

ACI Concrete Strength Testing Technician Practice Test (Sample)

Study Guide



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SAMPLE

Questions

- 1. What material is primarily responsible for the compressive strength of concrete?**
 - A. Water**
 - B. Cement**
 - C. Fine aggregates**
 - D. Admixtures**
- 2. What is a key factor affecting the accuracy of concrete strength test results?**
 - A. Ambient temperature and humidity**
 - B. Length of time since mixing**
 - C. Type of concrete used**
 - D. Size of the testing sample**
- 3. How should exposure to hydrogen sulfide gas be addressed due to its lethal potential?**
 - A. By increasing ventilation**
 - B. By wearing heavy protective clothing**
 - C. By restricting access to the area**
 - D. By using enhanced lighting**
- 4. What equipment is primarily used to conduct a compressive strength test?**
 - A. Vibrating table**
 - B. Concrete mixer**
 - C. Compression testing machine**
 - D. Moisture meter**
- 5. A higher rate of loading shall be permitted during the application of the first half of the anticipated loading phase. Is this statement True or False?**
 - A. True**
 - B. False**
 - C. Depends on the specimen**
 - D. Only for certain conditions**

- 6. What is the purpose of the concrete cylinder mold during casting?**
- A. To measure the concrete's temperature**
 - B. To shape and contain the concrete while it sets and cures**
 - C. To provide insulation during curing**
 - D. To facilitate the transport of concrete samples**
- 7. Which block is recommended for providing a machinable surface during maintenance?**
- A. Top bearing**
 - B. Anvil block**
 - C. Bottom bearing**
 - D. Side block**
- 8. What is the earliest time a compression test can be performed on cured specimens after their removal?**
- A. Within an hour**
 - B. After one day**
 - C. As soon as practicable**
 - D. After 6 hours**
- 9. During compression testing, what type of machine is typically used?**
- A. A bending test machine**
 - B. A compression testing machine**
 - C. A shear test machine**
 - D. An impact testing machine**
- 10. What factor can most negatively impact the strength of concrete during the curing process?**
- A. Maintaining a high humidity level**
 - B. Extreme temperature fluctuations**
 - C. Consistent moisture availability**
 - D. Poor quality aggregates**

Answers

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

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Explanations

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1. What material is primarily responsible for the compressive strength of concrete?

A. Water

B. Cement

C. Fine aggregates

D. Admixtures

Cement is the primary material responsible for the compressive strength of concrete because it acts as the binding agent that holds together the other components in the concrete mixture. When cement is mixed with water, it undergoes a chemical reaction called hydration, which leads to the formation of a hardened structure that provides strength. The quality, type, and amount of cement used significantly influence the final compressive strength of the concrete. While water is essential for hydration and the overall workability of the mix, it is not the primary contributor to strength. Fine aggregates, which include sand, contribute to the bulk and packing of concrete but do not significantly enhance its compressive strength. Admixtures can modify certain properties of concrete, such as setting time or durability, but they do not serve as the main factor in strength development. Therefore, cement is crucial for establishing the structural integrity and strength of concrete as it cures and hardens.

2. What is a key factor affecting the accuracy of concrete strength test results?

A. Ambient temperature and humidity

B. Length of time since mixing

C. Type of concrete used

D. Size of the testing sample

Ambient temperature and humidity are crucial factors influencing the accuracy of concrete strength test results because they significantly affect the curing and hardening processes of the concrete. High temperatures can accelerate the setting time, which may lead to incomplete hydration of the cement particles, while low temperatures can slow down the curing process, potentially resulting in a weaker concrete mix if not managed properly. Similarly, humidity levels can affect the water evaporation rate from the surface of the concrete, impacting its curing efficiency. Inconsistent curing conditions can lead to variability in the strength of the concrete, thus compromising test results. Proper control and monitoring of these environmental conditions are essential to ensure that the concrete achieves its intended strength when tested. While the length of time since mixing, type of concrete used, and size of the testing sample may also impact strength test results, the immediate effects of ambient temperature and humidity on the hydration and curing processes make them particularly critical to consider when assessing concrete strength.

3. How should exposure to hydrogen sulfide gas be addressed due to its lethal potential?

- A. By increasing ventilation**
- B. By wearing heavy protective clothing**
- C. By restricting access to the area**
- D. By using enhanced lighting**

Increasing ventilation is a crucial measure for addressing exposure to hydrogen sulfide gas due to its lethal potential. Hydrogen sulfide is a highly toxic and flammable gas that can accumulate in confined spaces, leading to dangerous concentrations that can cause serious health effects or fatalities. By enhancing ventilation in these areas, you can dilute the concentration of the gas, thereby reducing the risk of exposure to workers and ensuring a safer environment. Increased airflow helps to disperse the gas, lowering its level to a safe threshold. While protective clothing, restricting access, and enhanced lighting may contribute to overall safety measures, they do not specifically mitigate the airborne concentration of hydrogen sulfide. Protective clothing can protect individuals from contact but does not prevent inhalation of the gas. Restricting access can prevent potential exposure, but it does not address existing gas presence. Enhanced lighting may improve visibility for emergency responses but does not impact gas concentration.

4. What equipment is primarily used to conduct a compressive strength test?

- A. Vibrating table**
- B. Concrete mixer**
- C. Compression testing machine**
- D. Moisture meter**

The equipment primarily used to conduct a compressive strength test is the compression testing machine. This machine specifically measures the ability of concrete to withstand axial loads before failure, which is crucial for determining the material's strength. The test typically involves placing a concrete specimen, usually in the shape of a cylinder or cube, into the machine. The machine then applies a controlled load until the specimen fails, measuring the maximum load applied to the specimen. The results are used to calculate the compressive strength of the concrete mix. The other options serve different purposes in the concrete testing and construction process. A vibrating table is used to consolidate concrete mixes without air pockets but does not measure strength. A concrete mixer is essential for preparing concrete mixtures but has no role in strength testing. A moisture meter helps assess the moisture content of materials but is unrelated to measuring compressive strength. Therefore, the compression testing machine is the only suitable choice for conducting a compressive strength test.

5. A higher rate of loading shall be permitted during the application of the first half of the anticipated loading phase. Is this statement True or False?

A. True

B. False

C. Depends on the specimen

D. Only for certain conditions

The statement is accurate. In concrete testing, specifically during the compression tests outlined by standards such as those from the American Concrete Institute (ACI), the application of loads can vary depending on the phase of loading. The initial phase, which involves the first half of the loading, allows for a higher rate of loading as this is in alignment with standard practices that facilitate quicker data acquisition without compromising the integrity of the results. Loading at a higher rate initially can help in minimizing the time the specimen is subjected to various factors that could introduce variability, such as temperature changes or minor vibrations in the testing environment. However, as the loading progresses and approaches ultimate failure, a more controlled and slower loading rate is recommended. This transition ensures that the development of cracks and the ultimate failure of the concrete can be observed and measured accurately. This understanding aligns with the practices established in strength testing guidelines, emphasizing the importance of correct loading protocols to ensure reliable and reproducible test results.

6. What is the purpose of the concrete cylinder mold during casting?

A. To measure the concrete's temperature

B. To shape and contain the concrete while it sets and cures

C. To provide insulation during curing

D. To facilitate the transport of concrete samples

The purpose of the concrete cylinder mold during casting is to shape and contain the concrete while it sets and cures. When fresh concrete is poured into the mold, it takes the form of the cylinder, which is essential for producing standard test specimens used to determine the concrete's compressive strength. The mold ensures that the concrete maintains its shape and size throughout the curing process, allowing for consistent and repeatable test results. Proper containment during this stage is vital for preventing any loss of material and ensuring uniformity in the specimen's dimensions, which affects the accuracy of strength testing. The other options, while related to concrete testing in various contexts, do not accurately describe the primary role of the mold during the casting process. Measuring temperature, providing insulation, or facilitating transport do not address the fundamental function of holding the concrete as it matures into a test-ready specimen.

7. Which block is recommended for providing a machinable surface during maintenance?

- A. Top bearing**
- B. Anvil block**
- C. Bottom bearing**
- D. Side block**

The recommended choice for providing a machinable surface during maintenance is the bottom bearing block. The bottom bearing block is designed to support the testing apparatus and usually features a flat, stable surface that can be easily machined or modified when necessary. This ensures that it can sustain repeated loads, maintain alignment, and support consistent testing conditions. Machinable surfaces are essential for achieving precise measurements and ensuring accurate concrete strength tests, as any irregularities could lead to inconsistent results. In contrast, other blocks, such as the top bearing, anvil block, and side block, may serve different functions in the testing setup and are not primarily meant for providing a stable surface during maintenance. Their designs may prioritize other operational aspects rather than machinability. Thus, the bottom bearing is specifically suited for this requirement.

8. What is the earliest time a compression test can be performed on cured specimens after their removal?

- A. Within an hour**
- B. After one day**
- C. As soon as practicable**
- D. After 6 hours**

The earliest time a compression test can be performed on cured specimens after their removal is defined as "as soon as practicable." This ensures that the concrete specimens are tested when they have sufficiently set to provide reliable strength measurements, while also allowing for practical considerations such as transportation and testing logistics. Testing too early could lead to inaccurate results, as specimens may not have developed the necessary strength. The specification of "as soon as practicable" provides a balance, giving technicians the flexibility to perform tests promptly without compromising the integrity of the specimens. It aligns with industry practices that prioritize accuracy in measuring concrete strength while recognizing operational constraints. Other options, while they specify exact timeframes, do not encompass the practical aspect that is crucial for ensuring reliable testing conditions. For instance, testing within an hour or after 6 hours may not give the concrete enough time to achieve necessary strength characteristics, while one day may be unnecessarily delayed in certain situations. The phrase "as soon as practicable" captures the essence of performing the test at an optimal time, adhering to good testing practices.

9. During compression testing, what type of machine is typically used?

- A. A bending test machine**
- B. A compression testing machine**
- C. A shear test machine**
- D. An impact testing machine**

In the context of compression testing, the appropriate equipment used is a compression testing machine. This type of machine is specifically designed to apply a controlled compressive force on concrete samples to determine the material's strength under compression stress. This process involves placing a sample, usually a cube or cylinder, in the machine, which then gradually applies pressure until the sample fails. The machine records the maximum load the specimen can withstand before failure, which is critical for assessing the concrete's load-bearing capacity and overall strength characteristics. The other types of machines listed serve different purposes and are not suitable for compression testing. A bending test machine is designed to apply loads in a way that causes bending, rather than compressive forces. A shear test machine focuses on measuring the shear strength of materials, which involves forces that act parallel to the cross-section of the sample. An impact testing machine evaluates how materials behave under sudden forces or impacts, which is not relevant to the steady application of compression forces. Therefore, a compression testing machine is the correct tool for this assessment, making it the right choice in this context.

10. What factor can most negatively impact the strength of concrete during the curing process?

- A. Maintaining a high humidity level**
- B. Extreme temperature fluctuations**
- C. Consistent moisture availability**
- D. Poor quality aggregates**

Extreme temperature fluctuations can significantly impact the strength of concrete during the curing process for several reasons. Concrete relies heavily on a chemical reaction called hydration, where water reacts with cement to form a strong bond. Consistent and appropriate temperatures are essential for this reaction to proceed efficiently. When temperatures are exceptionally high, the water in the mix can evaporate too quickly, leading to insufficient hydration and consequently weaker concrete. Conversely, if temperatures are too low, hydration can slow down or halt altogether, preventing the concrete from reaching its potential strength. Rapid temperature changes can create stresses within the concrete as different parts of the mix expand or contract at different rates, leading to cracking and reduced integrity. Thus, maintaining a stable and suitable temperature range during the curing process is vital for achieving optimal strength in concrete.