

## Concrete Field Testing Technician Study Guide

### ASTM C 172 – SAMPLING FRESH CONCRETE

1. The maximum allowable time between obtaining the first and final portions of a composite sample is \_\_\_\_\_ minutes.
2. The sample shall be \_\_\_\_\_ when the concrete contains aggregate larger than that appropriate for the molds or equipment.
3. When wet sieving, mortar adhering to the sides of the sieves shall be scraped back into the batch used for testing. True or False
4. After all concrete samples have been transported to the place where tests are to be performed; the samples must be \_\_\_\_\_ and \_\_\_\_\_ with a \_\_\_\_\_ to ensure uniformity.
5. Tests for temperature, slump, and air content, shall be started within \_\_\_\_\_ minutes after obtaining the final portion of the composite sample.
6. The molding of strength specimens shall begin within \_\_\_\_\_ minutes after fabricating the composite sample.
7. After obtaining the concrete sample, it must be protected from \_\_\_\_\_, \_\_\_\_\_, and other sources of \_\_\_\_\_ and from \_\_\_\_\_.
8. The size of a sample to be used for strength testing should be a minimum of \_\_\_\_\_ ft<sup>3</sup>.
9. When sampling from a stationary mixer, collect \_\_\_\_\_ or more portions taken at \_\_\_\_\_ spaced intervals from the \_\_\_\_\_ portion of the batch. Combine portions into one \_\_\_\_\_ sample before testing.
10. Concrete samples from a truck mixer must be obtained after all water and admixtures have been added to the mixer at the job site. True or False
11. Collection of a sample of concrete from a revolving drum truck mixer includes obtaining at least \_\_\_\_\_ portions taken at regularly spaced \_\_\_\_\_ during discharge of the middle portion of the batch.
12. Two methods for obtaining a sample of concrete from a revolving drum mixer are to repeatedly pass a receptacle through the entire \_\_\_\_\_ stream or to completely \_\_\_\_\_ the discharge stream into a sample container.

13. When sampling from a paving mixer, \_\_\_\_\_ the contents of the paving mixer and obtain samples from at least \_\_\_\_\_ different portions of the pile.
14. Samples from open-top truck mixers should be obtained by the most applicable method which will produce a representative sample. True or False

### **ASTM C 1064 - TEMPERATURE**

15. The temperature measuring device shall be capable of measuring the temperature of fresh concrete to  $\pm$  \_\_\_\_\_ °F and throughout the range of \_\_\_\_\_ °F to \_\_\_\_\_ °F.
16. The temperature measuring device shall be verified \_\_\_\_\_, or whenever there is a question of \_\_\_\_\_.
17. The accuracy of TMD's must be verified at \_\_\_\_\_ temperatures at least \_\_\_\_\_ apart.
18. The temperature of fresh concrete may be measured in the transporting equipment or forms providing there is at least 3" of cover. True or False
19. If transport equipment or forms are not used as the container, prior to sampling, you must \_\_\_\_\_ the sample container used for obtaining the temperature of fresh concrete.
20. A composite sample of concrete is required even if the only purpose for obtaining the sample is to determine temperature. True or False
21. The thermometer sensor should be immersed a minimum of \_\_\_\_\_ inches into the concrete and have at least \_\_\_\_\_ inches of concrete cover in all directions.
22. After inserting the thermometer, the concrete must be pressed around the temperature measuring device to prevent the \_\_\_\_\_ temperature from affecting the reading.
23. Leave the temperature measuring device in the concrete for at least \_\_\_\_\_ minutes, but not more than \_\_\_\_\_ minutes before reading.
24. The temperature measuring device may be removed from the concrete for reading. True or False
25. After reading, record the temperature to the nearest \_\_\_\_\_ °F.

## ASTM C 143 – SLUMP OF HYDRAULIC CEMENT CONCRETE

26. The rigid surface or base must be large enough to contain all of the slumped concrete. True or False
27. Slump molds should be verified before first use and at least \_\_\_\_\_ thereafter.
28. The measuring device used to determine slump must have \_\_\_\_\_ inch divisions or smaller.
29. Before filling, \_\_\_\_\_ the mold and \_\_\_\_\_. Place the slump cone on a rigid, \_\_\_\_\_, level, non-absorbent, surface free of \_\_\_\_\_.
30. The slump mold is filled in three layers of equal \_\_\_\_\_.
31. During rodding, the rod must be \_\_\_\_\_ to allow consolidation of the concrete near the perimeter of the mold.
32. If the concrete drops below the top of the slump mold during rodding of the final layer, rodding must be discontinued until \_\_\_\_\_ concrete has been added to raise the level above the rim, then resumed until 25 strokes have been completed.
33. The \_\_\_\_\_ should be used to strike off the top surface of the concrete using a rolling and \_\_\_\_\_ motion.
34. After strike-off, \_\_\_\_\_ the concrete from around the base of the mold to prevent interference with the slumping of the concrete.
35. Raise the mold vertically without lateral or torsional movement, a distance of \_\_\_\_\_ inches, in \_\_\_\_\_ ± \_\_\_\_\_ seconds.
36. Complete the slump test from filling to removal of mold in a time of \_\_\_\_\_ minutes.
37. Determine the slump by measuring the vertical distance between the top of the mold and the \_\_\_\_\_ original center of the concrete surface.
38. If a decided shearing away occurs, \_\_\_\_\_ the test and make a new test on another portion of the sample.
39. Report slump to the nearest \_\_\_\_\_ inch.

### ASTM C 138 – DENSITY (Unit Weight)

40. The measure must be made of metal when determining the density of fresh concrete. True or False
41. The size of the measure required is based on the \_\_\_\_\_ of the aggregate. Therefore, there is no wet-sieving required by this method.
42. Prior to filling the measure, the measure must be \_\_\_\_\_ and then \_\_\_\_\_.
43. After filling and consolidation of the final layer, an excess of \_\_\_\_\_ inch of concrete above the rim of the mold is considered ideal.
44. Adjustments to the level of concrete is permitted after consolidation but must be made prior to \_\_\_\_\_ - \_\_\_\_\_.
45. Strike-off of the concrete surface must be made using the strike-off \_\_\_\_\_, with the final strokes accomplished by \_\_\_\_\_ the plate to produce a smooth surface.
46. After strike-off, all excess concrete must be removed from the exterior of the bowl before weighing. True or False
47. Report the density of concrete to the nearest \_\_\_\_\_ lb/ft<sup>3</sup>.
48. Yield is the \_\_\_\_\_ of concrete produced from a concrete batch.
49. Relative Yield is a \_\_\_\_\_ of the actual volume of concrete obtained to the \_\_\_\_\_ volume of concrete.
50. Cement Content is the weight of cement per cubic yard or cubic meter of \_\_\_\_\_ produced.
51. Gravimetric Air Content is the calculated air content based on the \_\_\_\_\_ density of the concrete batch.

### ASTM C 231 – AIR CONTENT BY THE PRESSURE METHOD

52. This test method is intended for use with concretes that contain relatively \_\_\_\_\_ aggregates for which an aggregate correction factor can be determined.
53. Air content by the pressure method is not appropriate for concretes made with \_\_\_\_\_ aggregates, air-cooled blast furnace slag, or aggregates of high \_\_\_\_\_.

54. A check of the air pressure gauge dial readings is required every \_\_\_\_\_ months.
55. An aggregate correction factor is required by this method. True or False
56. Prior to filling the mold with concrete, the mold must be \_\_\_\_\_.
57. Never continue vibration long enough to cause the escape of \_\_\_\_\_ from the sample. Over vibration may cause \_\_\_\_\_ and loss of intentionally entrained air.
58. The strike-off \_\_\_\_\_ or the strike-off \_\_\_\_\_ may be used in this method to strike-off the top surface of the concrete after consolidation.
59. \_\_\_\_\_ the rim of the measuring bowl and cover assembly prior to attaching the cover assembly to the measuring bowl.
60. For a Type B meter, after clamping the cover to the bowl, \_\_\_\_\_ is injected into one petcock using a syringe until it emerges from the opposite petcock. Continue filling with water and \_\_\_\_\_ the meter, until all trapped air is expelled.
61. After filling a Type B meter with water, \_\_\_\_\_ the air bleeder valve, and pump air into the chamber until the hand on the dial gauge is on the initial pressure line. The petcocks are \_\_\_\_\_ during this operation.
62. After stabilizing the pressure on the initial pressure line, \_\_\_\_\_ both petcocks and \_\_\_\_\_ the main air valve while striking the sides of the measure with the \_\_\_\_\_ to remove trapped air.
63. While holding the main air valve open, lightly \_\_\_\_\_ the gauge with your hand and read the dial when stable. Then release the main air valve.
64. Release the pressure in the measure by \_\_\_\_\_ both petcocks. Remove cover before releasing the air in the air chamber.
65. The aggregate correction factor is \_\_\_\_\_ from the dial reading to determine the final air content.
66. Report the % air to the nearest \_\_\_\_\_ % if the reading is from 0 – 8 %, and to the nearest \_\_\_\_\_ - \_\_\_\_\_ division if it exceeds 8 %.

### **ASTM C 31 MAKING AND CURING CONCRETE TEST SPECIMENS**

67. When strength specimens are to be made, \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_ tests must also be conducted.

68. For acceptance testing for specified compressive strength, cylinders shall be \_\_\_\_\_ x \_\_\_\_\_ in. or \_\_\_\_\_ x \_\_\_\_\_ in.
69. When molding 6 x 12 cylinders by rodding, the concrete is placed into the cylinders in \_\_\_\_\_ equal layers and each layer is rodded \_\_\_\_\_ times.
70. When molding 4 x 8 cylinders by rodding or vibration, the concrete is placed into the cylinders in \_\_\_\_\_ equal layers.
71. For cylinder molds which may be dented or permanently distorted by using a mallet; after consolidation of each layer you must tap the outside of the mold 10 to 15 times using an \_\_\_\_\_.
72. Underfilled molds shall be adjusted with representative concrete during \_\_\_\_\_ of the top layer.
73. Strike-off the concrete surface of cylinders using the \_\_\_\_\_ or a handheld \_\_\_\_\_ or trowel to produce an even surface that has no depressions or projections larger than \_\_\_\_\_ inch.
74. After strike-off, verify that the mold has been \_\_\_\_\_ to identify the concrete it represents.
75. After strike-off, provide protection to prevent \_\_\_\_\_ loss, and move the specimen to an \_\_\_\_\_ place for storage.
76. Concrete mixtures with specified strengths of 6000 psi or greater shall have an initial curing temperature between \_\_\_\_\_ °F and \_\_\_\_\_ °F.
77. Specimens shall not be transported until at least \_\_\_\_\_ hours after final set and the transportation time shall not exceed \_\_\_\_\_ hours.
78. During transportation, test specimens must be protected from damage due to \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_.
79. Upon completion of initial curing and within \_\_\_\_\_ minutes of removing the mold, cure specimens by maintaining free \_\_\_\_\_ on all surfaces at a temperature of \_\_\_\_\_ ± \_\_\_\_\_ °F.

#### **ASTM C 173 – AIR CONTENT BY THE VOLUMETRIC METHOD**

80. Air content by the volumetric method can be performed on concrete containing any type of aggregate. True or False

81. The alcohol used in this test method must be \_\_\_\_\_ with a concentration of \_\_\_\_\_ % by volume.
82. Calibrate the meter and calibrated cup initially and \_\_\_\_\_ thereafter.
83. If the concrete for testing by the volumetric method contains aggregates that would be retained on an \_\_\_\_\_ inch sieve, wet-sieve a sufficient amount of the sample over a \_\_\_\_\_ inch sieve.
84. Prior to filling the bowl, \_\_\_\_\_ the inside of the bowl and remove any \_\_\_\_\_ water from the bottom.
85. The bowl of the meter will be filled with fresh concrete in \_\_\_\_\_ layers of approximately equal volume.
86. Adjustment to the concrete level may be made after strike-off. True or False
87. Prior to attaching the top section, \_\_\_\_\_ the top section including the gasket.
88. After attaching the top section, insert the \_\_\_\_\_ and add at least \_\_\_\_\_ pint of water followed by the selected amount of alcohol. Then, continue to add water through the funnel until the water level is seen in the \_\_\_\_\_. Remove the funnel and fill the neck with water until the bottom of the \_\_\_\_\_ is level with the zero mark.
89. After securing the lid, invert the meter and shake to free the concrete from the \_\_\_\_\_. Do not keep the meter inverted for more than \_\_\_\_\_ seconds at a time to prevent lodging of aggregate in the neck.
90. Repeat the inversion and shaking procedure for a minimum of \_\_\_\_\_ seconds.
91. After freeing the concrete from the base, roll the meter for approximately \_\_\_\_\_ minute.
92. After rolling, set the meter upright and allow the liquid level to stabilize. The liquid is considered stable when it does not change by more than \_\_\_\_\_ % in a \_\_\_\_\_ minute time period.
93. When the liquid level is stable without excessive foam, read the bottom of the meniscus to the nearest \_\_\_\_\_ %. This is recorded as the \_\_\_\_\_ meter reading.
94. If there is more than \_\_\_\_\_ % foam after the initial rolling procedure, discard the test and start a new test using more \_\_\_\_\_.

95. For this test to be completed, the maximum amount of change between the recorded initial and final meter readings is \_\_\_\_\_ %.
96. If there are portions of undisturbed, tightly packed concrete found in the bowl when emptying, the test is valid. True or False
97. If more than \_\_\_\_\_ pints of alcohol are used, a correction to the final meter reading is required.
98. The final air content is reported to the nearest \_\_\_\_\_ %.

**GENERAL**

99. For Density tests  $\leq 0.5 \text{ ft}^3$  and all other test methods, rod \_\_\_\_\_ times per layer and tap with the mallet \_\_\_\_\_ to \_\_\_\_\_ times. Rod \_\_\_\_\_ inch into the previous layer. If a mallet is required for these test methods, the size of the mallet shall be \_\_\_\_\_ pounds.
100. If using a 4 x 8 inch cylinder mold, the tamping rod must have a diameter of \_\_\_\_\_ inches. For all other test methods, the tamping rod must have a diameter of \_\_\_\_\_ inches. The tip must be \_\_\_\_\_.
101. For all tests where vibration is allowed, the minimum frequency is \_\_\_\_\_ vibrations per minute.

**WET SIEVE AND CONSOLIDATION SUMMARY**

	Must Vibrate	Rod or Vibrate	Must Rod	How to Vibrate	Mallet when Vibrating	Wet Sieve Info
<b>Slump</b>	Rod only					If aggregate is retained on 1 1/2", wet sieve over 1 1/2"
<b>Density</b>	< 1"	1 - 3"	> 3"	2 lifts, 3 insertions per layer	None	Based on <u>NMAS</u>
<b>Air Pressure</b>	< 1"	1 - 3"	> 3"	2 lifts, 3 insertions per layer	None	If aggregate is retained on 2", wet sieve over 1 1/2"
<b>Air Volumetric</b>	Rod only					If aggregate is retained on 1 1/2", wet sieve over 1"
<b>Cylinders</b>	< 1"	$\geq 1"$	N/A	4x8" cylinder: 2 lifts, 1 insertion per layer 6x12" cylinder: 2 lifts, 2 insertions per layer	At least 10 times	NMAS > 2, wet sieve over 2"
<b>Beams</b>	< 1"	$\geq 1"$	N/A	Standard: 1 lift, insert at intervals $\leq 6"$ along centerline Wide: 1 lift, use alternating insertions along two lines	At least 10 times	NMAS > 2, wet sieve over 2"