

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

## Study Guide



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**SAMPLE**

## **Questions**

- 1. What is the consequence of not calibrating the temperature measuring device?**
  - A. Incorrect temperature readings**
  - B. Increased durability of concrete**
  - C. Faster setting times**
  - D. Improved accuracy**
- 2. 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**
- 3. Standard Curing is primarily used for what purpose?**
  - A. Determining cure time**
  - B. Acceptance testing for specified strength**
  - C. Field evaluations of structure**
  - D. Mix design development**
- 4. When the slump is greater than 3 inches, which method of consolidation is required?**
  - A. Finishing**
  - B. Rodding**
  - C. Vibration**
  - D. Tamping**
- 5. What must be used when pouring the initial quantity of water and alcohol into the air meter?**
  - A. The funnel**
  - B. A measuring cup**
  - C. Directly from the bottle**
  - D. A spatula**

- 6. 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**
- 7. Which test provides a quick estimate of workability in freshly mixed concrete?**
- A. Vebe test**
  - B. Slump test**
  - C. Compression test**
  - D. Tensile test**
- 8. Sampling is required when tests are to be made to determine \_\_\_\_\_ with specification requirements.**
- A. Compliance**
  - B. Strength**
  - C. Durability**
  - D. Workability**
- 9. What should be done if the concrete samples show significant deviation in strength?**
- A. Ignore the results**
  - B. Recast the samples immediately**
  - C. Investigate the concrete mix and testing procedure**
  - D. Test only the higher strength samples**
- 10. What is the required shape of the tamping end of the rod for the slump test?**
- A. Flat tip**
  - B. Rounded to a hemispherical tip**
  - C. Pointed tip**
  - D. Cylindrical tip**

## **Answers**

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

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## **Explanations**

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**1. What is the consequence of not calibrating the temperature measuring device?**

- A. Incorrect temperature readings**
- B. Increased durability of concrete**
- C. Faster setting times**
- D. Improved accuracy**

Not calibrating the temperature measuring device leads directly to incorrect temperature readings. The accuracy of temperature measurements is crucial in concrete testing because temperature can significantly affect the setting time, strength, and overall performance of concrete. If the device is not calibrated, it may provide readings that misrepresent the actual temperature of the concrete mix. These erroneous readings can ultimately lead to improper mixing or curing practices, which could result in subpar concrete quality, compromised structural integrity, or failures in the concrete under load. Other options, such as increased durability or faster setting times, do not directly relate to the consequences of calibration issues. Instead, they imply favorable conditions that arise from accurate readings, which makes the risk of incorrect temperature readings even more critical to managing the concrete's properties effectively. Similarly, improved accuracy is not a consequence of failing to calibrate; rather, it is a benefit derived from proper calibration practices.

**2. 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.

### 3. Standard Curing is primarily used for what purpose?

- A. Determining cure time
- B. Acceptance testing for specified strength**
- C. Field evaluations of structure
- D. Mix design development

Standard curing is primarily utilized to ensure that concrete achieves its intended strength and durability under controlled conditions. By maintaining specific temperature and moisture levels, standard curing minimizes the risk of premature drying and temperature fluctuations that can negatively affect the hydration process of cement. This controlled environment is critical when performing acceptance testing for specified strength because the strength of concrete that is tested should reflect the quality of the mix as specified in project requirements. In the context of acceptance testing, achieving the specified compressive strength is essential for the structural integrity of the concrete. Curing methods directly impact the hydration of the cement, and without proper curing, the concrete may not attain the desired strength, leading to potential structural failures or reduced performance. The other options relate to aspects that do not focus as directly on the primary purpose of standard curing. While determining cure time, conducting field evaluations, and mix design development are important facets of concrete work, these do not encapsulate the main goal of standard curing, which is to provide an optimal environment for strength development in the concrete mixture.

### 4. 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.

**5. What must be used when pouring the initial quantity of water and alcohol into the air meter?**

- A. The funnel**
- B. A measuring cup**
- C. Directly from the bottle**
- D. A spatula**

The correct option is the funnel because it provides a controlled and precise way to pour liquids into the air meter without splashing or overfilling. Using a funnel helps to ensure that the initial quantities of water and alcohol are measured accurately, which is crucial for obtaining reliable results in air content tests. It minimizes the risk of spills and allows for a clearer view of the liquid levels entering the meter, ensuring that the process adheres to proper testing protocols. Options such as a measuring cup might not provide the same level of precision when pouring, especially if the goal is to avoid any mess or loss of material. Pouring directly from the bottle can lead to inaccuracies and potential spillage, compromising the integrity of the test. A spatula is not suitable for liquid measurement as it is designed for solid materials, thus being ineffective for this particular task.

**6. 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.

**7. Which test provides a quick estimate of workability in freshly mixed concrete?**

- A. Vebe test**
- B. Slump test**
- C. Compression test**
- D. Tensile test**

The slump test is widely recognized as a quick and effective method to estimate the workability of freshly mixed concrete. It involves measuring the vertical settlement of a conical mold filled with concrete. The degree of slump indicates how easily the concrete can be mixed, placed, and finished, which are crucial factors for construction applications. A higher slump value generally signifies a more workable mix that can flow easily into place, while a lower slump indicates a stiffer mix that may be more difficult to work with. This test is particularly favored in the field due to its simplicity and quick results, allowing technicians to assess the consistency and suitability of the concrete for a specific job without the need for extensive equipment or lengthy procedures. While other tests, like the Vebe test, can also assess workability, they are not as commonly used for a quick estimate in everyday field testing. The compression and tensile tests are primarily designed to evaluate the strength of concrete rather than its workability, focusing on different properties altogether. Thus, the slump test stands out as the benchtop technique for determining the workability of freshly mixed concrete efficiently.

**8. Sampling is required when tests are to be made to determine \_\_\_\_\_ with specification requirements.**

- A. Compliance**
- B. Strength**
- C. Durability**
- D. Workability**

Sampling is a crucial step in the testing process because it ensures that the materials used in concrete production meet the established specifications. The term "compliance" refers specifically to the adherence to the specified criteria laid out in relevant standards or building codes. In the context of concrete, compliance testing verifies that the properties of the concrete mix, such as strength, workability, and durability, are within the limits prescribed by the specifications. When sampling is performed for compliance testing, it typically involves collecting a representative portion of the material—such as fresh concrete—so that various tests can be conducted to assess quality attributes. The results of these tests confirm whether the concrete mix conforms to the required specifications, thereby ensuring that it is suitable for the intended structural application. The other choices—strength, durability, and workability—are all important properties of concrete, and while they relate to compliance, they represent specific aspects rather than the overarching requirement of meeting specifications. Thus, the focus on compliance as the correct answer highlights the broader obligation to ensure that the concrete adheres to all specified standards rather than just individual characteristics.

**9. What should be done if the concrete samples show significant deviation in strength?**

- A. Ignore the results**
- B. Recast the samples immediately**
- C. Investigate the concrete mix and testing procedure**
- D. Test only the higher strength samples**

When concrete samples demonstrate significant deviation in strength, investigating the concrete mix and testing procedure is crucial to ensure the quality and integrity of the material. This step includes examining the ingredients used in the mix, the mixing process, the handling of the concrete, and the environmental conditions during curing. In any construction project, adherence to specified standards and practices is key to achieving desired performance outcomes. A thorough investigation can help identify issues such as incorrect water-to-cement ratios, improper mixing times, or errors in the testing process itself. By understanding the root cause of the deviation, appropriate corrective actions can be taken to prevent future occurrences, ensuring that the concrete meets the required specifications and performance criteria. Taking this action not only enhances the quality control process but also helps maintain safety and durability in the final construction product.

**10. What is the required shape of the tamping end of the rod for the slump test?**

- A. Flat tip**
- B. Rounded to a hemispherical tip**
- C. Pointed tip**
- D. Cylindrical tip**

The required shape of the tamping end of the rod for the slump test is rounded to a hemispherical tip. This design is essential for ensuring that the pressure applied during the test distributes evenly across the surface of the concrete. The rounded tip allows the rod to compact the concrete effectively without introducing any sharp edges that could create uneven stress or result in air pockets. Using a hemispherical end helps to achieve accurate and consistent results when measuring slump, as the compaction method is standardized to prevent variations that could affect the test outcomes. The other shapes, such as flat, pointed, or cylindrical tips, do not provide the same level of compaction or uniformity and could lead to discrepancies in slump measurements. Hence, a hemispherical shape is specifically prescribed in testing standards to maintain reliability in the test procedure.