

## 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 wet-sieving, the composite sample must be \_\_\_\_\_ with a shovel to ensure uniformity prior to testing.
5. 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.
6. Tests for temperature, slump, and air content, shall be started within \_\_\_\_\_ minutes after obtaining the final portion of the composite sample.
7. The molding of strength specimens shall begin within \_\_\_\_\_ minutes after fabricating the composite sample.
8. After obtaining the concrete sample, it must be protected from \_\_\_\_\_, \_\_\_\_\_, and other sources of \_\_\_\_\_ and from \_\_\_\_\_.
9. The size of a sample to be used for strength testing should be a minimum of \_\_\_\_\_ ft<sup>3</sup>.
10. 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.
11. 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
12. 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.

13. 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.
14. If needed, the rate of discharge from a drum truck mixer may be regulated by adjusting the rate of \_\_\_\_\_ of the \_\_\_\_\_.
15. When sampling from a continuous mixer, concrete samples should not be obtained until all \_\_\_\_\_ have been made and only after \_\_\_\_\_ cubic feet or more of concrete has been discharged.
16. After combining sample portions from a continuous mixer into a composite sample, wait a minimum of \_\_\_\_\_ minutes and a maximum of \_\_\_\_\_ minutes before beginning tests.
17. When sampling from a paving mixer, \_\_\_\_\_ the contents of the paving mixer and obtain samples from at least \_\_\_\_\_ different portions of the pile.
18. 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**

19. The temperatures of concrete may be used to determine \_\_\_\_\_ with specifications.
20. Concrete containing aggregate with a nominal maximum aggregate size greater than 3 inches may require up to \_\_\_\_\_ minutes before the temperature stabilizes after mixing.
21. 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.
22. The temperature measuring device shall be verified \_\_\_\_\_, or whenever there is a question of \_\_\_\_\_.
23. Reference thermometers must be accurate and readable to  $\pm$  \_\_\_\_\_ °F.
24. The accuracy of TMD's must be verified at \_\_\_\_\_ temperatures at least \_\_\_\_\_ apart.
25. 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

26. 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.
27. A composite sample of concrete is required even if the only purpose for obtaining the sample is to determine temperature. True or False
28. The thermometer sensor should be immersed a minimum of \_\_\_\_\_ inches into the concrete and have at least \_\_\_\_\_ inches of concrete cover in all directions.
29. After inserting the thermometer, the concrete must be pressed around the temperature measuring device to prevent the \_\_\_\_\_ temperature from affecting the reading.
30. Leave the temperature measuring device in the concrete for at least \_\_\_\_\_ minutes, but not more than \_\_\_\_\_ minutes before reading.
31. The temperature measuring device may be removed from the concrete for reading. True or False
32. After reading, record the temperature to the nearest \_\_\_\_\_ °F.

### **ASTM C 143 – SLUMP OF HYDRAULIC CEMENT CONCRETE**

33. The slump test is applicable to concretes with a maximum aggregate size of \_\_\_\_\_ inches. If the concrete contains aggregate larger than \_\_\_\_\_ inches, wet sieve over the \_\_\_\_\_ inch sieve.
34. The rigid surface or base must be large enough to contain all of the slumped concrete. True or False
35. The tamping rod used in the slump test is a smooth steel rod of \_\_\_\_\_ inches in diameter and has at least one \_\_\_\_\_ tip.
36. The height of the slump cone is \_\_\_\_\_ inches with a base opening of \_\_\_\_\_ inches and a top opening of \_\_\_\_\_ inches.
37. Slump molds should be verified before first use and at least \_\_\_\_\_ thereafter.
38. The measuring device used to determine slump must have \_\_\_\_\_ inch divisions or smaller.

39. Before filling, \_\_\_\_\_ the mold and \_\_\_\_\_. Place the slump cone on a rigid, \_\_\_\_\_, level, non-absorbent, surface free of \_\_\_\_\_.
40. The slump mold is filled in three layers of equal \_\_\_\_\_.
41. Rod each layer \_\_\_\_\_ times using the \_\_\_\_\_ end of the tamping rod.
42. During rodding, the rod must be \_\_\_\_\_ to allow consolidation of the concrete near the perimeter of the mold.
43. When rodding a second or third layer, the rod must penetrate approximately \_\_\_\_\_ inch into the previous layer.
44. 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.
45. The \_\_\_\_\_ should be used to strike off the top surface of the concrete using a rolling and \_\_\_\_\_ motion.
46. After strike-off, \_\_\_\_\_ the concrete from around the base of the mold to prevent interference with the slumping of the concrete.
47. Raise the mold vertically without lateral or torsional movement, a distance of \_\_\_\_\_ inches, in \_\_\_\_\_  $\pm$  \_\_\_\_\_ seconds.
48. Complete the slump test from filling to removal of mold in a time of \_\_\_\_\_ minutes.
49. Determine the slump by measuring the vertical distance between the top of the mold and the \_\_\_\_\_ original center of the concrete surface.
50. If a decided shearing away occurs, \_\_\_\_\_ the test and make a new test on another portion of the sample.
51. Report slump to the nearest \_\_\_\_\_ inch.

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

52. The balance used during the density test must be accurate to \_\_\_\_\_ lb or to within \_\_\_\_\_ % of the test load, whichever is greater.

53. The measure must be made of metal when determining the density of fresh concrete. True or False
54. The size of the measure required is based on the \_\_\_\_\_ of the aggregate. Therefore, there is no wet-sieving required by this method.
55. Determine the volume of the measure using ASTM \_\_\_\_\_ yearly and report the volume of the measure to the nearest \_\_\_\_\_ ft<sup>3</sup>.
56. The tamping rod length must be at least \_\_\_\_\_ inches greater than the depth of the mold being used but not greater than \_\_\_\_\_ inches.
57. The required frequency of the vibrator used in this test method is at least \_\_\_\_\_ vibrations per minute.
58. A metal strike-off plate must be at least \_\_\_\_\_ inch thick and if made of glass or acrylic at least \_\_\_\_\_ inch thick. The length and width of a strike-off plate must be at least \_\_\_\_\_ inches greater than the diameter of the measure.
59. The specified weight of the mallet used on measures that are 0.5 ft<sup>3</sup> or smaller is \_\_\_\_\_ ± \_\_\_\_\_ lbs.
60. \_\_\_\_\_ must be used to consolidate concretes with a slump less than 1 inch, whereas \_\_\_\_\_ must be used to consolidate concretes with slumps greater than 3 inches.
61. If rodding is the method of consolidation, the measure must be filled in \_\_\_\_\_ layers of approximately equal volume.
62. For a measure of 0.5 ft<sup>3</sup> or smaller, \_\_\_\_\_ strokes of the tamping rod are required for consolidation of each layer.
63. After rodding each layer, tap the sides of the measure using the mallet \_\_\_\_\_ to \_\_\_\_\_ times to close the voids left by the tamping rod.
64. If vibration is the method of consolidation, the measure must be filled in \_\_\_\_\_ approximately equal layers.
65. When using an internal vibrator, the vibrator is not allowed to touch the sides or bottom of the measure. True or False
66. Prior to filling the measure, the measure must be \_\_\_\_\_ and then \_\_\_\_\_.

67. After filling and consolidation of the final layer, an excess of \_\_\_\_\_ inch of concrete above the rim of the mold is considered ideal.
68. Adjustments to the level of concrete is permitted after consolidation but must be made prior to \_\_\_\_\_ - \_\_\_\_\_.
69. 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.
70. After strike-off, all excess concrete must be removed from the exterior of the bowl before weighing. True or False
71. Report the density of concrete to the nearest \_\_\_\_\_ lb/ft<sup>3</sup>.
72. Yield is defined as the \_\_\_\_\_ of concrete produced from a known quantity of materials.

#### **ASTM C 231 - AIR CONTENT BY THE PRESSURE METHOD**

73. Air content by the pressure method determines the air content from an observation of the change in \_\_\_\_\_ of concrete with a change in \_\_\_\_\_.
74. This test method is intended for use with concretes that contain relatively \_\_\_\_\_ aggregates for which an aggregate correction factor can be determined.
75. Air content by the pressure method is not appropriate for concretes made with \_\_\_\_\_ aggregates, air-cooled blast furnace slag, or aggregates of high \_\_\_\_\_.
76. Changes in barometric pressure will affect the standardization of the Type \_\_\_\_\_ meter.
77. The minimum capacity of the measuring bowl used in this test is \_\_\_\_\_ cubic feet with a typical volume of the type B meter bowl being \_\_\_\_\_ cubic feet.
78. If a vibrator is used for consolidation it must have a frequency of at least \_\_\_\_\_ vibrations per minute.
79. The strike-off bar which may be used is a flat, metal bar at least \_\_\_\_\_ inch thick, \_\_\_\_\_ inches wide, and \_\_\_\_\_ inches long.
80. A check of the air pressure gauge dial readings is required every \_\_\_\_\_ months.

81. An aggregate correction factor is required by this method. True or False
82. If the concrete to be tested contains aggregate retained on the \_\_\_\_\_ inch sieve, the sample must be wet-sieved over the \_\_\_\_\_ inch sieve prior to testing.
83. Consolidate concrete in this method by: \_\_\_\_\_ concrete with a slump of greater than 3 inches; \_\_\_\_\_ or \_\_\_\_\_ concrete with a slump of 1 to 3 inches; \_\_\_\_\_ concrete with a slump of less than 1 inch.
84. Prior to filling the mold with concrete, the mold must be \_\_\_\_\_.
85. When consolidation is accomplished by rodding, place the concrete in the bowl in \_\_\_\_\_ equal layers and rod each layer \_\_\_\_\_ times. After rodding, tap the sides of the bowl with a mallet \_\_\_\_\_ to \_\_\_\_\_ times.
86. If the concrete sample is to be consolidated by vibration, the measure is filled in \_\_\_\_\_ layers of equal volume. Insert the vibrator \_\_\_\_\_ times per layer.
87. Never continue vibration long enough to cause the escape of \_\_\_\_\_ from the sample. Over vibration may cause \_\_\_\_\_ and loss of intentionally entrained air.
88. The strike-off \_\_\_\_\_ or the strike-off \_\_\_\_\_ may be used in this method to strike-off the top surface of the concrete after consolidation.
89. \_\_\_\_\_ the rim of the measuring bowl and cover assembly prior to attaching the cover assembly to the measuring bowl.
90. 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.
91. 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.
92. 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.
93. 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.

94. Release the pressure in the measure by \_\_\_\_\_ both petcocks. Remove cover before releasing the air in the air chamber.
95. If water enters the air chamber, it must be \_\_\_\_\_ from the chamber and blown out using the pump to prevent errors in the next measurement.
96. The aggregate correction factor is \_\_\_\_\_ from the dial reading to determine the final air content.
97. 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**

98. The concrete used to make the molded specimens shall be sampled after all on-site \_\_\_\_\_ have been made to the mixture proportions.
99. When strength specimens are to be made, \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_ tests must also be conducted.
100. For a 6 x 12 cylinder, the tamping rod must be a round, straight steel rod with a diameter of \_\_\_\_\_ inches, but if using a 4 x 8 inch mold, the \_\_\_\_\_ inch diameter rod must be used.
101. The minimum frequency of an internal vibrator used in this procedure is \_\_\_\_\_ vibrations per minute. The diameter of the vibrator should be no more than \_\_\_\_\_ the diameter of the cylinder mold or width of the beam mold.
102. The required weight of mallet used in this procedure is \_\_\_\_\_ lbs.
103. When placing concrete in a beam mold, either a scoop or shovel is permitted.  
True or False
104. For acceptance testing for specified compressive strength, cylinders shall be \_\_\_\_\_ x \_\_\_\_\_ in. or \_\_\_\_\_ x \_\_\_\_\_ in.
105. For a cylinder, if the nominal maximum aggregate size of the coarse aggregate exceeds \_\_\_\_\_ inches, the concrete must be \_\_\_\_\_ over the 2 inch sieve prior to placement in the mold.
106. Consolidation of concrete having a slump of less than one inch must be accomplished by using \_\_\_\_\_ when making cylinders or beams.



107. When molding 6 x 12 cylinders by rodding, the concrete is placed into the cylinders in \_\_\_\_\_ equal layers and each layer is rodded \_\_\_\_\_ times.
108. When using an internal vibrator to consolidate a 6 x 12 compressive strength test specimen, the mold is filled in \_\_\_\_\_ layers and the vibrator must be inserted at \_\_\_\_\_ different points for each layer.
109. When rodding the upper layer(s) of a cylinder, the tamping rod should penetrate the underlying layer by about \_\_\_\_\_ inch.
110. When molding 4 x 8 cylinders by rodding or vibration, the concrete is placed into the cylinders in \_\_\_\_\_ equal layers.
111. 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 \_\_\_\_\_.
112. Underfilled molds shall be adjusted with representative concrete during \_\_\_\_\_ of the top layer.
113. 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.
114. You may cap the top surface of freshly made cylinders with a thin layer of Portland cement paste which is then permitted to harden and cure with the specimen.  
True or False
115. After strike-off, verify that the mold has been \_\_\_\_\_ to identify the concrete it represents.
116. After strike-off, provide protection to prevent \_\_\_\_\_ loss, and move the specimen to an \_\_\_\_\_ place for storage.
117. The standard size beam is \_\_\_\_\_ inches wide by \_\_\_\_\_ inches deep and a minimum of \_\_\_\_\_ inches long.
118. For beams, if the NMAS is greater than 2 inches, wet sieving over the 2 inch sieve is required. True or False
119. A standard sized beam is filled in \_\_\_\_\_ lift(s) when rodding and \_\_\_\_\_ lift(s) when using a vibrator.

120. The number of roddings required per layer for a flexural strength specimen is one rodding for each \_\_\_\_\_ square inches of the top surface area of the beam.
121. After rodding and tapping each layer of a beam specimen, you must spade along the sides and ends with a trowel or other suitable device. True or False
122. When internal vibration is used to consolidate a standard flexural strength test specimen, the vibrator is inserted at intervals not exceeding \_\_\_\_\_ along the centerline of the beam.
123. When using a vibrator to consolidate a beam, you must tap the outside of the mold after vibration at least \_\_\_\_\_ times with a \_\_\_\_\_.
124. The supporting surface on which specimens are stored shall be level within \_\_\_\_\_ per \_\_\_\_\_.
125. *Standard Curing* is the method used when test specimens are to be used for \_\_\_\_\_ testing, checking the \_\_\_\_\_ of mixture proportions, and \_\_\_\_\_.
126. *Field Curing* is the test method used when test specimens are to be used for determining when a \_\_\_\_\_ may be put into use, comparison testing, the adequacy of \_\_\_\_\_ and \_\_\_\_\_ of the concrete in the structure, and \_\_\_\_\_ removal time requirements.
127. When *Standard Curing* concrete mixtures with a specified strength of less than 6000 psi, initial curing requires that the specimens be stored for a period up to \_\_\_\_\_ hours in a temperature range from \_\_\_\_\_ °F to \_\_\_\_\_ °F.
128. Concrete mixtures with specified strengths of 6000 psi or greater shall have an initial curing temperature between \_\_\_\_\_ °F and \_\_\_\_\_ °F.
129. Specimens shall not be transported until at least \_\_\_\_\_ hours after final set and the transportation time shall not exceed \_\_\_\_\_ hours.
130. During transportation, test specimens must be protected from damage due to \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_.
131. Upon completion of initial curing, the test specimens may be left in their molds and sealed in plastic bags. True or False
132. 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.

133. Beams must be cured by storing in water saturated with \_\_\_\_\_ at  $73.5 \pm 3.5$  °F at least \_\_\_\_\_ hours prior to testing.
134. Beam surfaces are allowed to dry prior to testing. True or False
135. When field curing cylinders, provide like \_\_\_\_\_ and \_\_\_\_\_ conditions as the structural work.
136. When reporting data for strength test specimens, it is important to report the location of placement, time of casting, and the curing method. True or False

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

137. Air content by the volumetric method can be performed on concrete containing any type of aggregate. True or False
138. The bowl volume must be at least \_\_\_\_\_ ft<sup>3</sup>.
139. The strike off bar made of steel shall have dimensions of at least \_\_\_\_\_ x \_\_\_\_\_ x \_\_\_\_\_ inches, and if made of plastic the required thickness increases to \_\_\_\_\_ inch.
140. The rubber or rawhide mallet required for this test should have a mass of approximately \_\_\_\_\_ lbs.
141. The calibrated cup is used only to add \_\_\_\_\_ when the air content exceeds 9 % and should be equal to \_\_\_\_\_  $\pm$  \_\_\_\_\_ % of the bowl volume.
142. The alcohol used in this test method must be \_\_\_\_\_ with a concentration of \_\_\_\_\_ % by volume.
143. Calibrate the meter and calibrated cup initially and \_\_\_\_\_ thereafter.
144. 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.
145. Prior to filling the bowl, \_\_\_\_\_ the inside of the bowl and remove any \_\_\_\_\_ water from the bottom.
146. The bowl of the meter will be filled with fresh concrete in \_\_\_\_\_ layers of approximately equal volume.
147. Rod each layer \_\_\_\_\_ times with the tamping rod.

148. After each rodding, tap the sides of the bowl \_\_\_\_\_ to \_\_\_\_\_ times with a mallet to close any voids left by the tamping rod.
149. Adjustment to the concrete level may be made after strike-off. True or False
150. Prior to attaching the top section, \_\_\_\_\_ the top section including the gasket.
151. 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.
152. 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.
153. Repeat the inversion and shaking procedure for a minimum of \_\_\_\_\_ seconds.
154. After freeing the concrete from the base, roll the meter for approximately \_\_\_\_\_ minute.
155. 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.
156. 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.
157. If there is more than \_\_\_\_\_ % foam after the initial rolling procedure, discard the test and start a new test using more \_\_\_\_\_.
158. For this test to be completed, the maximum amount of change between the recorded initial and final meter readings is \_\_\_\_\_ %.
159. If there are portions of undisturbed, tightly packed concrete found in the bowl when emptying, the test is valid. True or False
160. If more than \_\_\_\_\_ pints of alcohol are used, a correction to the final meter reading is required.
161. The final air content is reported to the nearest \_\_\_\_\_ %.