# Performance Examination - Aggregate

## Standard Method of Test for Specific Gravity and Absorption of Fine Aggregate (AASHTO T 84-13) [ASTM C128-15]

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

| Apparatus | Trial 1 | Trial 2 |
|---|---|---|
| **Balance** Class G2 | | |
| **Sieves** (Nest of two) (a) 75-µm (No. 200) Protective sieve 2.36 mm (No. 8) to 1.18 mm (No. 16) | | |
| **Oven** Maintains uniform temperature of 110 ± 5 °C (230 ± 9 °F) | | |
| **Conical Mold** Made of metal, 0.8 mm minimum thickness, with a height of 75 ± 3 mm Inside diameter at top 40 ± 3 mm and inside diameter at bottom 90 ± 3 mm | | |
| **Tamper Flat** Circular tamping face 25 ± 3 mm in diameter and tamper mass of 340 ± 15 g | | |
| **Pycnometer** Flask or other suitable container into which the fine aggregate test sample can be placed, and volume content can be reproduced with ± 100 $mm^3$. Volume of the container filled to mark shall be at least 50 % greater than the space required to accommodate test sample. A volumetric flask of 500-ml capacity or a fruit jar (Mason, Kerr, etc.) fitted with a pycnometer top is satisfactory for a 500-g test sample of most fine aggregates. A Le Chatelier flask as described in T 133 is satisfactory for an approximately 55-g test sample. | | |
| **Burette (Optional)** Readable to 0.15 ml | | |
| **Procedures** | **Trial 1** | **Trial 2** |
| **Sample Preparation** | | |
| 1. The sample obtained by R 76, approximately 1000 g | | |
| 2. Dried to constant mass at 110 ± 5 °C (230 ± 9 °F)<br>*Note: Oven drying not necessary if naturally moist condition is desired* | | |
| 3. Allowed to cool to comfortable handling temperature | | |
| 4. Covered with water or at least 6% moisture added | | |
| 5. Allowed to stand 14-19 hours, or naturally moist | | |
| 6. Excess water decanted (if necessary) without loss of fines | | |
| 7. Sample spread on flat, nonabsorbent surface, and uniformly dried by a current of warm air | | |
| 8. Mold placed on flat, nonabsorbent surface and filled to overflowing | | |
| 9. Tamper allowed to fall freely under gravitational attraction, 25 times with a 5 mm drop<br>*Note: See provisional tests 1-4 for materials that do not readily slump.* | | |
| 10. Loose sand removed from around base and mold lifted vertically | | |
| 11. A sample fails to slump on the first test | | |
| 12. If it does slump on the first test, is water added, sample covered and allowed to stand 30 minutes | | |
| 13. Drying continued and slump test repeated at frequent intervals until sample slumps slightly | | |

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| Procedures (continued) | Trial 1 | Trial 2 |
|---|---|---|
| **Pycnometer Procedure** | | |
| 1. Pycnometer partially filled with water and 500 ± 10 g sample added and SSD sample mass recorded | | |
| 2. Pycnometer filled to 90% of total capacity and agitated to eliminate air bubbles | | |
| 3. Mechanical agitation permitted if performed in a manner that will not degrade the sample and comparison to manual agitation on the same material performed every six months, and the two results fall within the range (see: Table 1 in standard) | | |
| 4. Temperature of contents adjusted to 23.0 ± 1.7 °C (73.4 ± 3 °F) | | |
| 5. Water level adjusted to calibrated capacity and mass of pycnometer and contents determined | | |
| 6. The sample removed and dried to constant mass at 110 ± 5 °C (230 ± 9 °F) | | |
| 7. Sample cooled in air at room temperature for 1.0 ±0.5 hour and dry specimen mass determined | | |
| 8. Empty pycnometer filled to its calibration capacity with water at 23.0 ± 1.7 °C (73.4 ± 3 °F) and mass determined (pycnometer may be previously calibrated) | | |
| 9. All masses determined to nearest 0.1 g | | |
| 10. Bulk specific gravity calculated as follows [Bulk sp gr = A / (B + S – C)] and reported to nearest 0.001 (or reported to nearest 0.01 for fine aggregate meeting M 6 requirements) | | |
| 11. If the sample tested in a naturally moist condition, the source of the sample and the procedures used to prevent drying before testing reported | | |
| **Burette Method (Alternate Method to Determine the Weight of Pycnometer, Specimen, and Water)** | | |
| 1. Mass of saturated surface-dry specimen determined (S) | | |
| 2. Mass of empty pycnometer determined (W) | | |
| 3. Water at 23.0 ± 1.7 °C (73.4 ± 3 °F) added to pycnometer from burette, quantity of water read from burette ($V_a$) | | |
| 4. Total mass of pycnometer, specimen, and water (C) calculated from equation [$C = 0.9975\ V_a + S + W$] | | |
| 5. Specific gravity reported to nearest 0.001 (or reported to nearest 0.01 for fine aggregate meeting M6 | | |
| **Le Chatelier Method (Alternate Procedure)** | | |
| 1. Le Chatelier flask filled with water to point on the stem between 0- and 1- ml marks with the initial volume recorded | | |
| 2. The temperature of flask and contents at 23.0 ± 1.7 °C (73.4 ± 3 °F) | | |

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| | | |
|---|---|---|
| 3. Approximately 55 ± 5 g (other masses acceptable) of saturated surface dry fine aggregate added to the flask | | |
| **Procedures (continued)** | **Trial 1** | **Trial 2** |
| **Le Chatelier Method (Alternate Procedure) (continued)** | | |
| 4. Separate 500 ± 10-g sample of saturated surface-dry material taken for absorption determination | | |
| 5. Flask and contents check to be within 1°C of temperature in Step 3, water level read and recorded | | |
| 6. Aggregate removed from the flask and dried to constant mass at 110 ± 5 °C (230 ± 9 °F) | | |

| **Calculations** | **Trial 1** | **Trial 2** |
|---|---|---|
| Gravity procedure – density (OD), $lb/ft^3$, = 62.27<br>A/(B + S - C) | | |
| Volume procedure – density (OD), $lb/ft^3$, = 62.27<br>$S_1$ (A/S)/[0.9975 ($R_2 – R_1$)] | | |
| Gravity procedure – density (SSD), $lb/ft^3$, = 62.27<br>S/(B + S –C) | | |
| Volume procedure – density (SSD), $lb/ft^3$, = 62.27<br>$S_1$/[0.9975 ($R_2 – R_1$)] | | |
| Gravity procedure – apparent density (SSD), $lb/ft^3$, = 62.27<br>A/(B + A – C) | | |
| Volume procedure – app density (SSD), $lb/ft^3$, = 62.27<br>$S_1$ (A/S) / 0.9975 ($R_2 – R_1$) – [($S_1$/S)(S – A)] | | |
| Absorption, % = 100[(S – A//A] | | |

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

**Exam Administration:** Remote _____ In-Person _____

**Comments:**

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**Examiner Name:** _____ **Examiner Signature**: _____ **Date:** _____