand sieving, particles not forced to pass through openings?				
6. AASHTO: Sieving continued until not more than 0.5% by mass of the total specimen passes a given sieve during one minute of continuous hand sieving?*				
Sieve size:	Mass retained on sieve:	Mass passing sieve:		
7. Residue on each sieve weighed to 0.1 percent of original dry mass?				
8. Sieves not overloaded: (a) Mass of residue on each sieve [finer than 4.75-mm (No. 4) sieves] does not exceed 7 kg/m^2 of sieving surface (200 g for 8" diameter sieve 511 g for 12" diameter sieve) (b) Mass of residue on each sieve [for 4.75-mm (No. 4) sieves and larger] does not exceed $2.5 \times (\text{sieve opening, mm}) \times (\text{effective sieving area, m}^2)$?				
9. Total mass of material after sieving agrees with mass before sieving to within 0.3% (If not, do not use for acceptance testing)?				
10. Percentages calculated to nearest 0.1% and reported to nearest whole number?				
11. Percentage calculations based on <u>original</u> dry sample mass, <u>including</u> the passing 75- μm fraction (if T11 was used)?				
* Check by hand with 8-in. diameter sieve.				

Date Tested: _____

Proctor: _____

Retest Date: _____

Proctor: _____

AASHTO T11-97
MATERIALS FINER THAN 75- μ m (No. 200) SIEVE
IN MINERAL AGGREGATES BY WASHING

APPARATUS												
	Test	Retest										
1. <u>Balance</u> : AASHTO: Readable to 0.1% of sample mass?												
2. <u>Sieves</u> (Nest of two): (a) 75- μ m (No. 200)? (b) AASHTO: Protective sieve 2.36 mm (No.8) to 1.18 mm (No. 16)?												
3. <u>Container</u> , size and condition OK?												
4. <u>Oven</u> , maintains 110 \pm 5°C (230 \pm 9°F)?												
5. <u>Mechanical washing apparatus</u> (optional): (a) Results are consistent with those obtained using manual methods? (b) Degradation of the sample is avoided?												
PROCEDURE												
Method A – Washing with Plain Water												
Student may either hand wash or use a mechanical washer to perform the test. Student must demonstrate Method A and list the remaining method for the proctor. Student washed sample: by hand _____ mechanical washer _____	Test	Retest										
1. Test sample obtained by T248?												
2. Test sample mass conforms to following table? <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="text-align: center;">Nominal Maximum Size</th> <th style="text-align: center;">Minimum Mass, g</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">No.4 or finer</td> <td style="text-align: center;">300</td> </tr> <tr> <td style="text-align: center;">3/8 in</td> <td style="text-align: center;">1000</td> </tr> <tr> <td style="text-align: center;">3/4 in</td> <td style="text-align: center;">2500</td> </tr> <tr> <td style="text-align: center;">1 1/2 in or larger</td> <td style="text-align: center;">5000</td> </tr> </tbody> </table> <p>Note: If same sample is to be tested as in T27, minimum mass should conform to requirements of that method.</p>	Nominal Maximum Size	Minimum Mass, g	No.4 or finer	300	3/8 in	1000	3/4 in	2500	1 1/2 in or larger	5000		
Nominal Maximum Size	Minimum Mass, g											
No.4 or finer	300											
3/8 in	1000											
3/4 in	2500											
1 1/2 in or larger	5000											
3. Test sample dried to constant mass at 110 \pm 5°C (230 \pm 9° F)?												
4. Test sample mass determined to 0.1 percent of the original dry sample mass?												
5. Placed in container and covered with water?												
6. Contents of container vigorously agitated?												
7. Complete separation of coarse and fine particles?												
8. Wash water poured through sieve nest?												
9. Wash water free of coarse particles?												
10. Operation continued until wash water is clear?												
11. Material on sieves returned to washed sample?												

**AASHTO T11-97
MATERIALS FINER THAN 75- μ m (No. 200) SIEVE
IN MINERAL AGGREGATES BY WASHING**

PROCEDURE (continued)		
	Test	Retest
12. Excess water decanted from washed sample only through the 75- μ m sieve (No. 200 sieve)?		
13. Washed aggregate dried to constant mass at 10 \pm 5°C (230 \pm 9°F)?		
14. Washed aggregate mass determined to 0.1 percent of the original sample mass?		
15. Calculation: % less than 75 μ m = $\frac{\text{Orig. dry mass} - \text{Final dry mass}}{\text{Original dry mass}} \times 100?$		
16. Method B – Washing with a Wetting Agent		
Comments:		

Date Tested: _____

Proctor: _____

Retest Date: _____

Proctor: _____

AASHTO T89-02
DETERMINING THE LIQUID LIMIT OF SOILS

APPARATUS		
	Test	Retest
1. Grooving Tools (a) Gage end (square) 9.8 mm – 10.20 mm? (b) Cutting edge width 1.9 – 2.1 mm? (c) Curved end thickness 9.9 – 10.1 mm? (d) Radius of curve 22.2 mm (7/8 in.)? (e) Curve length approximately 90°?		
2. Liquid Limit Device (a) Maker? (b) Hand Operated? (c) Electric 1.9-2.1 drops/second? (d) Base of hard rubber? (e) Base diameter mm AASTHO 125 ± 5 x 150 ± 5 x 50 ± 5? (f) Base has four feet made of resilient material? (g) Brass cup thickness 1.9 – 2.1 mm? (h) Cup depth 26-28 mm (i) Little or no groove in cup? (j) Rim not worn to less than ½ original thickness? (k) Cam and followers not worn excessively? AASHTO: Point of contact on cup or base less than 13 mm diameter?		
3. Porcelain Dish or similar mixing dish, about 115 mm in diameter?		
4. Spatula or pill knife about 75 to 100 mm long & 20 mm wide?		
5. Water Content Containers (a) Resistant to corrosion, disintegration, and weight change? (b) Close-fitting lids?		
6. Balance Class G1 [readable to 0.01 g]? VTM – 7 a balance sensitive to 0.1 gram may be used.		
7. Oven maintains 110±5°C (230±9°F)?		

**AASHTO T89-02
DETERMINING THE LIQUID LIMIT OF SOILS**

PROCEDURE Method B		
Sample Preparation - AASHTO only:	Test	Retest
1. Sample obtained by T87 or T146?		
2. Sample was dried at 60°C (140°F)?		
3. Sample consists of about 50 g of soil passing 425-µm (No. 40) sieve?		
4. Soil mixed with 8 to 10 mL of distilled or demineralized water in mixing dish (other than brass cup)? Note: Tap water may be used for routine testing if comparative tests indicate no differences in results using tap and distilled water.		
5. Mixing done by stirring, kneading and chopping with spatula?		
6. Additional increments of water added (1 to 3 mL) until mass is uniform and has stiff consistency?		
7. No additional dry soil added to wet sample once testing has begun?		
8. If too wet, sample either discarded or mixed to evaporate water?		
9. AASHTO T89 Method A is used for Referee Testing.		
PROCEDURE Method B		
	Test	Retest
1. Liquid limit device previously inspected for wear and height of cup drop checked?		
2. Part of mixture put in cup and spread with spatula until 10 mm deep at maximum thickness?		
3. As few strokes of spatula as possible used?		
4. Care taken to avoid entrapment of air bubbles?		
5. Excess soil returned to mixing dish?		
6. Unused wet soil in storage dish covered during test?		

AASHTO T89-02
DETERMINING THE LIQUID LIMIT OF SOILS

PROCEDURE		
Method B (continued)		
	Test	Retest
7. (Using curved grooving tool): Soil in dish divided through centerline of follower with no more than six strokes of curved tool and only last stroke of grooving tool scrapes bottom of cup? Or (Using 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? Note: Several strokes may be used, or precut groove with spatula and use tool to bring cut to final dimension.		
8. Soil in dish divided through centerline of follower with no more than six strokes of curved tool?		
9. Only last stroke of grooving tool scrapes bottom of cup?		
10. Tearing along groove and slippage of cake avoided?		
11. Cup lifted and dropped twice per second until bottom of groove closes about 13 mm (0.5 in.) in 22 to 28 blows? Note: Closures between 15 and 40 blows acceptable if variations of $\pm 5\%$ of the true liquid limit are tolerable to the lab. Note if lab accepts anything other than 22 to 28 blows.		
12. Base of device not held with hand while turning crank?		
13. Soil in cup immediately returned to mixing dish, and no additional water added?		
14. Steps 2 through 10 repeated?		
15. Closure in 22 to 28 blows?		
16. Number of blows recorded for second closure?		
17. Moisture specimen is taken after second groove closure (if closure is in acceptable range and within ± 2 blows of the first closure)?		
18. Slice of soil, width of spatula, extending across cake at right angles to groove and including portion that flowed together removed from dish and placed in container?		

**AASHTO T89-02
DETERMINING THE LIQUID LIMIT OF SOILS**

PROCEDURE Method B (continued)		
	Test	Retest
19. Container and soil weighed to 0.01 g? VTM -7 – a balance sensitive to 0.1 gram may be used.		
20. Water content determined according to T265?		
21. Water content calculated to nearest whole percent by: $\% \text{ moisture} = \frac{\text{mass of water}}{\text{mass of oven dry soil}} \times 100?$		
22. Liquid limit calculated by one of the methods in Section 14 (nomograph, multicurve, slide rule, etc.)?		
Comments:		

Date Tested: _____

Proctor: _____

Retest Date: _____

Proctor: _____

**AASHTO T90-00
DETERMINING THE PLASTIC LIMIT
AND PLASTICITY INDEX OF SOILS**

APPARATUS		
	Test	Retest
1. Porcelain Dish or similar mixing dish, about 115 mm in diameter?		
2. Spatula or pill knife about 75 to 100 mm long and 20 mm wide?		
3. Rolling surface: (a) AASHTO Ground glass plate or smooth unglazed paper?		
4. Plastic limit rolling device (optional): (a) Made of acrylic? (b) Top plate and bottom fixed plate of suitable dimensions for properly rolling specimens? (c) Designed so top plate slides freely on side rails without wobbling? (d) Heights of side rails: AASHTO 3.20 ± 0.25 mm + thickness of unglazed paper attached to bottom plate?		
(e) Unglazed paper that does not add foreign matter (fibers, paper fragments) to soil during test attached to top and bottom plates (AASHTO only: attached by spray-on adhesive or self-adhesive backing)?		
5. Water Content Containers (a) Resistant to corrosion, disintegration, & weight change? (b) Close-fitting lids?		
6. Balance Class G1 [readable to 0.01 g]? VTM – 7 a balance sensitive to 0.1 gram may be used.		
7. Oven maintains $110 \pm 5^\circ\text{C}$ ($230 \pm 9^\circ\text{F}$)?		

**AASHTO T90-00
DETERMINING THE PLASTIC LIMIT
AND PLASTICITY INDEX OF SOILS**

PROCEDURE		
Student must tell proctor under what circumstances 20 grams of –40 material is appropriate for use and when an 8 gram portion of –40 material would be used.	Test	Retest
1. AASHTO: Sample is either about 20 g of minus 425- μm (No. 40) material obtained by T87 or T146, or about 8 g of liquid limit material?		
2. Sample was dried at 60°C (140°F)?		
3. If 20-g sample of dry material (AASHTO only): (a) Mixed with distilled or demineralized water in mixing dish? (b) Approximately 8-g ball formed?		
4. A 1.5 to 2-g portion of the 8-g ball selected and formed into ellipsoidal mass?		
5. Alternate procedure (using plastic limit rolling device): (a) Ellipsoidal mass placed on bottom plate and top plate placed in contact with mass? Note: More than one soil mass can be rolled simultaneously in the device. (b) Simultaneous downward force and back and forth motion applied to top plate so plate comes in contact with side rails within 2 minutes? (c) Soil thread not allowed to contact side rails during rolling?		
6. Mass rolled between fingers or palm and plate/paper (or between top and bottom plate of rolling device) to form 3-mm diameter thread?		
7. 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)?		
8. Mass rolled for no more than two minutes to obtain thread diameter of 3 mm?		
9. When thread diameter is 3 mm, thread broken into several pieces?		
10. Pieces squeezed together between thumbs and fingers into ellipsoidal mass?		
11. Steps 4 through 9 repeated until thread crumbles and soil can no longer be rolled into a thread? Note: Crumbling may occur when thread diameter is greater than 3 mm.		

Date Tested: _____

Proctor: _____

Retest Date: _____

Proctor: _____

AASHTO T19-00
BULK DENSITY (Unit Weight) & VOIDS IN AGGREGATE

APPARATUS				
1. Unit Weight Measures	1	2	3	4
Capacity? – Record 2.8, 9.3, 14, 28, 70 or 100 L (1/10, 1/3, 1/2, 1, 2 1/2, or 3 1/2 ft ³)*				
Diameter? (Record)				
Height is 80 – 150% of diameter? (Record height)				
Top rim is smooth and watertight?				
Top rim is plane to 0.25 mm (0.01 in)?				
Interior wall of measure a smooth and continuous surface?				
Capacity less than 11 L (0.4 ft ³):				
Min. thickness of bottom = 5.0 mm (0.20 in)?				
Min. thick. of top 38 mm of wall = 2.5 mm (0.10 in)?				
Min. thick. of remainder of wall = 2.5 mm (0.10 in)?				
Capacity 11 to 42 L (0.4 to 1.5 ft ³):				
Min. thickness of bottom = 5.0 mm (0.20 in)?				
Min. thick. of top 38 mm of wall = 5.0 mm (0.20 in)?				
Min. thick. of remainder of wall = 3.0 mm (0.12 in)?				
Capacity >42 to 80 L (1.5 to 2.8 ft ³):				
Min. thickness of bottom = 10.0 mm (0.40 in)?				
Min. thick. of top 38 mm of wall = 6.4 mm (0.25 in)?				
Min. thick. of remainder of wall = 3.8 mm (0.15 in)?				
Capacity >80 to 133 L (2.8 to 4.0 ft ³):				
Min. thickness of bottom = 13.0 mm (0.50 in)?				
Min. thick. of top 38 mm of wall = 7.6 mm (0.30 in)?				
Min. thick. of remainder of wall = 5.0 mm (0.20 in)?				
Reported calibration factor or volume? (Record)				
* The actual volume of measure shall be at least 95% of the nominal volume. VOLUME = 3.142 d ² h / 4 1 L = 0.001 m ³				
		Test	Retest	
2. Tamping rod:				
(a) Round, straight steel rod?				
(b) 16 mm (5/8 in.) in diameter?				
(c) Approximately 600 mm (24 in.) long?				
(d) 16 mm (5/8 in.) hemispherical tip?				
3. Shovel or scoop?				
4. Calibration equipment:				
(a) Piece of plate glass (larger than the measure's diameter)?				
(b) Chassis or water pump grease?				
5. Balance:				
(a) Graduated to at least 0.05 kg (0.1 lb) increments?				
(b) AASHTO: Readable to 0.1% of sample mass?				
ASTM: Accurate to 0.1% of test load?				

AASHTO T19-00
BULK DENSITY (Unit Weight) & VOIDS IN AGGREGATE

PROCEDURE																
Student will demonstrate Rodding procedure and list the other two methods for proctor.	Test	Retest														
1. Sample obtained by T248 (<i>ASTM C702</i>)?																
2. Sample size approximately 125 to 200 percent of the quantity needed to fill the measure?																
3. Sample dried to essentially constant mass or at 110±5°C (230±9°F)?																
4. Measure used conforms to the following table?																
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 40%;">Nominal Maximum Size</th> <th style="width: 60%;">Minimum Capacity of Measure, L (ft³) [m³]</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">12.5 mm (1/2 in)</td> <td style="text-align: center;">2.8 L (1/10) [0.0028]</td> </tr> <tr> <td style="text-align: center;">25.0 mm (1 in)</td> <td style="text-align: center;">9.3 L (1/3) [0.0093]</td> </tr> <tr> <td style="text-align: center;">37.5 mm (1 ½ in)</td> <td style="text-align: center;">14 L (1/2) [0.014]</td> </tr> <tr> <td style="text-align: center;">75 mm (3 in)</td> <td style="text-align: center;">28 L (1) [0.028]</td> </tr> <tr> <td style="text-align: center;">112 mm (4 ½ in) <i>ASTM: 100mm (4 in)</i></td> <td style="text-align: center;">70 L (2 ½) [0.070]</td> </tr> <tr> <td style="text-align: center;">150 mm (6 in) <i>ASTM: 125 mm (5 in)</i></td> <td style="text-align: center;">100 L (3 ½) [0.100]</td> </tr> </tbody> </table>	Nominal Maximum Size	Minimum Capacity of Measure, L (ft ³) [m ³]	12.5 mm (1/2 in)	2.8 L (1/10) [0.0028]	25.0 mm (1 in)	9.3 L (1/3) [0.0093]	37.5 mm (1 ½ in)	14 L (1/2) [0.014]	75 mm (3 in)	28 L (1) [0.028]	112 mm (4 ½ in) <i>ASTM: 100mm (4 in)</i>	70 L (2 ½) [0.070]	150 mm (6 in) <i>ASTM: 125 mm (5 in)</i>	100 L (3 ½) [0.100]		
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Rodding procedure (up to 37.5-mm [1 ½- in.] particles):																
1. Measure filled 1/3 full and leveled with fingers?																
2. Aggregate rodded with 25 evenly distributed tamping strokes?																
3. Tamping rod does not forcibly strike the bottom of the measure?																
4. Measure filled with two more similar layers?																
5. Tamping strokes limited to layer being tamped?																
6. Third layer filled to overflowing (before tamping)?																
7. Surface leveled with the fingers or the straightedge (tamping rod)?																
8. Average level surface obtained (aggregate projections above the rim balance the voids below the rim)?																
9. Net mass determined to the nearest 0.05 kg (0.1 lb)?																
10. Net mass of aggregate multiplied by calibration factor or divided by volume of the measure?																
11. Bulk density reported to the nearest 10 kg/m ³ (1 lb/ft ³)?																
12. Void content (if determined) reported to the nearest 1 percent?																
13. Jigging procedure (37.5 to 150-mm [1 ½ to 6- in.] particles):																
14. Shoveling procedure (up to 150-mm [6- in.] particles): Note: This method only used when specified.																

Date Tested: _____

Proctor: _____

Retest Date: _____

Proctor: _____