



## Performance Examination - Concrete

### Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method (ASTM C231 / C231M-17a) [AASHTO T 152-19]

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

| Apparatus   | Trial 1 | Trial 2 |
|---|---------|---------|
| <p><b>Measuring Bowl and Cover Assembly</b> The measuring bowl shall be essentially cylindrical in shape, made of steel, hard metal, or other hard material not readily attacked by the cement paste, having a minimum diameter equal to 0.75 to 1.25 times the height, and a capacity of at least 0.20 ft<sup>3</sup> (6.0 L).</p> <p>It shall be flanged or otherwise constructed to provide for a pressure tight fit between measuring bowl and cover assembly.</p> <p>The interior surfaces of the measuring bowl and surfaces of rims, flanges, and other component fitted parts shall be machined smooth.</p> <p>Verify the cover assembly is constructed of steel, hard metal, or other hard material not readily attacked by the cement paste.</p> <p>It shall be flanged or otherwise constructed to provide for a pressure-tight fit between the bowl and cover assembly.</p> |         |         |
| <p><b>Pressure Gauge Dial</b> Shall be calibrated to indicate the percent of air.</p> <p>Graduations shall be provided for a range in air content of at least 8 % readable to 0.1 % as determined by the proper air pressure calibration test.</p> <p>The cover assembly shall be fitted with air valves, air bleeder valves, and petcocks for bleeding off or through which water may be introduced as necessary for the particular meter design.</p> <p>Suitable means for clamping the cover to the measuring bowl shall be provided to make a pressure-tight seal without entrapping air at the joint between the flanges of the cover and measuring bowl.</p> <p>A suitable hand pump shall be provided with the cover either as an attachment or as an accessory.</p>   |         |         |
| <p><b>Calibration Vessel</b> A measure having an internal volume equal to a percent of the volume of the measuring bowl corresponding to the approximate percent of air in the concrete to be tested. When the design of the meter requires placing the calibration vessel within the measuring bowl to check calibration, the measure shall be cylindrical.</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 measuring bowl.</p>   |         |         |
| <p><b>Tamping Rod</b> A round, smooth, straight steel, high-density polyethylene, or another plastic rod of equal or greater abrasion resistance with a <math>\frac{5}{8}</math> in. <math>\pm</math> <math>\frac{1}{16}</math> in. (16 <math>\pm</math> 2 mm) diameter.</p> <p>The length of the tamping rod shall be at least 4 in. (100 mm) greater than the depth of the measuring bowl in which rodding is being performed, but not greater than 24 in. (600 mm) in overall length.</p> <p>The rod shall have the tamping end or both ends rounded to a hemispherical tip of the same diameter as the rod.</p>   |         |         |

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| Apparatus (continued)   | Trial 1 | Trial 2 |
|---|---------|---------|
| <b>Mallet</b> A mallet with a rubber or rawhide head weighing approximately 1.25 ± 0.50 lb (0.60 ± 0.25 kg) for use with measures of 0.5 ft <sup>3</sup> (14 L) or smaller and a mallet weighing approximately 2.25 ± 0.50 lb (1.0 ± 0.25 kg) for use with measures larger than 0.5 ft <sup>3</sup> (14 L). |         |         |
| <b>Strike-Off Bar</b> A flat straight bar of steel or other suitable metal at least 1/8 in. (3 mm) thick and 3/4 in. (20 mm) wide by 12 in. (300 mm) long.  |         |         |

| Procedure  | Trial 1 | Trial 2 |
|--|---------|---------|
| 1. Dampen the interior of the bowl and place on a flat, level, firm surface.   |         |         |
| 2. Using a scoop, place the concrete in the measuring bowl in the required number of layers, moving the scoop around the perimeter of the bowl opening to ensure an even distribution of the concrete.   |         |         |
| 3. For the first layer: fill the bowl approximately 1/3 of its volume; rod the layer 25 times throughout its depth, using care not to damage the bottom of the measuring bowl. Distribute the roddings uniformly over the cross section of the bowl; tap the outside of the bowl smartly 10 to 15 times with the mallet to close voids left by the tamping rod.  |         |         |
| 4. Strike-off the top layer of concrete: if using a strike-off plate, press the strike-off plate on the top surface of the measure to cover 2/3 of the surface and withdraw the plate with a sawing motion to finish only the area originally covered.<br><br>Place the plate on top of the measure to cover the original 2/3 of the surface and advance it with a vertical pressure and a sawing motion to cover the whole surface of the measure and continue to advance it until it slides completely off the measure.<br><br>Then incline the plate and perform several strokes with the edge of the plate to produce a smooth finish. |         |         |
| 5. Strike-off the top layer of concrete: If using a strike-off bar while performing C231, strike-off the top surface by sliding the strike-off bar across the top flange or rim of the measuring bowl with a sawing motion until the bowl is just level full.  |         |         |
| 6. Thoroughly clean the flange/rim of the bowl and cover assembly.   |         |         |
| 7. Clamp the cover to the bowl ensuring a pressure-tight seal.   |         |         |
| 8. Close the main air valve between the air chamber and bowl.<br><br>Open both petcocks on the cover.<br><br>Use a syringe to inject water through one petcock until water emerges from the opposite side petcock.<br><br>Jar the meter gently until all air has been expelled.  |         |         |
| 9. Close the air bleeder valve and pump air into the air chamber until the hand of the dial gauge is on the initial pressure line. Allow a few seconds for the compressed air to cool.   |         |         |

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| Procedure (continued)  | Trial 1 | Trial 2 |
|--|---------|---------|
| 10. Stabilize the gauge hand at the initial pressure line by bleeding, pumping and lightly tapping the gauge by hand. Close both petcocks.   |         |         |
| 11. Open the main air valve between the air chamber and bowl. Tap the sides of the bowl smartly with the mallet. Lightly tap the pressure gauge by hand to stabilize the gauge hand. |         |         |
| 12. Read the percentage of air on the dial of the pressure gauge.  |         |         |
| 13. Close the main air valve and then release the pressure in the bowl by opening both petcocks before removing the covers.  |         |         |
| 14. Report the air content to the nearest 0.1% using the aggregate correction factor (or to the nearest 1/2 scale division if the gauge reading exceeds 8%).                         |         |         |

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

**Comments:**

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