ACI Concrete Field Testing Technician - Grade I Practice Exam (Sample)

Study Guide

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Questions

1. **What material can be used to make the tamping rod, according to the requirements?**
   - **A. Aluminum**
   - **B. Steel**
   - **C. High-density polyethylene or equal**
   - **D. Both steel and high-density polyethylene**

2. **For cylinders with a diameter of 6 in. [150 mm] or greater, the tamping rod must have a diameter of what?**
   - **A. 1/2 in. [13 mm]**
   - **B. 3/4 in. [19 mm]**
   - **C. 5/8 in. ± 1/16 in. [16 mm ± 2 mm]**
   - **D. 1 in. [25 mm]**

3. **When the slump is greater than 3 inches, which method of consolidation is required?**
   - **A. Finishing**
   - **B. Rodding**
   - **C. Vibration**
   - **D. Tamping**

4. **What is the minimum and maximum time that the temperature measuring device should be in fresh concrete?**
   - **A. 1 to 3 minutes**
   - **B. 2 to 5 minutes**
   - **C. 3 to 8 minutes**
   - **D. 4 to 10 minutes**

5. **How deep must the sensor of the temperature measuring device be submerged in freshly mixed concrete?**
   - **A. 2 inches [50 mm]**
   - **B. 3 inches [75 mm]**
   - **C. 4 inches [100 mm]**
   - **D. 5 inches [125 mm]**

6. The concrete sample for this test should be obtained in accordance with which ASTM Standard?

A. C150

B. C172

C. C231

D. C191

7. What is the minimum size sample required for making strength test specimens in concrete testing?

A. 14 L (0.5 ft^3)

B. 28 L (1 ft^3)

C. 21 L (0.75 ft^3)

D. 35 L (1.25 ft^3)

8. What action is required if there is an excess quantity of concrete in the measure after final layer consolidation?

A. Soak it with water

B. Remove a representative quantity with a scoop or trowel

C. Leave it to settle

D. Report it to a supervisor

9. Before lifting the slump mold, what surrounding area must be cleared of concrete?

A. The area above the mold

B. The area surrounding the base of the mold

C. The area below the bottom of the mold

D. The sides of the mold

10. What must be done to a concrete sample containing aggregate larger than permitted before conducting a test?

A. Sent to a lab for analysis

B. Dry sieved

C. Wet sieved

D. Crushed into finer aggregates

Answers

1. D
2. C
3. B
4. B
5. B
6. B
7. B
8. B
9. B
10. C

Explanations

1. What material can be used to make the tamping rod, according to the requirements?

A. Aluminum

B. Steel

C. High-density polyethylene or equal

D. Both steel and high-density polyethylene

The requirements for the tamping rod used in concrete testing specify that it should be made from materials that are durable and capable of effectively compacting concrete without causing any contamination or alteration to the test results. Steel is a commonly used material due to its strength, durability, and resistance to wear. High-density polyethylene is also acceptable as it is non-reactive and will not affect the concrete mix. Using either of these materials fulfills the necessary criteria for a proper tamping rod, allowing for consistent results during testing. Therefore, the option that includes both steel and high-density polyethylene accurately reflects the acceptable materials for the tamping rod as outlined in industry standards.

2. For cylinders with a diameter of 6 in. [150 mm] or greater, the tamping rod must have a diameter of what?

A. 1/2 in. [13 mm]

B. 3/4 in. [19 mm]

C. 5/8 in. ± 1/16 in. [16 mm ± 2 mm]

D. 1 in. [25 mm]

The correct answer indicates that for concrete cylinders with a diameter of 6 inches (150 mm) or greater, the tamping rod must have a diameter of 5/8 inch ± 1/16 inch (16 mm ± 2 mm). This specification is crucial as it relates to the compaction process during concrete sampling to ensure consistent results in testing. The rationale behind this specification is rooted in the need to efficiently consolidate the concrete mix within the cylinder without over- or under-compacting it. The size of the tamping rod is designed to effectively compact the concrete while minimizing air voids and ensuring the concrete is homogeneous within the sample. The chosen diameter provides adequate density without interfering with the integrity of the cylinder walls, ultimately leading to reliable test results when assessing the strength and quality of the concrete. By establishing a precise tamping rod diameter, standards help align the procedures followed by field technicians with those outlined in ASTM and ACI guidelines, reinforcing quality control in concrete testing across varying projects.

3. When the slump is greater than 3 inches, which method of consolidation is required?

A. Finishing

B. Rodding

C. Vibration

D. Tamping

When the slump of concrete is greater than 3 inches, the method of consolidation that is required is vibration. This is primarily due to the fact that higher slump mixes have a more fluid consistency that necessitates thorough consolidation to eliminate air voids, ensure proper bonding, and achieve the desired strength and durability in the final product. Vibration is especially effective for high-slump concrete because it allows the material to flow and settle into place, resulting in a denser, more uniform mixture. This method also helps to ensure that the concrete completely fills the formwork and surrounds any embedded reinforcement adequately. Other methods such as rodding, tamping, and finishing are typically more suitable for lower-slump mixes. Rodding, for example, is effective for slumps that are 3 inches or lower, as it depends on displacing the concrete with a rod, which is less effective on wetter, more fluid mixes. Similarly, tamping is designed for denser, stiffer mixes; and finishing is a process that comes after consolidation to achieve a smooth surface rather than consolidate the concrete. Thus, vibration is the appropriate method in this scenario to achieve optimal density and performance of the concrete mix.

4. What is the minimum and maximum time that the temperature measuring device should be in fresh concrete?

A. 1 to 3 minutes

B. 2 to 5 minutes

C. 3 to 8 minutes

D. 4 to 10 minutes

The correct range of time for the temperature measuring device to be in fresh concrete is 2 to 5 minutes. This duration is crucial to obtain an accurate representation of the concrete's temperature. Having the device in place for at least 2 minutes ensures that the sensor adjusts and stabilizes in the fresh concrete, allowing it to accurately reflect the temperature of the concrete mass. If the device is removed too quickly, it may not register the true temperature due to insufficient time for thermal equilibrium. Conversely, leaving the device for too long may cause heat discrepancies due to factors like groundwater movement, evaporation, or temperature changes in the surrounding environment. Thus, the 2 to 5-minute range balances the need for accurate measurements while minimizing disturbances that could skew results. This careful timing is part of standard testing protocols to ensure consistency and reliability in the results obtained from temperature measurements in concrete testing.

5. How deep must the sensor of the temperature measuring device be submerged in freshly mixed concrete?

A. 2 inches [50 mm]

<u>B. 3 inches [75 mm]</u>

C. 4 inches [100 mm]

D. 5 inches [125 mm]

The depth to which the sensor of the temperature measuring device must be submerged in freshly mixed concrete is crucial for obtaining an accurate representation of the concrete's temperature. Submerging the sensor to a depth of 3 inches [75 mm] ensures that the reading is taken from within the mass of the concrete, minimizing the influence of ambient temperature or surface variations. At this depth, the sensor is less likely to be affected by factors such as air pockets, evaporation, or exposure to the elements, which could lead to inaccurate measurements. This standard practice is intended to provide a reliable temperature reading that reflects the thermal conditions existing within the concrete mix, thereby facilitating accurate assessment for quality control during concrete placement. Choosing a depth that is too shallow may yield erroneous readings, resulting in potential misinterpretations of the curing conditions.

6. The concrete sample for this test should be obtained in accordance with which ASTM Standard?

A. C150

<u>B. C172</u>

C. C231

D. C191

The correct choice is based on the guidelines set forth by ASTM C172, which outlines the proper methods for the sampling of fresh concrete. This standard is crucial as it ensures that the concrete used for testing reflects the properties of the concrete that will be placed in the actual construction. Adhering to ASTM C172 provides detailed procedures for collecting samples, including the locations from which to obtain them, the quantities needed, and the timing of the sampling, which is essential for obtaining representative samples that accurately represent the batch's characteristics. In contrast, the other ASTM standards listed address different aspects of concrete. For instance, ASTM C150 relates to the specifications for Portland cement, ASTM C231 pertains to the measurement of air content in fresh concrete, and ASTM C191 covers the density and unit weight of freshly mixed concrete. Each of these standards serves a specific purpose in the field of concrete testing and quality control but does not govern the sampling process itself. Thus, understanding the role of ASTM C172 is fundamental for anyone involved in concrete field testing.

7. What is the minimum size sample required for making strength test specimens in concrete testing?

A. 14 L (0.5 ft^3)

B. 28 L (1 ft^3)

C. 21 L (0.75 ft^3)

D. 35 L (1.25 ft^3)

The minimum size sample required for making strength test specimens in concrete testing is 28 liters (1 cubic foot). This requirement ensures that there is enough concrete material to produce the necessary test specimens while also accommodating variations that may arise during mixing. Having 28 liters allows for creating multiple test cylinders or beams, which can then be subjected to compressive strength testing. This volume helps to achieve accurate and reliable test results, as it guarantees that the samples are representative of the larger batch of concrete being tested. The choice of 28 liters is in line with various industry standards and practices that emphasize the importance of sample size in achieving consistency and accuracy in strength testing. A smaller sample might not provide the necessary volume to compensate for any non-homogeneity that could exist within the batch, potentially leading to misleading results. Thus, 28 liters represents the standard for ensuring sufficient material for comprehensive testing and promoting quality control in concrete production.

8. What action is required if there is an excess quantity of concrete in the measure after final layer consolidation?

A. Soak it with water

B. Remove a representative quantity with a scoop or trowel

C. Leave it to settle

D. Report it to a supervisor

When an excess quantity of concrete is found in the measure after the final layer has been consolidated, the appropriate action is to remove a representative quantity with a scoop or trowel. This procedure is essential for ensuring an accurate measurement of the concrete's volume, which is critical for determining its consistency and properties. By removing the excess concrete, you can ensure that the measure contains only the specified quantity that the test requires. This helps in maintaining the integrity of the test results, allowing for effective quality control and assessment of the concrete mix. Leaving the excess concrete as it is may result in an inaccurate reading, while soaking it with water or allowing it to settle would not lead to a correct measurement either. Reporting it to a supervisor does not directly address the need to adjust the concrete quantity immediately in the testing process. Therefore, removing the excess with a scoop or trowel is the correct and practical approach.

9. Before lifting the slump mold, what surrounding area must be cleared of concrete?

A. The area above the mold

B. The area surrounding the base of the mold

C. The area below the bottom of the mold

D. The sides of the mold

Before lifting the slump mold, it is essential to ensure that the area surrounding the base of the mold is cleared of concrete. This is crucial for several reasons. First, clearing the area around the base allows for an accurate reading of the slump. If concrete is present around the base, it can affect the measurement by potentially lifting the mold unevenly or creating resistance that alters the flow of the concrete when the mold is removed. Proper measurement is vital to assessing the workability of the concrete mix. Second, a clear area ensures safety during the lift. If there is concrete or debris around the mold, it can pose a tripping hazard or lead to spills, undermining the integrity of the slump test process. Ensuring that nothing obstructs the mold's base contributes to the reliability of the test results—an essential factor when evaluating concrete consistency and quality.

10. What must be done to a concrete sample containing aggregate larger than permitted before conducting a test?

A. Sent to a lab for analysis

B. Dry sieved

C. Wet sieved

D. Crushed into finer aggregates

To ensure accurate testing results, when a concrete sample contains aggregate larger than the specified limits, wet sieving is the appropriate method to prepare the sample before conducting tests. Wet sieving involves passing the sample through a series of sieves with water, which helps to separate the larger aggregates from the smaller particles effectively and minimizes the chance of clumping. This method is particularly useful as it also helps to wash off any excess cement paste that may adhere to the surface of the aggregates, allowing for a more precise assessment of the concrete's properties. In contrast, other methods such as dry sieving could lead to issues where dust or fine particles may not be adequately separated due to the lack of water, and sending the sample to a lab could delay results without addressing the immediate need for testing preparation. Crushing the aggregates into finer pieces alters the sample's characteristics, which is not suitable for the purpose of accurate field testing of the original concrete mix. Thus, wet sieving is the correct and best practice for handling oversized aggregates in field tests.