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

Study Guide

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Questions

1. What is the recommended action to protect a concrete sample from contamination?

A. Rapid evaporation

B. Use of a protective cover

C. Immediate transportation to a lab

D. Avoid mixing with other samples

2. If the air content exceeds the meter's 9% range, what should be done?

A. Calibrated cups of water are added to adjust the liquid level

B. Reduce the water content

C. Increase the alcohol content

D. The test should be restarted

3. When rodding the final layer of a concrete sample, how deep should the rod penetrate the previous layer?

A. 15 mm

B. 25 mm

C. 35 mm

D. 50 mm

4. 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]

5. What three tests must be conducted when strength specimens are to be made?

A. Slump, air content, temperature

B. Viscosity, temperature, slump

C. Air content, viscosity, weight

D. Strength, size, air content

6. For a 6 by 12 in. [150 mm by 300 mm] compressive strength test specimen, how many different points should the internal vibrator be inserted for each layer?

A. One

B. Two

C. Three

D. Four

7. What is the required characteristic of the tamping rod for this test method?

A. Round, straight steel rod

B. Flat, flexible plastic rod

C. Composite, straight rod

D. Cylindrical, metal rod

8. Which method is primarily used for quality control assessments of concrete mixtures?

A. Field curing

B. Standard curing

C. Accelerated curing

D. Dry curing

9. Which type of alcohol and concentration is used in the air meter test method?

A. Ethyl, 60% by volume

B. Isopropyl, 50% by weight

C. Isopropyl, 70% by volume

D. Methyl, 75% by weight

10. After the final rodding, should the sides of the slump mold be tapped with the tamping rod?

A. True

B. False

C. Only if the concrete is too wet

D. Only if the rod is unclean

Answers

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

Explanations

1. What is the recommended action to protect a concrete sample from contamination?

A. Rapid evaporation

B. Use of a protective cover

C. Immediate transportation to a lab

D. Avoid mixing with other samples

To protect a concrete sample from contamination, using a protective cover is the most effective action. This approach helps to prevent exposure to environmental factors such as dust, debris, and moisture that can alter the sample's characteristics and lead to inaccurate test results. A cover can be placed over the sample immediately after collection to shield it from any potential contaminants. While other actions, like rapid evaporation or immediate transportation to a lab, might address certain aspects of sample integrity, they do not directly prevent contamination during storage and transportation. Avoiding mixing with other samples is also important but does not provide a protective barrier against environmental contaminants specifically. Therefore, utilizing a protective cover is the best practice for maintaining the purity and reliability of a concrete sample prior to testing.

2. If the air content exceeds the meter's 9% range, what should be done?

A. Calibrated cups of water are added to adjust the liquid level

B. Reduce the water content

C. Increase the alcohol content

D. The test should be restarted

When dealing with an air content measurement that exceeds the meter's range, the appropriate action is to adjust the liquid level within the measuring device. This involves adding calibrated cups of water to the meter, which helps bring the liquid level down into the operational range of the meter. This adjustment is vital because if the air content readings are too high for the meter to accurately measure, it can lead to erroneous conclusions about the air entrainment in the concrete mix. Maintaining the meter's operational threshold ensures that readings can be taken within a valid range, allowing for accurate testing and subsequent adjustments to the mix design if necessary. In this context, reducing water content or increasing alcohol content would not appropriately address the issue of the air content measurement being too high. Similarly, restarting the test may lead to the same issues if the liquid level is not adjusted, as it does not rectify the original problem with the measurement range. Therefore, the best practice is to modify the conditions within the meter itself by adjusting the fluid level to ensure accurate air content measurements.

3. When rodding the final layer of a concrete sample, how deep should the rod penetrate the previous layer?

A. 15 mm

B. 25 mm

C. 35 mm

D. 50 mm

When preparing a concrete sample for testing, particularly during the consolidation process with a rod, it is essential to ensure that the rod penetrates the previous layer to achieve proper consolidation and layering. The correct depth for the rod to penetrate the previous layer is specified as 25 mm. This depth strikes a balance that allows for effective bonding between the layers, ensuring that the sample reaches the necessary density and homogeneity for accurate testing results. Penetrating a depth of 25 mm adequately disrupts the previous layer, helping to eliminate air pockets and ensuring the layers are well-integrated. Consistently applying this standard will help maintain uniformity in sample preparation, which is critical for reliable concrete testing. In contrast, other suggested depths may be insufficient or excessive, potentially affecting the sample integrity and testing outcomes.

4. 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]

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.

5. What three tests must be conducted when strength specimens are to be made?

A. Slump, air content, temperature

B. Viscosity, temperature, slump

C. Air content, viscosity, weight

D. Strength, size, air content

The correct response identifies the essential tests that need to be performed when preparing strength specimens for concrete. These tests—slump, air content, and temperature—are critical to ensure that the concrete's workability, durability, and overall performance are within specified limits prior to casting strength specimens. The slump test measures the consistency of fresh concrete, which is crucial for understanding how easily the concrete can be worked and placed. Consistency affects the ability to achieve a dense and durable concrete structure. Air content measurement is essential as it indicates the amount of entrained air in the concrete mixture. Proper air content is necessary for ensuring the concrete withstands freezing and thawing cycles, thereby enhancing its durability. Measuring the temperature of the concrete during placement is important because it influences the rate of hydration and the development of strength over time. High temperatures can accelerate the curing process, potentially leading to issues such as cracking, while low temperatures can impede it. Together, these tests ensure that the concrete mix is appropriate for the intended application and complies with quality standards, making it vital for producing accurate strength specimens.

6. For a 6 by 12 in. [150 mm by 300 mm] compressive strength test specimen, how many different points should the internal vibrator be inserted for each layer?

A. One

B. Two

C. Three

D. Four

In the context of preparing a 6 by 12 inch [150 mm by 300 mm] compressive strength test specimen, the correct approach involves inserting the internal vibrator at multiple points within each layer of concrete to ensure thorough consolidation. For a specimen of this size, inserting the vibrator at two different points per layer is necessary to achieve adequate compaction and to eliminate any air pockets or voids that can negatively impact the test results. Using two insertion points allows for better distribution of the vibrations throughout the concrete mix. This method helps to ensure that the concrete is uniformly consolidated, which is crucial for accurate measurement of compressive strength. Proper compaction is essential since any trapped air or insufficiently consolidated material can lead to weaker areas in the specimen, thus skewing the test data. In contrast, using only one point for vibration would not adequately consolidate the entire layer, leading to potential weak spots. Increasing the number of insertion points beyond two may not be necessary and could lead to over-consolidation or increased risk of segregation. Therefore, inserting the internal vibrator at two different points per layer strikes the right balance for effective concrete placement and alignment with standard testing practices.

7. What is the required characteristic of the tamping rod for this test method?

A. Round, straight steel rod

B. Flat, flexible plastic rod

C. Composite, straight rod

D. Cylindrical, metal rod

The required characteristic of the tamping rod for the test method in question is that it must be a round, straight steel rod. This specification is essential to ensure that the rod has enough stiffness and weight to effectively penetrate and compact the concrete mix during the testing process. The shape and material of the rod are important for achieving consistent and reliable results. A round rod allows for uniform contact with the concrete and helps prevent any issues that may arise from uneven surfaces, which could occur with rods of other shapes. Using a straight rod is crucial as it provides the necessary integrity during the tamping process, ensuring that there is no bending or flexing that could impact the results. The use of steel as the material enhances the durability of the rod, allowing it to withstand repeated use and the rigors of the testing environment without deformation. These factors combined ensure that the tamping process is effective and standardized, which is critical for accurate field test results.

8. Which method is primarily used for quality control assessments of concrete mixtures?

A. Field curing

B. Standard curing

C. Accelerated curing

D. Dry curing

Standard curing is primarily used for quality control assessments of concrete mixtures because it simulates the conditions under which concrete is expected to harden in actual use. This method involves maintaining the concrete samples under controlled temperature and humidity conditions for a prescribed period, typically 28 days, which allows for consistent development of concrete strength and performance characteristics. By following standardized curing protocols, technicians can ensure that the samples undergo the same environmental conditions that real-world structures will face, providing an accurate representation of the concrete's durability and strength. This consistency is crucial for establishing benchmarks and for comparing results against specifications. Field curing, while relevant to understanding how concrete behaves on-site, does not provide the controlled conditions necessary for precise quality assessments. Accelerated curing is often used to speed up the initial setting or strength gain and is not a typical method for quality control assessments. Dry curing lacks moisture control, which can lead to different hardening characteristics and is not suitable for ensuring reliable data on the concrete's performance.

9. Which type of alcohol and concentration is used in the air meter test method?

A. Ethyl, 60% by volume

B. Isopropyl, 50% by weight

C. Isopropyl, 70% by volume

D. Methyl, 75% by weight

In the air meter test method, isopropyl alcohol at a concentration of 70% by volume is utilized primarily for its effectiveness in reducing the surface tension of the water. This characteristic aids in ensuring that entrained air bubbles can be accurately measured, which is critical for assessing the air content in concrete. Using isopropyl alcohol at this specific concentration allows the test to achieve results that are reliable and reproducible, which is crucial in quality control and adherence to mix design specifications in concrete production. The choice of isopropyl alcohol over other types ensures a lower risk of volatile organic compound (VOC) emissions compared to methyl alcohol, while still being effective in performing the air meter test. The other options involve different types of alcohol or concentrations that do not meet the testing standards. For example, variations in concentration either too low or too high can affect the accuracy of the results, leading to misinterpretation of the air content in the concrete mix. Thus, the specified use of 70% isopropyl alcohol by volume is significant for maintaining consistency and precision in air content measurement.

10. After the final rodding, should the sides of the slump mold be tapped with the tamping rod?

A. True

B. False

C. Only if the concrete is too wet

D. Only if the rod is unclean

After the final rodding during a slump test, tapping the sides of the slump mold with the tamping rod is not a necessary step. The purpose of the slump test is to determine the workability of freshly mixed concrete, and the rodding process itself is sufficient to embed the concrete in the mold and eliminate any air pockets. Tapping the sides afterward could potentially disturb the concrete and affect the accuracy of the slump measurement. Therefore, not tapping the sides maintains the integrity of the test and ensures it reflects the true workability of the concrete mix being evaluated. This is why the answer indicating that it should not be done is appropriate.