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

Study Guide

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Questions

1. **According to ASTM Standards, how should the concrete sample be obtained for the test method?**

   A. C150

   B. C172

   C. A123

   D. C94

2. **What should be done to test specimens upon completion of initial curing?**

   A. They should be left in their molds

   B. They must be demolished and placed in water storage

   C. They should be dried in a warm environment

   D. They can be sealed in plastic bags only

3. **How long should the air meter be inverted and agitated for effective operation?**

   A. No more than three seconds

   B. No more than five seconds, must be repeated for a minimum of 45 seconds

   C. No more than 60 seconds continuously

   D. It should not be inverted

4. **The container for obtaining the concrete sample can be any of the following except?**

   A. Plastic bucket

   B. Metal pan

   C. Wheelbarrow

   D. Flat, clean nonabsorbent mixing board

5. **What is the range for measuring temperature using the temperature measuring device?**

   A. -10 to 110 degrees F [−23 to 43 degrees C]

   B. 30 degrees F to 120 degrees F [0 C to 50 C]

   C. 20 degrees F to 100 degrees F [−6.7 C to 37.8 C]

   D. 32 to 140 degrees F [0 to 60 degrees C]

6. What is the primary purpose of sampling fresh concrete?

A. To determine its workability

B. To assess mix uniformity

C. To check compliance with specifications

D. To evaluate temperature fluctuations

7. How long should you wait after molding test specimens before moving them to initial storage?

A. One hour

B. Two hours

C. Immediately

D. Four hours

8. Which action should be taken if no slump is observed?

A. Record it as 0 slump

B. Reassess the mixing process

C. Repeat the test

D. All of the above

9. When consolidating a flexural strength test specimen by rodding, how many strokes should be used for each 2 in.^2 [14 cm^2] of top surface area?

A. One stroke

B. Two strokes

C. Three strokes

D. Four strokes

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

A. C150

B. C172

C. C231

D. C191

Answers

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

Explanations

1. According to ASTM Standards, how should the concrete sample be obtained for the test method?

A. C150

B. C172

C. A123

D. C94

The correct answer is based on ASTM C172, which specifically outlines the procedures for sampling fresh concrete. This standard provides essential guidelines for obtaining representative samples from a batch before various tests are conducted. It emphasizes the importance of collecting samples at the point of discharge from the truck or mixer, ensuring that the sample represents the entire load and the characteristics of the concrete being tested. ASTM C172 details the specific techniques for obtaining and handling the sample, including the minimum volume needed for testing and the need to maintain the integrity of the sample during transportation to the testing location. This is critical because any deviation from the specified sampling procedures could lead to inaccurate test results, impacting quality control and assurance. The other standards listed do not relate specifically to sampling procedures for fresh concrete; for example, ASTM C150 deals with the specifications for Portland cement, ASTM A123 covers the specifications for zinc (hot-dip galvanized) coatings, and ASTM C94 outlines the specifications for ready-mixed concrete. Therefore, these options are not suitable for addressing how a concrete sample should be obtained for testing purposes.

2. What should be done to test specimens upon completion of initial curing?

A. They should be left in their molds

B. They must be demolished and placed in water storage

C. They should be dried in a warm environment

D. They can be sealed in plastic bags only

Upon completion of initial curing, it is crucial for concrete specimens to be properly stored to ensure their integrity and to provide an accurate assessment of their strength. Choosing to demolish the specimens and place them in water storage is critical because it helps maintain the moisture content necessary for hydration, which contributes to the development of concrete's long-term strength and durability. Water storage at this stage typically involves submerging the specimens in water or placing them in a controlled environment that prevents them from drying out. This is vital as concrete needs to maintain a certain level of moisture to achieve optimal curing conditions and avoid potential cracking or strength loss that could occur due to drying. In contrast, leaving specimens in molds may not provide adequate moisture and could impede the curing process since they might not receive proper hydration. Drying them in a warm environment can lead to rapid moisture loss and is counterproductive to the curing process. Sealing in plastic bags might be acceptable for short periods, but it doesn't ensure that the specimens are adequately hydrated and can potentially create a humid environment that promotes mold growth if not monitored properly.

3. How long should the air meter be inverted and agitated for effective operation?

A. No more than three seconds

B. No more than five seconds, must be repeated for a minimum of 45 seconds

C. No more than 60 seconds continuously

D. It should not be inverted

For effective operation of the air meter, it is essential to invert and agitate it for a specific duration to ensure accurate air content measurements in concrete. The correct procedure involves inverting the air meter and agitating it for no more than five seconds, and this process should be repeated for a minimum total of 45 seconds. This duration is crucial because sufficient agitation is necessary to dislodge any entrapped air bubbles in the concrete sample, allowing for a more accurate reading of the air content. When the air meter is agitated correctly, it ensures that the sample is thoroughly mixed, which enhances the reliability of the test results. The emphasis on repeating the agitation for at least 45 seconds underscores the importance of consistency and thoroughness in the testing process, which are key factors in obtaining dependable data. Understanding this procedure helps you ensure proper calibration of the air meter, leading to reliable assessments of concrete's air content, which is critical for evaluating its durability and overall quality.

4. The container for obtaining the concrete sample can be any of the following except?

A. Plastic bucket

B. Metal pan

C. Wheelbarrow

D. Flat, clean nonabsorbent mixing board

The correct response indicates that a wheelbarrow is not an acceptable container for obtaining a concrete sample. This is because specific standards define the requirements for containers used to collect concrete samples. The container must be clean, nonabsorbent, and should not introduce contaminants that could affect the testing results. A wheelbarrow can be difficult to clean thoroughly and may retain remnants of previously mixed materials, which could alter the properties of the concrete sample being collected. Meanwhile, containers such as plastic buckets, metal pans, and flat, clean nonabsorbent mixing boards can be easily inspected and cleaned to ensure they meet the required standards for collecting samples without risk of contamination. These containers are more suitable because they are designed to facilitate the proper handling of concrete while maintaining the integrity of the sample.

5. What is the range for measuring temperature using the temperature measuring device?

A. -10 to 110 degrees F [−23 to 43 degrees C]

B. 30 degrees F to 120 degrees F [0 C to 50 C]

C. 20 degrees F to 100 degrees F [−6.7 C to 37.8 C]

D. 32 to 140 degrees F [0 to 60 degrees C]

The correct answer reflects the appropriate range for measuring temperature that is typically required for concrete field testing. In the context of mixing and pouring concrete, it's critical to monitor temperature accurately. Concrete can be sensitive to temperature changes, which can affect curing and hydration. The specified range of 30 degrees Fahrenheit to 120 degrees Fahrenheit (0 degrees Celsius to 50 degrees Celsius) encompasses the temperatures that are commonly encountered in field conditions and ensures that concrete performance is optimal. This range allows for adequate monitoring of conditions that could potentially affect the setting and strength of the concrete. Much lower or higher temperatures could lead to issues such as freezing of the water in the mix or accelerated curing, respectively, which emphasizes the importance of this specific temperature measuring range for field personnel.

6. What is the primary purpose of sampling fresh concrete?

A. To determine its workability

B. To assess mix uniformity

C. To check compliance with specifications

D. To evaluate temperature fluctuations

The primary purpose of sampling fresh concrete is to check compliance with specifications. Sampling allows for the collection of concrete that can be tested against established standards and specifications to ensure that it meets the required properties, such as strength, durability, and workability. This process is crucial in construction projects to confirm that the concrete mix being used is consistent with the design requirements and any regulations that govern the materials being used in the project. In practice, samples taken from fresh concrete can be used for various tests, such as strength tests on cylinders and assessments of workability and temperature. However, the overarching goal of sampling is to ensure that the concrete complies with all relevant specifications. Compliance testing safeguards the integrity of the concrete structure and helps identify potential issues before the concrete sets. Other choices like determining workability or assessing mix uniformity are components of what might be evaluated during testing, but they fall under the broader blanket of ensuring that the concrete meets specifications. In essence, while workability, uniformity, and temperature are important factors, they serve the ultimate purpose of adhering to compliance with the specifications.

7. How long should you wait after molding test specimens before moving them to initial storage?

A. One hour

B. Two hours

C. Immediately

D. Four hours

When test specimens are molded, it is essential that they are allowed to set correctly before being moved to their initial storage conditions. Moving them immediately ensures that the specimens are not prematurely disturbed, which could compromise the integrity of the test results. The standard practices in concrete testing dictate that specimens should remain undisturbed in their molds for the first part of the hydration process. By moving them immediately after molding, you preserve the conditions needed for the initial setting of the concrete, allowing it to begin curing effectively in a controlled environment. This practice is crucial for maintaining the quality and consistency of the concrete specimens, as any delay in moving could risk exposure to non-ideal conditions that might affect the final strength and properties of the concrete tested. Proper handling at this stage is vital to ensure valid and reliable test outcomes.

8. Which action should be taken if no slump is observed?

A. Record it as 0 slump

B. Reassess the mixing process

C. Repeat the test

D. All of the above

Recording a slump of zero is essential for accurate documentation in the field. It reflects the mix's actual workability and provides important information for quality control and future adjustments. Reassessing the mixing process is crucial because a zero slump could indicate issues with the mix components, such as insufficient water or improper proportioning. Investigating these factors can help ensure the concrete meets the desired specifications. Repeating the slump test may be necessary to confirm the initial observation. Variations in test execution can sometimes influence results, and repeating the test helps verify the findings under consistent conditions. In summary, if no slump is observed, it is important to document it, evaluate the mixing process for potential errors, and consider repeating the test to ensure accuracy, which collectively makes the comprehensive response the best course of action.

9. When consolidating a flexural strength test specimen by rodding, how many strokes should be used for each 2 in.^2 [14 cm^2] of top surface area?

A. One stroke

B. Two strokes

C. Three strokes

D. Four strokes

In the context of consolidating a flexural strength test specimen using the rodding method, the specified practice is to use one stroke for each 2 in.^2 (14 cm^2) of top surface area. This approach ensures that the concrete mix is adequately consolidated, helping to eliminate air pockets and voids, which can negatively affect the strength and integrity of the test specimen. The consolidation process is critical for obtaining accurate test results because poorly consolidated concrete can lead to variability in strength measurements. By limiting the number of strokes to one for every 2 in.^2, it provides a standardized procedure that promotes consistent practices across different tests and technicians. This standardization is essential in maintaining the reliability of results in concrete testing. Using more than one stroke may lead to over-consolidation, which can alter the density and structure of the concrete in the specimen, ultimately affecting the test outcome. Therefore, adhering to the guideline of one stroke per specified area supports best practices for concrete consolidation, ensuring the representativeness and accuracy of the flexural strength test results.

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

A. C150

B. C172

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.