



## Performance Examination - Concrete

### Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete (AASHTO T 121M / T 121-19)

Candidate Name: \_\_\_\_\_ NICET ID: \_\_\_\_\_

| Apparatus  | Trial<br>1 | Trial<br>2 |
|--|------------|------------|
| <p><b>Balance</b> Accurate to 0.1 lb (45 g) or to within 0.3% of the test load, whichever is greater at any point within the range of use. The range of use shall be considered to extend from the mass of the measure empty to the mass of the measure plus its contents at 160 lb/ft<sup>3</sup> (2600 kg/m<sup>3</sup>)</p>   |            |            |
| <p><b>Tamping Rod</b> A round, smooth, straight, steel rod with a <math>\frac{5}{8}</math> in. <math>\pm</math> <math>\frac{1}{16}</math> in. (16 mm <math>\pm</math> 2 mm) diameter. The length of the tamping rod shall be at least 4 in. (100 mm) greater than the depth of the measure in which rodding is being performed but not greater than 24 in. (600 mm) in overall length. The rod shall have the tamping end or both ends rounded to a hemispherical tip of the same diameter as the rod.</p>   |            |            |
| <p><b>Internal Vibrators</b> The frequency of vibration shall be at least 9000 vibrations per minute (150 Hz) while the vibrator is operating in the concrete. The outside diameter or the side dimension of the vibrating element shall be at least 0.75 in. (19 mm) and not greater than 1.50 in. (38 mm). The combined length of the vibrator shaft and vibrating element shall exceed the depth of the section being vibrated by at least 3 in. (75 mm).</p>   |            |            |
| <p><b>Measure</b> A cylindrical container made of steel or other suitable metal. The minimum capacity of the measure shall conform to the nominal maximum size of coarse aggregate in the concrete to be tested. All measures except for measuring bowls of air meters, which are also used for T 121 tests, shall conform to the requirements of T 19. When measuring bowls of air meters are used, they shall conform to the requirements of T 152 and shall be calibrated for volume as described in T 19. The top rim of the air meter bowls shall be smooth and plane within 0.01 in. (0.3 mm).</p> |            |            |
| <p><b>Strike Off Plate</b> A flat rectangular metal plate at least <math>\frac{1}{4}</math> in. (6 mm) thick or a glass or acrylic plate at least <math>\frac{1}{2}</math> in. (12 mm) thick with a length and width of at least 2 in. (50 mm) greater than the diameter of the measure with which it is to be used. The edges of the plate shall be straight and smooth within a tolerance of <math>\frac{1}{16}</math> in. (2 mm).</p>   |            |            |
| <p><b>Mallet</b> A mallet with a rubber or rawhide head having a mass of 1.25 <math>\pm</math> 0.50 lb (600 <math>\pm</math> 200 g) for use with measures of 0.5 ft<sup>3</sup> (14 L) or smaller and a mallet having a mass of 2.25 <math>\pm</math> 0.50 lb (1000 <math>\pm</math> 200 g) for use with measures larger than 0.5 ft<sup>3</sup> (14 L).</p>   |            |            |
| <p><b>Scoop</b> Of a size large enough so each amount of concrete obtained from the sampling receptacle is representative and small enough, so it is not spilled during placement in the measure.</p>  |            |            |

| Procedure  | Trial<br>1 | Trial<br>2 |
|--|------------|------------|
| 1. Dampen the interior of the measure and remove any standing water from the bottom. |            |            |
| 2. Determine the mass (lb or kg) of the empty measure to be used.                    |            |            |

Examiner Name: \_\_\_\_\_ Examiner Signature: \_\_\_\_\_ Date: \_\_\_\_\_



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| Procedures (continued)   | Trial 1 | Trial 2 |
|--|---------|---------|
| 3. Using a scoop, place the concrete in the measure in three layers of approximately equal volume moving the scoop around the perimeter of the measured opening to ensure an even distribution of the concrete.  |         |         |
| 4. For the first layer: fill the measure approximately 1/3 of its volume; rod the layer 25 times throughout its depth, use care not to damage the bottom of the measure; tap the sides of the measure 10 to 15 times with the mallet to close voids left by the tamping rod.   |         |         |
| 5. For the second layer: fill the measure approximately 2/3 of its volume; rod the layer 25 times, penetrate the first layer about 1 in. (25 mm), distribute the roddings uniformly over the cross-section of the measure; tap the sides of the measure 10 to 15 times with the mallet to close voids left by the tamping rod. |         |         |
| 6. For the third layer: add material to avoid overfilling; rod the layer 25 times, penetrate the second layer about 1 in. (25 mm), distribute the roddings uniformly over the cross-section of the measure; tap the sides of the measure 10 to 15 times with the mallet to close voids left by the tamping rod.                |         |         |
| 7. After consolidating the third layer, an approximate 1/8 in. (3 mm) of excess concrete above the top of the measure is considered optimal. The representative material can be added or removed as needed before strike-off.  |         |         |
| 8. Strike-off the top surface of the concrete and finish it smoothly with the flat strike-off plate, leaving the measure just level full. Completely clean the exterior of the measure and determine the mass (lb or kg) of the measure filled with concrete.  |         |         |
| 9. Report the density (unit weight) of the concrete to the nearest 0.1 lb/ft <sup>3</sup> (1.0 kg/m <sup>3</sup> ).  |         |         |

First Attempt: Pass: \_\_\_\_\_ Fail: \_\_\_\_\_ Second Attempt: Pass: \_\_\_\_\_ Fail: \_\_\_\_\_

Exam Administration: Remote \_\_\_\_\_ In-Person \_\_\_\_\_

Comments:

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Examiner Name: \_\_\_\_\_ Examiner Signature: \_\_\_\_\_ Date: \_\_\_\_\_



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