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

Study Guide

Everything you need from our exam experts!

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Questions

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1. The slump of concrete is reported to the nearest what?

A. 1/8 inch

B. 1/4 inch

C. 1/2 inch

D. 1 inch

2. How long should concrete cylinders typically be cured to achieve optimal strength?

A. 1 day

B. 7 days

C. 14 days

D. 28 days

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 many layers should a measure be filled with when using rodding for consolidation?

A. 1

B. 2

C. 3

D. 4

5. Vibration of a concrete sample is prohibited when the slump exceeds how many millimeters?

A. 50 mm

B. 75 mm

C. 100 mm

D. 125 mm

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6. If less than 2.5 pints of alcohol are used, how is the air content indicated?

A. It is always indicated by the final meter reading

B. Only by visual inspection

C. By the temperature of the solution

D. The number of calibrated cups of water must be adjusted

7. What condition might require adjusting the volume of concrete during the testing process?

A. If the weather is too cold

B. If the concrete drops during rodding

C. If the concrete is too dry

D. If the mold is defective

8. When rodding a standard 6 by 12 in [150 mm by 300 mm] cylinder, how many times must each layer be rodded?

A. 15 times

B. 25 times

C. 35 times

D. 45 times

9. What must the surface be like where the slump mold is placed?

A. Sloped and dry

B. Flat, level, moist, nonabsorbent, and free of vibration

C. Uneven and dry

D. Wet and uneven

10. When sampling from a stationary mixer, how often must the batch be sampled during discharge?

A. At least 1 interval

B. At least 2 intervals

C. At least 3 intervals

D. At least 4 intervals

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Answers

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

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Explanations

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1. The slump of concrete is reported to the nearest what?

A. 1/8 inch

B. 1/4 inch

C. 1/2 inch

D. 1 inch

The slump of concrete is reported to the nearest quarter inch. This level of precision is necessary because it provides a useful measure of workability that can be readily communicated and compared in various concrete mixes and applications. Reporting the slump to the nearest quarter inch helps maintain a consistent standard within the industry and enables accurate assessments of concrete's performance characteristics. When assessing the workability of concrete through slump tests, the significance of using a smaller unit of measurement, like a quarter inch, ensures that minor variations in mix consistency can be detected and addressed. This is essential for quality control in concrete production, providing relevant feedback for adjusting mix designs if needed. While other options may suggest different levels of precision, using a quarter inch balance reflects practical industry practices and the need for sufficiently detailed information in evaluating concrete workability.

2. How long should concrete cylinders typically be cured to achieve optimal strength?

A. 1 day

B. 7 days

C. 14 days

D. 28 days

The optimal curing time for concrete cylinders to achieve optimal strength is generally recognized as 28 days. This period allows the concrete to fully hydrate and reach its designed compressive strength, which is critical for ensuring the durability and performance of the concrete in its intended application. During the initial curing stages, particularly in the first week, a significant amount of hydration occurs, contributing to early strength development. However, the majority of the strength gain in concrete occurs over the first 28 days, with diminishing returns after this period. It is important to maintain proper moisture and temperature conditions during curing to prevent premature drying, which can lead to cracking and reduced strength. While shorter curing periods like 1 day, 7 days, or even 14 days can contribute to achieving some level of strength, they do not allow the concrete to develop its full potential. Thus, for applications where strength, durability, and longevity are critical, a curing period of 28 days is standard practice in the industry.

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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 many layers should a measure be filled with when using rodding for consolidation?

A. 1

B. 2

C. 3

D. 4

When consolidating a concrete measure using the rodding method, it is standard practice to fill the measure in three layers. Each layer should be uniformly placed and then consolidated using a rod to ensure thorough compaction. By filling the measure in three distinct layers, you allow adequate opportunity for the air to escape and the concrete to achieve proper density, minimizing the effect of air entrapment that can lead to inconsistencies in test results. Rodding each layer typically involves using a straight, rounded end rod to poke the concrete throughout the layer, which helps to eliminate pockets of air and ensures that the material flows into corners and covers the bottom fully. After consolidating each layer, the process is repeated for the subsequent layers, maintaining the specified number to witness effective consolidation. This method is prescribed in guidelines to ensure uniformity and reliability in testing, making it critical for technicians to adhere to this procedure during the consolidation phase of concrete sampling.

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5. Vibration of a concrete sample is prohibited when the slump exceeds how many millimeters?

A. 50 mm

B. 75 mm

C. 100 mm

D. 125 mm

The prohibition of vibration for concrete samples with a slump that exceeds 75 millimeters is based on the need to maintain the integrity and true representation of the concrete's workability. When the slump is greater than this threshold, the concrete mix is considered to be more fluid or workable, which can lead to segregation if it is vibrated. Vibration is used to eliminate air pockets and ensure uniformity in less workable mixtures. However, in high-slump mixes, the additional vibration can cause the heavier aggregates to settle and lead to separation of the components, resulting in a misleading slump test result. Therefore, adhering to this guideline is essential for producing reliable and consistent concrete testing outcomes.

6. If less than 2.5 pints of alcohol are used, how is the air content indicated?

A. It is always indicated by the final meter reading

B. Only by visual inspection

C. By the temperature of the solution

D. The number of calibrated cups of water must be adjusted

The indication of air content in a concrete mix depends on the amount of alcohol used in the test procedure. When the volume of alcohol is less than 2.5 pints, adjustments become necessary to ensure accurate measurements. In this context, the number of calibrated cups of water that are used in the test must be adjusted accordingly to compensate for the lower volume of alcohol. This adjustment is essential because the air content measurement relies on achieving a consistent relationship between the alcohol and water volumes in the test apparatus. By modifying the number of calibrated cups of water, the technician can maintain the integrity of the test results despite the reduced alcohol volume. Other options may refer to alternative methods or indicators of air content, such as meter readings, visual checks, or temperature measurements, but they do not directly address the necessary adjustments to the testing setup based on alcohol volume. Therefore, they are not applicable in this scenario.

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7. What condition might require adjusting the volume of concrete during the testing process?

A. If the weather is too cold

B. If the concrete drops during rodding

C. If the concrete is too dry

D. If the mold is defective

Adjusting the volume of concrete during the testing process is particularly important when the concrete drops during rodding. During the consistency test, if the concrete mix is not properly consolidated—such as when the concrete drops out of the mold—it indicates that the sample may not accurately represent the cohesiveness and uniformity of the mix. To ensure an accurate test result, additional concrete may need to be added to maintain the intended volume and to mitigate any air voids or segregation that may occur during the rodding process. In contrast, factors such as weather conditions, dryness of the mix, or defects in the mold might affect the testing process but do not directly necessitate adjusting the volume of concrete in the way that a drop during rodding does. While weather can impact the curing and handling of concrete, and a dry mix can lead to a need for additional water rather than an adjusted volume, a defective mold typically results in compromised test integrity rather than a straightforward volume adjustment.

8. When rodding a standard 6 by 12 in [150 mm by 300 mm] cylinder, how many times must each layer be rodded?

A. 15 times

B. 25 times

C. 35 times

D. 45 times

When rodding a standard 6 by 12 inch cylinder, the correct process involves rodding each layer of concrete precisely to ensure proper consolidation and to minimize air pockets. Each layer of concrete should be thoroughly compacted through careful rodding. For a cylinder of this size, the accepted standard practice is to rod each layer 25 times. This number is based on procedures outlined in ASTM specifications, which dictate the testing and preparation methods for concrete samples. Rodding is done in a specific manner—uniformly distributing the strokes in a way that effectively compacts the concrete while not disturbing the layers previously placed. The rationale behind the importance of this specific number of roddings is to achieve a uniform density in the specimen, which is critical for accurate measurement of the concrete's properties later in testing. If too few roddings are performed, the concrete may not be adequately compacted, leading to unreliable test results. Therefore, performing 25 roddings for each layer strikes the right balance for effective consolidation in the creation of the concrete cylinder, ensuring the integrity of the test is maintained.

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9. What must the surface be like where the slump mold is placed?

A. Sloped and dry

B. Flat, level, moist, nonabsorbent, and free of vibration

C. Uneven and dry

D. Wet and uneven

The surface on which the slump mold is placed should be flat, level, moist, nonabsorbent, and free of vibration to ensure accurate and reliable test results. A flat and level surface is crucial because any tilt could cause the concrete to settle incorrectly, affecting the slump measurement. Additionally, a moist surface helps to prevent the dry ground from absorbing water from the concrete mix, which could also impact the consistency and properties being tested. Nonabsorbent surfaces are preferred because they minimize the risk of moisture loss, thus ensuring that the slump test reflects the true workability of the fresh concrete mix. Lastly, a vibration-free environment is critical as vibrations can disrupt the concrete mix during the test and lead to inaccurate measurements. These combined factors lead to a more precise assessment of the concrete's workability.

10. When sampling from a stationary mixer, how often must the batch be sampled during discharge?

A. At least 1 interval

B. At least 2 intervals

C. At least 3 intervals

D. At least 4 intervals

When sampling from a stationary mixer, it is required to take samples during the discharge process. The practice of sampling at least two intervals ensures a more representative sample of the batch. This is important because, during the mixing and discharging process, the consistency of the concrete can vary due to factors such as material segregation or variations in the mix. By taking samples at multiple intervals, you can assess the uniformity of the mix and identify any discrepancies that may occur throughout the discharge. This helps in ensuring that the concrete being tested truly reflects the properties and performance of the entire batch, leading to more accurate and reliable testing results. Sampling at just one interval could give a skewed representation, and more than two intervals might not be necessary for maintaining efficiency while still achieving a representative sample. Thus, sampling at two intervals strikes a balance between representativeness and practicality during the testing process.

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