



Performance Examination - Concrete

Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method (ASTM C173 / C173M-16) [AASHTO T 196M / T 196-11]

Candidate Name: _____ NICET ID: _____

Apparatus	Trial 1	Trial 2
<p>Air Meter The measuring bowl and top sections shall be of sufficient thickness and rigidity to withstand rough field use. The material shall not be attacked cement paste, deform when stored at high temperatures in closed spaces or become brittle or crack at low temperatures. A watertight seal must be obtained when the top section is attached to the measuring bowl.</p>		
<p>Measuring Bowl Shall have a diameter equal to 1 to 1.25 times the height and be constructed with a flange at or near the top surface. Measuring bowls shall not have a capacity of fewer than 0.075 ft³ (2.0 L). The top section shall have a capacity of at least 20% larger than the measuring bowl and shall be equipped with a flexible gasket and a device to attach the top section to the measuring bowl. The top section shall be equipped with a transparent scale, graduated in increments not greater than 0.5% from 0 at the top to 9%, or more, of the volume of the measuring bowl. Graduations shall be accurate to ± 0.1% by volume of the measuring bowl. The upper end of the neck shall have a watertight cap that will maintain a watertight seal when the meter is inverted and rolled.</p>		
<p>Scoop 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>Funnel A funnel with a spout of the size permitting it to be inserted through the neck of the top section and long enough to extend to a point just above the bottom of the top section. The discharge end of the spout shall be so constructed that when water is added to the container there will be a minimum disturbance of the concrete.</p>		
<p>Tamping Rod A round, smooth, straight steel, high-density polyethylene, or another plastic rod of equal or greater abrasion resistance with a $\frac{5}{16}$ in. ± $\frac{1}{16}$ in. (16 ± 2 mm) diameter. 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. The rod shall have the tamping end or both ends rounded to a hemispherical tip of the same diameter as the rod.</p>		
<p>Strike-off Bar A flat, straight steel bar at least $\frac{1}{8}$ by $\frac{3}{4}$ by 12 in. (3 by 20 by 300 mm) or a flat straight high-density polyethylene bar or other plastic of equal or greater abrasion resistance at least $\frac{1}{4}$ by $\frac{3}{4}$ by 12 in. (6 by 20 by 300 mm).</p>		
<p>Calibration Cup A metal or plastic cup either having a capacity of or being graduated in increments equal to 1.00 ± 0.04% of the volume of the measuring bowl of the air meter. The calibrated cup is only to be used to add water when the concrete air content exceeds 9% or the calibrated range of the meter.</p>		
<p>Syringe A rubber syringe is having a capacity of at least 2 oz. (50 ml).</p>		
<p>Pouring Vessel for Water A container of approximately one qt (1 L) capacity.</p>		
<p>Isopropyl Alcohol Verify the isopropyl alcohol is 70% by volume (approximately 65% by weight).</p>		
<p>Mallet A mallet with a rubber or rawhide head with a mass of approximately 1.25 ± 0.5 lb (600 ± 200 g)</p>		

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Procedures	Trial 1	Trial 2
1. Dampen the interior of the measuring bowl and remove any standing water from the bottom. Using the scoop, fill the measuring bowl with freshly mixed concrete in 2 layers of approximately equal volume, moving the scoop around the perimeter of the measuring bowl opening to ensure an even distribution of the concrete with minimal segregation.		
2. Rod the bottom layer 25 times uniformly over the cross-section and throughout its depth with the rounded end of the tamping rod. Use care not to damage the bottom of the measuring bowl.		
3. Tap the sides of the measuring bowl 10 to 15 times with the mallet to close any voids left by the tamping rod and to release any large bubbles of air. Rod the upper layer 25 times uniformly over the cross-section, penetrating through the layer being rodded and into the layer below approximately 25 mm (1 in.), With the rounded end of the tamping rod. Tap the sides of the measuring bowl 10 to 15 times with the mallet to close any voids left by the tamping rod and to release any large bubbles of air. After tapping the final layer, a slight excess of concrete, 3 mm (1/8 in.) or less, above the rim is acceptable. Add or remove a representative sample of concrete as necessary to obtain the required amount of concrete.		
4. Strike-off the excess concrete with the strike-off bar and wipe the flange of the measuring bowl clean.		
5. Wet the inside of the top section of the meter, including the gasket, and attach it to the measuring bowl, creating a water-tight seal. Insert the funnel and add at least 0.5 L (1 pt) of water followed by the selected amount of isopropyl alcohol. Record the amount of alcohol added. Add water until it appears in the neck of the top section. Remove the funnel. Adjust the liquid (water and alcohol) level with the syringe until the bottom of the meniscus is level with the zero marks on the transparent scale. Attach and tighten the cap, producing a water-tight seal. Quickly invert the meter, shake the measuring bowl, and return the meter to the upright position. Do not invert the meter for more than 5 seconds at a time.		
6. Repeat the inversion, shaking, and upright process for a minimum of 45 seconds, and until the concrete is free from the measuring bowl. Using the hand on the flange to rotate the meter, vigorously roll the meter 1/4 to 1/2 turn forward and back several times, quickly starting and stopping the roll.		
7. Turn the measuring bowl about 1/3 turn and repeat the rolling procedure in Step 6		
8. Repeat Steps 6 and 7 for approximately 1 min. while listening for aggregate sliding in the meter.		
9. Set the meter upright, loosen the cap, and allow the liquid level to stabilize. The liquid level is stable when it does not change more than 0.25% within a 2 min. Period. If the liquid level does not stabilize within 6 minutes, discard the test and conduct a new test using additional alcohol.		
10. If there is more foam present in the neck than that which is equivalent to 2 full air percent divisions, discard the test and conduct a new test using additional alcohol.		

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Procedures (continued)	Trial 1	Trial 2
11. If the air content is greater than the 9% range, add calibrated cups of water to the meter to ring the liquid level into the graduated range of the meter. Record the number of cups of water added.		
12. When the liquid level is stable, read the level to the bottom of the meniscus, to the nearest 0.25%. This is the Initial Meter Reading.		
13. Re-tighten the cap and repeat Steps 6 through 8.		
14. If the second reading of the liquid level has not changed more than 0.25% from the Initial Meter Reading record the reading as the Final Meter Reading. Proceed to Step 29.		
15. If the second reading differs from the first by more than 0.25%, record the second reading as the Initial Meter Reading and repeat Steps 6 through 8.		
16. If the third reading of the liquid level has not changed more than 0.25% from the Initial Meter Reading record the third reading as the Final Meter Reading. Otherwise, discard the test and conduct a new test using additional alcohol.		
17. Disassemble the air meter by detaching the top section from the measuring bowl. Allow the liquid to discharge from the air meter.		
18. Dump out the contents of the measuring bowl, and examine the measuring bowl for portions of undisturbed, tightly packed concrete. If such material is present, the test is invalid.		
19. The final air content is equal to the Final Meter Reading, minus the correction factor, plus the number of calibrated cups of water added. Report the air content to the nearest 0.25%.		

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

Exam Administration: Remote _____ In-Person _____

Comments:

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