

Name: \_\_\_\_\_  
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Date of scheduled ACI Concrete Field Testing Technician Exam: \_\_\_\_\_

## ACI GRADE 1 FIELD TESTING CERTIFICATION PRACTICE TEST

### ASTM C 1064

#### Standard Test Method for Temperature of Freshly Mixed Hydraulic – Cement Concrete

1. For concrete with aggregates less than 3 inches, the thermometer must remain in the fresh concrete sample a minimum of 5 minutes or until the temperature reading stabilizes. (T or F)
2. The temperature measuring device must be accurate to within 0.1°. (T or F)
- 3.. The temperature measuring device shall have a capacity of measuring temperature of freshly mixed concrete throughout a range of \_\_\_\_\_ to \_\_\_\_\_ °F ( \_\_\_\_\_ to \_\_\_\_\_ °C)
4. A composite sample is not needed if only the temperature test is being run. (T or F)
5. The temperature of fresh concrete in a placement must be measured by inserting a thermometer into the top six inches of concrete. (T or F)
6. The temperature of the concrete is recorded to the nearest \_\_\_\_\_ °F ( \_\_\_\_\_ °C).
7. **ASTM C1064 states the container used to measure temperature of concrete must be large enough to provide at least 5 inches of concrete around the sensor.** (T or F)
8. Calibrate the temperature measuring device at least \_\_\_\_\_, or whenever there is a question of accuracy.
  - a. Annually
  - b. monthly
  - c. weekly
  - d. daily
9. After the thermometer is placed in the concrete:
  - a. Gently press concrete around the thermometer
  - b. Cool the surface of concrete with water
  - c. Tap the side of the container 10-15 times
  - d. All of the above

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10. According to ASTM C1064, what is one reason to take the temperature of concrete?

- a. Verify conformance
- b. Verify ambient air temperature
- c. Verify slump
- d. None of the above.

11. It is allowable to remove the temperature measuring devices from the freshly mixed concrete to read the temperature if you cannot see the reading. (T or F)

Name: \_\_\_\_\_  
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## **ASTM C172**

### **Standard Test Method for Sampling Freshly Mixed Concrete**

1. The maximum allowable time between obtaining the first and last portions of the composite sample may not exceed 5 minutes. (T or F).
2. Start molding specimens for strength tests within 30 minutes after fabricating the composite sample. (T or F)
3. The composite concrete sample must be protected from sun, wind, contamination and rapid evaporation. (T or F)
4. If the concrete contains aggregates larger than those that are appropriate for a size of mold or equipment used, the sample should be wet-sieved before making the test. (T or F)
5. The composite sample should not be remixed before beginning any tests. (T or F)
6. Sampling should normally be performed, as the concrete is discharged from the mixer. (T or F)
7. ASTM Method C172 includes sampling from stationary mixers, paving mixers, truck mixers, agitators, and non-agitating equipment. (T or F)
8. After sampling is completed, start the tests for slump and air content within:
  - a. 2 ½ minutes
  - b. 10 minutes
  - c. 15 minutes
  - d. None of the above
9. In any case, do not obtain samples until:
  - a. All the water and admixtures have been added to the concrete
  - b. 200 revolutions of the drum have been obtained
  - c. ½ of the water has been added
  - d. None of the above
10. No samples shall be taken before \_\_\_\_\_ or after \_\_\_\_\_ of the batch has been discharged.
  - a. 10% or after 90%
  - b. 20% or after 90%
  - c. 20% or after 80%
  - d. None of the above

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11. When strength tests are to be made, the minimum size of the composite sample shall be:
  - a.  $\frac{1}{4}$  cubic foot
  - b. 1 cubic foot
  - c. Any convenient size
  - d. 1 Wheelbarrow
  
12. Sample the concrete from the chute of a truck mixer by:
  - a. Raising chute to stop the flow and scoop concrete from there into the slump cone and cylinder molds
  - b. Passing a receptacle completely through the discharge stream or by completely diverting the discharge into the sample container
  - c. Holding a shovel in the flow and direct half into a bucket
  - d. None of the above
  
13. Fresh concrete to be tested at the job site should be sampled from:
  - a. The beginning of mixer discharge
  - b. The last concrete discharged
  - c. Two or more regularly spaced intervals during discharge of the middle portion of the batch
  - d. All of the above
  
14. The elapsed time between obtaining the first and final portions of the composite sample, according to ASTM C172, shall not exceed:
  - a. 10 minutes
  - b. 20 minutes
  - c. 30 minutes
  - d. None of the above

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## **ASTM C143**

### **Standard Test Method for Slump of Hydraulic-Cement Concrete**

1. The sides of the slump cone should be tapped with the mallet to consolidate the concrete in the mold. (T or F)
2. For the slump test, when Rodding the second layer and the top layer, the tamping rod should just penetrate into the underlying layer. (T or F)
3. According to ASTM C143, it is permissible to use a mold, which clamps to a non-absorbent base. (T or F)
4. When filling the final layer of the slump cone, never heap the concrete above the top of the mold. (T or F)
5. The filling of the slump cone should be done in three layers of equal height. (T or F)
6. The slump test may be done on any flat surface. (T or F)
7. When filling the slump cone, each layer should be rodded 25 times. (T or F)
8. The slump cone is filled in three layers of equal volume. (T or F)
9. Concrete should be removed from around the base before the cone is lifted. (T or F)
10. The slump cone should be raised carefully, vertically upward, in a steady motion in \_\_\_\_\_ Seconds
  - a. 2 to 6
  - b. 4 to 8
  - c. 3 to 7
  - d. 5 to 9
11. The elapsed time between the start of filling the slump cone and the removal of the cone must be no more than:
  - a. 1 minute
  - b. 2 1/2 minutes
  - c. 5 minutes
  - d. 15 minutes
12. The slump should be measured to the nearest
  - a. Tenth of an inch
  - b. Quarter of an inch
  - c. Half of an inch
  - d. 1 inch

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13. In order to determine slump, you should measure the vertical distance from:
- Top of the mold to the highest point of the slumped concrete
  - Top of the concrete to the base of the concrete
  - Top of the mold to the displaced original center of the top surface
  - None of the above
14. The dimensions of the slump cone are:
- Top diameter 6 inches, bottom diameter 12 inches, height 12 inches
  - Top diameter 4 inches, bottom diameter 8 inches, height 16 inches
  - Top diameter 4 inches, bottom diameter 8 inches, height 12 inches
  - None of the above
15. In the slump test, if a decided falling away or shearing off the concrete from one side or portion of the mass occurs upon raising the slump cone, one should:
- Reject the load for lack of uniformity
  - Accept the load but warn the plant
  - Disregard the test and make a new test when the next load arrives
  - Disregard the test and make a new test on another portion of the sample
16. The slump cone should be struck-off with:
- A float or trowel
  - A straight edge
  - The tamping rod
  - Any of the above
17. The slump cone must be placed:
- Only on the flat base provided by the mold's manufacturer
  - On a flat, clean, dry, wooden surface
  - On a flat moist, non-absorbent, rigid surface
  - On flat, dampened, compacted soil

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Date: \_\_\_\_\_

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## **ASTM C138**

### **Standard Test Method for Density (Unit Weight) Yield of Concrete**

1. When rodding the second and third layers, the rod should penetrate the preceding layer by about 1 inch. (T or F)
2. The normal  $\frac{1}{2}$  cubic foot bucket may not be used to determine Density (unit weight) of lightweight concrete. (T or F)
3. Concrete slump of less than 1 inch should be consolidated using a vibrator. (T or F)
4. ASTM C138 states, "the minimum capacity of the bucket depends on the maximum slump requirement." (T or F)
5. According to ASTM C138, after rodding each layer, tap the sides of the container, with the rod exactly 25 times. (T or F)
6. The outside of the density bucket should be cleaned before weighing. (T or F)
7. Concrete with a slump less than 1 inch should be rodded 25 times per layer. (T or F)
8. According to C138, concretes with slumps of 1-3 inches may be compacted with the vibrator or the rod. (T or F)
9. The unit weight bucket must be calibrated at least once a month. (T or F)
10. According to ASTM C138, when rodding the bottom layer, the rod shall not forcibly strike the bottom of the measure. (T or F)
11. The strike-off plate must be:
  - a. At least  $\frac{1}{4}$  inch thick if metal
  - b. Flat
  - c. At least  $\frac{1}{2}$  inch thick if glass or acrylic
  - d. All of the above

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12. Given the following: wt of bucket 16.2 lbs, volume of bucket =0.498 cf, wt of bucket and concrete 88.5 lbs.
- a. 140.7 lb/ft<sup>3</sup>      b. 145.2 lb/ft<sup>3</sup>      c. 177.7 lb/ft<sup>3</sup>      d. None of the above
13. What is the optimum amount of the concrete that should be protruding above the top of the mold after the third layer has been tapped by the mallet?
- a. None      b. About a 1/8<sup>th</sup> inch      c. About 1 inch      d. About 2 ½ inches
14. After strike-off, the next operation is:
- a. Tap the sides of the container smartly 10-15 times with the appropriate mallet
- b. Rod the top layer 25 times with the tamping rod
- c. Clean the excess concrete from the exterior of the measure
- d. Determine the net weight of concrete in the measure
15. Strike-off density (unit weight) bucket by:
- a. Using a trowel in a sawing motion
- b. Using a straightedge in a sawing motion
- c. Using a flat plate in a sawing motion
- d. None of the above
16. If the density (unit weight) of concrete is 146 lb/ft<sup>3</sup> and the total batch weight is 35,468 lb., what is the yield?
- a. 9.7 yd<sup>3</sup>      b. 7.0 yd<sup>3</sup>      c. 9.0 yd<sup>3</sup>      d. 243 yd<sup>3</sup>
17. The tamping, rod used for the unit weight test:
- a. A round, straight steel rod
- b. Has a 5/8 inch diameter with the tamping end rounded
- c. Is approximately 24 inches in length
- d. All of the above

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18. For a design batch of 9.0 cubic yards, the total weight of all materials batched was 36,400 lb., and the actual yield was 9.5 cubic yards. What was the relative yield?

- a. 1.06    b. 0.95    c. 4044 ft<sup>3</sup>    d. 3832 lbs.

19. Determine the air content. Total material batched 37,500 lbs...design yield 9.0 yd<sup>3</sup>...theoretical unit wt. 150.0 lbs/ft<sup>3</sup>...actual unit wt. 140.0 lbs/ft<sup>3</sup> actual yield 9.6 yd<sup>3</sup>

- a. 7.1%    b. 6.7%    c. 8.7%    d. Not enough information

***Additional Sample Problems are attached to the end of this test.***

Name: \_\_\_\_\_  
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## **ASTM C231**

### **Standard Test Method for Air Content of Freshly Mixed Concrete (Pressure Method)**

1. The pressure method should be used for determining the air content of concrete containing lightweight aggregates. (T or F)
2. The aggregate correction factor should only be used when concrete containing lightweight aggregate is being tested. (T or F)
3. After consolidation, if the measure contains a great excess of material, remove a quantity of representative concrete then strike off the surface. (T or F)
4. ASTM C231 covers procedures for both Type A and Type B meters. (T or F)
5. During filling with water, once water emerges through the opposite petcock, the Type B pressure meter should be jarred to expel all air bubbles through the petcock. (T or F)
6. Using the Type B meter, the gauge should read to the nearest 0.1%. (T or F)
7. Wet sieving is needed when the sample of fresh concrete contains aggregates larger than 2 inches. (T or F)
8. After the Type B pressure meter is filled with water and all the air has been expelled through the petcock:
  - a. Pump up the pressure chamber until the gauge reads zero
  - b. Pump up the pressure chamber until the gauge reads the coarse aggregate correction factor
  - c. Close the bleeder valve and pump up the pressure chamber and adjust the gauge to the initial pressure line
  - d. Close the bleeder valve and pump the meter to the maximum pressure



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## **ASTM C173**

### **Standard Test Method for Air Content of Freshly Mixed Concrete (Volumetric Method)**

1. This test method cannot be used to determine the air content of concrete containing lightweight aggregates. (T or F)
2. The rollameter base should be filled in three equal layers by volume. (T or F)
3. Isopropyl alcohol is used only at the end of the test procedures to dispel foam. (T or F)
4. The rollameter should never be used when ambient temperatures are below 60°F. (T or F)
5. If the concrete contains coarse aggregate particles that would be retained on a 1-1/2 in sieve, the concrete must be wet sieved to remove large sizes before testing in the rollameter. (T or F)
6. The rollameter may be used for concretes containing lightweight or normal weight aggregates. (T or F)
7. The calibrated measuring cup is equivalent to approximately 1% of the volume of the bowl of the air meter. (T or F)
8. Always add isopropyl alcohol prior to the initial filling of the meter with liquid. (T or F)
9. Immediately after water is added and the cap is tightened, the next step is:
  - a. Roll and rock the unit for approximately one minute
  - b. Tap the sides of the bond 10-15 times
  - c. Allow the unit to stand until the water column stabilizes
  - d. Invert and agitate the unit for at least 45 seconds
10. Which of the following equipment is not used in the ASTM C173 tests?
  - a. Strike off plate
  - b. 5/8-inch diameter rod
  - c. 1 ¼ pound mallet
  - d. Funnel

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11. After the meter had been rolled twice with no change in the liquid level and no foam on the surface of the liquid, the direct reading of the liquid in the neck was 3.25%. What was the air content of the concrete? The aggregate correction factor is 0.3% & 2 pints of alcohol were added initially.
- a. 6.25            b. 0.25            c. 3.55            d. 3.25
12. Read the liquid level in the neck, estimating to the nearest:
- a. 1.0 %            b. 0.5%            c. 0.25%            d. 0.1%
13. After the top is clamped on, fill the rollameter with liquid by:
- a. Carefully pouring water and alcohol directly on the top of the concrete surface without using the funnel
- b. Using the syringe to add all the water & alcohol
- c. Using the funnel until the liquid appears in the neck
- d. None of the above
14. The rolling procedure must be performed:
- a. With a rollameter in a horizontal position
- b. With the neck of the rollameter elevated
- c. While striking the base with the mallet
- d. All of the above

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## **ASTM C31**

### **Standard Test Method for Making and Curing Test Specimens in the Field**

1. Standard concrete specimens for comprehensive strength tests should be “initially” cured at 50 to 90° F. (T or F)
2. Standard compressive strength specimens for acceptance may be 6 X 12 or 4 X 8 inch cylinders. (T or F)
3. While rodding the top two layers, ASTM C31 requires the rod to penetrate the preceding Layer by 4 inches. (T or F)
4. Standard concrete test cylinders shall be molded on a level surface as near as practicable to its initial curing location. (T or F)
5. Never tap the sides of a compression test specimen with the mallet. (T or F)
6. 4 X 8 inch cylinders that are rodded should be filled in 3 layers of equal volume. (T or F)
7. When rodding ASTM C31 specimens, each layer should be rodded how many times?
  - a. 10-15 times
  - b. 25 times
  - c. 50 times
  - d. None of the above
8. The top of the cylinders should be covered after molding with:
  - a. A plastic sheet or bag
  - b. A plastic cap or lid
  - c. A non-absorptive, non reactive plate
  - d. Any of the above
9. Standard cured compressive test specimens cannot be transported from the field to the laboratory until:
  - a. 4 hours after initial set
  - b. at least 2 days
  - c. 12 hours after final set
  - d. 8 hours after final set

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10. Light-gauge single use molds, susceptible to damage if tapped with the mallet should be tapped with:
- a. The tamping rod
  - b. An open hand
  - c. The edge of the wooden float
  - d. None of the above
11. Cylinders shipped from the field to the laboratory for testing must be:
- a. Protected from physical damage
  - b. Protected from moisture loss
  - c. Protected from freezing
  - d. All of the above
12. Final curing for concrete test cylinders for the basis of acceptance that are standard cured:
- a. Shall not be below 80°F
  - b. Shall be with moisture maintained on all surfaces at 73.5+/-3.5°F
  - c. Shall be demoded at 24+/-8 hr. then cured at 60 to 80°F
  - d. Shall be as near the structure until tested



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- **Relative Yield = (Actual Yield) / (Design Yield)**

- Example C. Actual Yield = 9.5 yd<sup>3</sup> Design Yield = 9.0 yd<sup>3</sup> Relative Yield = ?

- Solution C. Relative Yield = (9.5 yd<sup>3</sup>) / (9.0 yd<sup>3</sup>) = **1.0556=1.1**

| Actual Yield (yd <sup>3</sup> ) | Design Yield (yd <sup>3</sup> ) | Relative Yield |
|---------------------------------|---------------------------------|----------------|
| 9.5                             | 9.0                             | 1.1            |
| 6.5                             | 6.3                             |                |
| 8.6                             | 8.9                             |                |
| 10.8                            | 10                              |                |
| 8.5                             | 8.2                             |                |
| 8.2                             | 8.5                             |                |
| 4.6                             | 4.6                             |                |
| 5.5                             | 5                               |                |

- **Gravimetric Air Content = ((Theoretical Density - Unit Weight) / Theoretical Density) X 100**

***Density = Unit Weight***

- Example D. Theoretical Density = 150 lbs/ft<sup>3</sup> Unit Weight = 140 lbs/ft<sup>3</sup>

Gravimetric Air Content = ?

- Solution D. Gravimetric Air Content (%) = ((150 lbs/ft<sup>3</sup> - 140 lbs/ft<sup>3</sup>) / 150 lbs/ft<sup>3</sup>) X 100 = **6.7%**

| Theoretical Density/unit Wgt (lbs/ft <sup>3</sup> ) | Actual Density/Unit Wgt (lbs/ft <sup>3</sup> ) | Air Content (%) |
|---|--|-----------------|
| 150.0   | 140.0  | 6.7             |
| 152.0   | 150.0  |                 |
| 143.6   | 140.1  |                 |
| 144.5   | 138.6  |                 |
| 143.6   | 142.2  |                 |
| 155.6   | 144.5  |                 |
| 151.3   | 149.2  |                 |
| 143.3   | 142.9  |                 |
| 143.5   | 138.6  |                 |

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