

GDT 26

A. Scope

For a complete list of GDTs, see the Table of Contents.

Use this test method to determine the air content of freshly mixed concrete.

NOTE: This method will not work for concrete containing lightweight or highly porous aggregates. For this type of concrete, use GDT 32, “Test for Air Content of Freshly Mixed Concrete by the Volumetric Method,” to perform the air tests.

This method includes instructions for using two types of air meters:

- Pressure Air Meter
- Press-Ur-Meter

B. Apparatus

1. Pressure Air Meter

The apparatus consists of the following:

- a. Complete Air Meter: The complete meter is listed as Warehouse Stock WE-4. The meter includes the following pieces:
 - 1) Material Container
 - 2) Lid Assembly
 - 3) Tamping Rod (WR-7)
 - 4) Strike-off Bar (WS-13-1)
 - 5) Carrying Case
- b. Field Check of Pressure Air Meter (Test For Accuracy)

[Figure 26-1](#), below, shows the basic equipment used in determining air content. Some of the steps below make reference to the numbers shown on the figure.

NOTE: Quickly check meter calibration with an approved calibration canister.

- 1) [Figure 26-1](#) .
Place the meter in a level position.
- 2) Determine volume of material container by filling it with water (use weight or volumetric method: 1 g of water = 1 ml). The volume of the container will normally be approximately 1.87 gal (7100 ml).
- 3) With the material container filled with water, place the lid (5) on the container and close the four toggle clamps (6).
- 4) Close the main air valve (4) on top of the lid.
- 5) Close the bleeder valve (10).
- 6) Gently pump air into the receiver until the gauge hand (12) is near the red line.
 - a. Make sure the hand passes the initial starting point (the stationary pointer).
 - b. Do not worry about whether the hand is on one side or the other of the red line.
- 7) Tap the gauge (13) gently with one hand. At the same time, crack the bleeder valve (10) until gauge hand (12) rests exactly on the initial starting point.
- 8) Quickly close the bleeder valve (10).
- 9) Close both petcocks (8 and 9).
- 10) Open the main air valve (4) and record reading when gauge hand (12) comes to rest. This initial reading will probably be greater than one percent.

- 11) Close the main air valve (4) and open center petcock (8) slowly to release air pressure and ensure no water loss.
 - 12) Open petcock (9) and remove a volume of water equal to 1 to 2 percent of the volume of the material container.
 - 13) Tip container and pour off water from the petcock (9) into a receptacle for weighing or volumetric measurement.
 - 14) Repeat [steps 5 through 11](#). The reading on the gauge should be 1 to 2 percent plus the reading obtained in [step 10](#) (initial reading).
 - 15) Repeat [steps 7 and 8](#), then [steps 5 through 11](#), in that order, until you have removed at least 8 percent of the water volume in the material container.
 - 16) If the meter deviates from the theoretical reading by more than 0.2 percent at any point, return the meter to the District Office for inspection. The theoretical reading is the initial reading plus the percentage of water removed from the material container.
- c. Maintenance of Apparatus
- 1) Always close main air valve before releasing pressure from either the material container or the air receiver. If this valve is not closed, it will draw water into air receiver and ruin future measurements.
 - a. If water is drawn into air receiver, open the bleeder valve in end of the receiver and top lid so that the water runs out the bleeder valve.
 - b. Pump the handle several times to blow out the last traces of water.
 - 2) The gauge hand should not exceed 1/2 in (13 mm) beyond the red line limit.
 - 3) Release pressure on the meter before opening toggle clamps.
- d. Care of the Pressure Air Meter
- 1.) To ensure trouble free operation, keep the meter clean and dry after each test.
Clean meter by flushing it with a pressurized stream of water or by washing in water with a brush.

NOTE: Do not submerge the gauge in water.

- 2) Remove sand or grit from the underside of the material container lip and toggle clamps before assembling.
- 3) When meter is not in use, leave bleeder valve and both petcocks open.
- 4) Apply a light, protective, lubricating film of paraffin wax to the underside of the material container lip every 15 to 20 tests.
- 5) When not using the meter, store it in its carrying case. Do not store with the lid clamped to the material container.

NOTE: After prolonged use, the surface of the meter may look dull. Do not repolish. This may damage the meter.

2. Press-Ur-Meter

The apparatus consists of the following:

- a. Material Container
- b. Lid Assembly
- c. Tamping Rod (WR-7)
- d. Strike-off Bar (WS-31-1)
- e. Threaded Straight Tubing
- f. Threaded Curved Tubing
- g. Calibrating Vessel (.1 gal (379 ml))
- h. Syringe
- i. Mallet (WM-01)
- j. Carrying Case

k. Calibration Of Press-Ur-Meter (Test For Accuracy):

- 1) Open the air bleeder valve in the end of the air receiver.
If gauge hand does not stop in the hand-free position, send the meter to the District Office for mechanical check. If the gauge hand does rest in the hand-free position, continue with the calibration.
- 2) Place the material container on a level surface.
- 3) Fill the container full of water.
- 4) Screw the short piece of straight tubing into the threaded petcock hole on the underside of the lid.
- 5) Clamp lid on the material container with the tube extending down into the water.
- 6) With both petcocks open, add water with a syringe through the petcock having the pipe extension below, until all air is forced out opposite petcock.
- 7) Tap the meter gently until no air bubbles come out through opposite petcock. Leave both petcocks open.
- 8) Add air pressure to slightly past the predetermined initial pressure line.
- 9) Wait a few seconds for compressed air to cool to normal temperature.
- 10) Stabilize the gauge hand at the proper initial pressure line by gently tapping gauge with one hand. At the same time, crack the bleeder valve until gauge hand rests exactly on the predetermined initial pressure line.
- 11) Quickly close bleeder valve. Pump and bleed off as needed.
- 12) Close both petcocks and immediately press down the thumb lever to release the air into the material container.
- 13) Wait a few seconds until the hand stabilizes.
- 14) If all air was eliminated and the initial pressure was correctly selected, the gauge should read 0 percent.
 - a. If two or more tests show a consistent variation from 0 percent in the result, change initial pressure line to compensate for the variation.
 - b. Use the new initial pressure line for subsequent tests.
- 15) Screw curved tubes into the outer end of the petcock.
- 16) Press the thumb lever and control flow with petcock lever until you fill the 5 percent calibrating vessel (.1 gal (379 ml)) level full of water from the material container.
- 17) Release the air at the free petcock.
- 18) Open the other petcock and let the water in the curved pipe run back into the material container. There is now 5 percent air in the material container.
- 19) With petcocks open, pump air pressure in the exact manner outlined in [steps k.8 through k.11](#).
- 20) Close petcocks and immediately press the thumb lever.
- 21) Wait a few seconds for exhaust air to warm to normal temperature and for the needle to stabilize.
- 22) The dial should now read 5 percent.
If two or more consistent tests show that the gauge reads incorrectly at 5 percent air in excess of 0.20 percent, remove gauge glass and reset the dial hand to 5 percent by turning the recalibrating screw located just below and to the right of the center dial.
- 23) When gauge hand reads correctly at 5 percent, withdraw more water to check the results at 10 percent, 15 percent, 20 percent, etc.
- 24) Check increments of 1 percent by removing .02 gal (76 ml) of water per 1 percent from the material container.

l. Care of the Press-Ur-Meter

[Apparatus, 1.d, Care of the Pressure Air Meter.](#)

C. Sample Size and Preparation

1. Place concrete to be tested in the material container in three equal layers.
2. Rod each layer 25 times, as directed in making compressive test cylinder specimens.
3. Tap the outside of the material container after rodding each layer of concrete.

4. Remove excess concrete by sliding the strike-off bar across the top flange with a sawing motion until container is just full.
5. Wipe the lip of the container clean of all sand and mortar.

D. Procedures

1. Pressure Air Meter

[Figure 26-1](#) shows the basic equipment used in determining air content. Some of the steps below include a number reference in parentheses to the numbers shown on the figure.

- a. Close the red-colored main air valve on top of the air receiver.
 - b. Open both petcocks (8 and 9) on top of lid.
 - c. Place lid (5) on the material container and close the four toggle clamps (6).
 - d. Pour water into the funnel (7) until water comes out the petcock (8) in the center of the lid.
 - e. Jar the meter gently until no air bubbles come out through the center petcock.
 - f. Close both petcocks (8 and 9).
 - g. Close the main air valve (4) and bleeder valve (10) in the end of the air receiver.
 - h. Gently pump air into the receiver until gauge hand (12) gets close to the red line.
 - 1) Make sure the hand passes the initial starting point.
 - 2) Do not worry about whether the hand is on one side or the other of the red line.
 - i. Tap the gauge (13) gently with one hand. At the same time, crack the bleeder valve (10) until gauge hand (12) rests exactly on the initial starting point.
 - j. Quickly close bleeder valve (10).
 - k. Open the main air valve (4) between the air receiver and the material container.
 - l. Jar the container slightly after releasing the pressure to allow particles to rearrange.
 - m. Tap the gauge (13) gently until the hand (12) comes to rest. Record the reading as the percent of air entrained.
 - n. Immediately close the main air valve (4).
 - o. When the aggregate has large voids, and you want to subtract their volume from the measured air content:
 - 1) Place the amount of each size of aggregate used in the test in the material container.
 - 2) Fill the container with water.
 - 3) Complete the regular determination for air content. This reading is the aggregate correction factor.
- ### 2. Press-Ur-Meter
- a. Place a representative sample of the concrete obtained according to GSP 17, "Sampling Freshly Mixed Structural Concrete," in the material container in three equal layers.
 - b. Rod each layer of concrete with 25 strokes of the tamping rod, evenly distributed over the cross section.
 - c. When rodding the first layer, do not strike the bottom of the container.
 - d. Tap the sides of the bowl sharply with the mallet after rodding each layer. Do this until the cavities left by rodding are leveled out and no large bubbles of air appear on the surface of the rodded layer.
 - e. In rodding the second and final layers, use only enough force to cause the rod to penetrate the surface of the previous layer.
 - f. Slightly overfill the bowl with the third layer. After rodding and tapping, remove the excess concrete by sliding the strike-off bar across the top flange with a sawing motion until the material container is just level full.
 - g. Wipe top lip of container clean of all sand and mortar.
 - h. Open both petcocks on top of lid.
 - i. Place lid on material container and close the four toggle clamps.
 - j. Using the rubber syringe to inject water through one petcock until all air is expelled through the opposite petcock.
 - k. Jar the meter gently until no air bubbles come out through petcock.
 - l. Leave the petcocks open.

- m. With the built-in pump, pump air into the receiver until gauge band has slightly passed the predetermined initial pressure line.
- n. Wait a few seconds for the compressed air to cool to normal temperature.
- o. Tap the gauge gently with one hand. At the same time, crack bleeder valve in the air receiver until gauge hand rests exactly on the predetermined initial pressure line.
- p. Quickly close bleeder valve.
- q. Close both petcocks and press down on thumb lever to release the air into the base.
- r. Hold thumb lever down for a few seconds and slightly jar the container when pressure is on to allow particles to rearrange.
- s. Tap gauge gently until the hand comes to rest. This reading is percent of air entrained.
- t. Open the petcocks to release the pressure.
- u. Remove the lid.
- v. When the aggregate has large voids, and you want to subtract their volume from the measured air content:
 - 1) Place the amount of each size of aggregate used in the test in the material container.
 - 2) Fill the container 1/3 full with water.
 - 3) Add the mixed aggregate, a small amount at a time, until all of the aggregate is inundated.
 - 4) Tap the sides of the material container and lightly rod the upper 1 in (25 mm) of the aggregate about 10 times.
 - 5) Stir after each addition of fine aggregate to eliminate entrapped air.
 - 6) When all of the aggregate has been inundated for at least 5 minutes, strike off all foam and excess water.
 - 7) Thoroughly clean top lip on container.
 - 8) Complete the regular determination for air content. This reading is the aggregate correction factor.

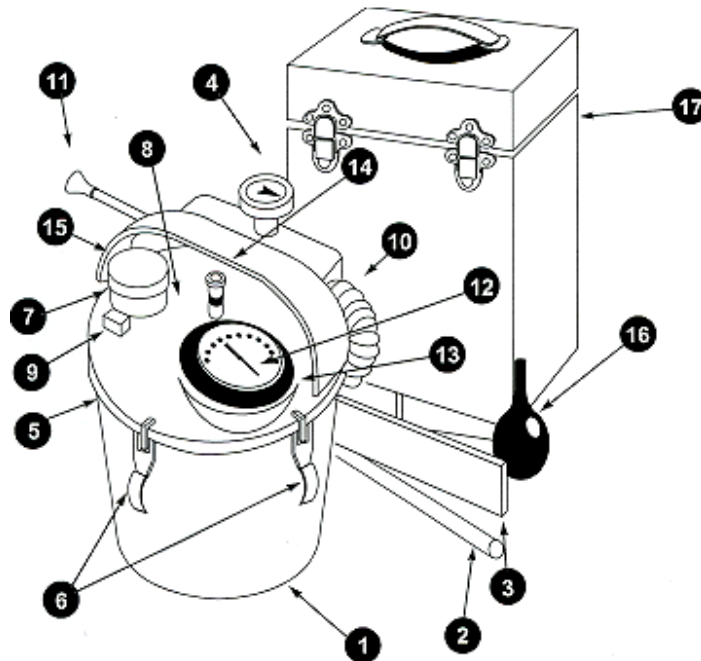


Figure 26-1

E. Calculations

No calculations are required for this test.

F. Report

Report the aggregate correction factor and percent of air entrained on Form 319 and Form 525.