

API 936 - Refractory Personnel Certification Practice Exam (Sample)

Study Guide



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SAMPLE

Questions

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- 1. What task should a contractor schedule to qualify all equipment for installation work?**
 - A. Only acquiring materials**
 - B. Scheduling and execution of work**
 - C. Only recruiting personnel**
 - D. Any tasks related to inspections**
- 2. At what temperature should refractories be held for 5 hours during oven firing?**
 - A. 1000F**
 - B. 1500F**
 - C. 2000F**
 - D. 2500F**
- 3. How should Permanent Linear Change test specimens be measured?**
 - A. Along the 2 in dimension**
 - B. Along the width of the specimen**
 - C. Along the 9 in dimension at the corners**
 - D. Along the flat surface only**
- 4. Which of the following is a reference recommended within API 936?**
 - A. API Std 780 - Guidelines for Material Testing**
 - B. ACI 547R - Refractory Concrete: Stage-of-the-Art Report**
 - C. ISO 9001 - Quality Management Systems**
 - D. ASTM C95 - Standard Guide for Refractories**
- 5. How should air-setting phosphate bonded refractories be mixed?**
 - A. With a manual mixer**
 - B. In a rotating paddle mixer**
 - C. Using a handheld drill**
 - D. Using an open bucket**

- 6. What is the minimum curing time for refractory cast in mock-up panels?**
- A. 6 hours**
 - B. 12 hours**
 - C. 24 hours**
 - D. 48 hours**
- 7. How is density measured in the context of casting installation?**
- A. In pounds per cubic foot**
 - B. In grams per cubic meter**
 - C. In kilograms per square meter**
 - D. In ounces per gallon**
- 8. Which of the following is a method of forming test specimens?**
- A. Vibration cast**
 - B. 3D printing**
 - C. Wooden framing**
 - D. Injection molding**
- 9. What is a Test Specimen?**
- A. A batch of refractory materials**
 - B. An individual cube, bar, or plate used for physical testing**
 - C. A seal used in the installation of refractories**
 - D. A guideline document for testing procedures**
- 10. How many months after a succeeding qualification test can the respective batch be re-qualified?**
- A. 1 month**
 - B. 2 months**
 - C. 3 months**
 - D. 4 months**

Answers

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

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Explanations

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1. What task should a contractor schedule to qualify all equipment for installation work?

- A. Only acquiring materials**
- B. Scheduling and execution of work**
- C. Only recruiting personnel**
- D. Any tasks related to inspections**

The appropriate task for a contractor to schedule in order to qualify all equipment for installation work is the scheduling and execution of work. This process involves not only the physical installation of equipment but also ensuring that all necessary preparations are made beforehand. It includes verifying that all machinery and tools are available and functioning correctly, coordinating with various teams to ensure readiness, and aligning schedules to accomplish the installation seamlessly. It is essential that a contractor conducts a thorough scheduling process that encompasses all required steps, such as confirming equipment specifications and ensuring that safety protocols are adhered to. This ensures that the installation process runs smoothly and efficiently, minimizing delays and potential resource mishaps. Having only acquired materials lacks the broader perspective of the overall project execution. Similarly, merely recruiting personnel does not guarantee that all equipment and logistical details are in place for optimal installation. While inspections are crucial, they are typically part of the overall execution and scheduling process and not sufficient on their own to qualify all aspects of a project's readiness. Therefore, scheduling and executing work is fundamental to ensuring that all equipment is properly qualified for installation.

2. At what temperature should refractories be held for 5 hours during oven firing?

- A. 1000F**
- B. 1500F**
- C. 2000F**
- D. 2500F**

The correct temperature to hold refractories for 5 hours during oven firing is 1500F. This temperature is critical because it allows the refractory materials to achieve the necessary physical and chemical stability needed for their intended applications. The firing process promotes the vitrification of certain materials, which enhances their density, strength, and overall performance in high-temperature environments. At 1500F, many refractories reach an optimal point where binders and other components are sufficiently activated without being overly stressed, which can happen at higher temperatures. Holding the refractories at this temperature for an extended period ensures that the materials are fully cured and can withstand the thermal cycles they will encounter in service. Overall, proper adherence to the specified firing temperature and duration is vital for ensuring that the refractory linings perform as required in industrial processes, enhancing longevity and efficiency.

3. How should Permanent Linear Change test specimens be measured?

- A. Along the 2 in dimension**
- B. Along the width of the specimen**
- C. Along the 9 in dimension at the corners**
- D. Along the flat surface only**

The measurement of Permanent Linear Change test specimens is critical for assessing the dimensional stability of refractories after they undergo high-temperature exposure and subsequent cooling. The standard practice involves measuring the specimens along the longest dimension, which is typically the length of the specimen. In this case, measuring along the 9-inch dimension at the corners is the appropriate method. This approach captures the effects of thermal expansion and contraction more accurately by reflecting the maximum deviation, which can occur along the longest surface of the material. By focusing on the corners and ensuring that the longest dimension is measured, the test provides a reliable indicator of how much the material changes size due to thermal stresses encountered during use. This is essential for ensuring the quality and longevity of refractory materials in industrial applications, as the goal is to evaluate how these materials hold up under high temperatures without significant dimensional instability.

4. Which of the following is a reference recommended within API 936?

- A. API Std 780 - Guidelines for Material Testing**
- B. ACI 547R - Refractory Concrete: Stage-of-the-Art Report**
- C. ISO 9001 - Quality Management Systems**
- D. ASTM C95 - Standard Guide for Refractories**

The reference recommended within API 936 is ACI 547R - Refractory Concrete: Stage-of-the-Art Report. This document is acknowledged for its comprehensive overview of the advancements and practices in refractory concrete, which makes it particularly relevant for professionals working with refractory materials. It covers key aspects, including composition, properties, testing methodologies, and applications in various industrial environments. In the context of API 936, which primarily focuses on the certification and guidelines for refractory personnel, having a reference that addresses the specifics of refractory concrete is crucial for understanding best practices and current trends in the industry. This directly supports the training and certification process by ensuring that personnel are informed of high-quality standards in refractory applications. Resources like API Std 780, ISO 9001, and ASTM C95, while valuable in their own right, do not specifically focus on the nuances of refractory materials and their application, which is why they are not recommended as references within API 936 for this particular context.

5. How should air-setting phosphate bonded refractories be mixed?

- A. With a manual mixer**
- B. In a rotating paddle mixer**
- C. Using a handheld drill**
- D. Using an open bucket**

Mixing air-setting phosphate bonded refractories requires a method that ensures a homogenous mixture while adequately blending the components to achieve the desired properties. A rotating paddle mixer is designed to effectively combine the raw materials and additives, creating a uniform consistency crucial for the performance of the refractory material. Using a rotating paddle mixer facilitates thorough mixing through its design, which allows for continuous movement and blending of the materials. This type of mixer applies sufficient shear and mixing action to the ceramic constituents, ensuring that the phosphate binders are evenly distributed throughout the mix. Proper mixing is essential to achieve the optimal setting characteristics and strength of the final product. In contrast, mixing with a manual mixer or a handheld drill might not provide the same level of consistency and might lead to incomplete mixing or uneven distribution of the materials, which can adversely affect the performance of the refractory. Using an open bucket for mixing would also be less efficient and may not achieve the necessary homogeneity, as it lacks the mechanical advantages of a rotating paddle mixer. Therefore, using this specialized mixing equipment is critical for ensuring the quality and integrity of air-setting phosphate bonded refractories.

6. What is the minimum curing time for refractory cast in mock-up panels?

- A. 6 hours**
- B. 12 hours**
- C. 24 hours**
- D. 48 hours**

The minimum curing time for refractory cast in mock-up panels is recognized as 12 hours. This timeframe is important to allow the material to achieve adequate strength and hardness, ensuring that the refractory material can properly set and bond during the curing phase. Curing is critical because it involves maintaining moisture and temperature to help the chemical reactions that develop strength in the refractory. A minimum curing period of 12 hours is generally necessary to reach sufficient initial set, enabling the mock-up panels to be handled safely and tested without compromising the material's performance characteristics. Shorter curing durations would not allow the appropriate bond and structure to form, potentially leading to failure during subsequent testing or in service. Longer durations, while beneficial for certain aspects, are not considered the minimum required for adequate curing in this specific context.

7. How is density measured in the context of casting installation?

- A. In pounds per cubic foot**
- B. In grams per cubic meter**
- C. In kilograms per square meter**
- D. In ounces per gallon**

Density is a crucial property in the context of casting installation, as it directly impacts the performance and behavior of the refractory material. Measuring density in pounds per cubic foot is a standard approach in the United States, particularly in industries that often handle materials by weight and volume, such as refractory applications. This unit provides a clear and easily interpretable value for engineers and technicians to understand how much mass is contained in a specific volume of the material.

Understanding density in this way helps with calculating material needs for installation, estimating the material's thermal properties, and assessing structural integrity. It also aligns with common practices in the construction and engineering sectors where materials are often quoted and specified in imperial units. Other measurement units provided, such as grams per cubic meter, kilograms per square meter, or ounces per gallon, while relevant in different contexts, do not align as closely with the industry standards for refractory installations in the U.S. and might complicate calculations for professionals accustomed to working with pound-per-cubic-foot measurements. Hence, using pounds per cubic foot not only adheres to industry norms but also facilitates effective communication among personnel involved in refractory applications.

8. Which of the following is a method of forming test specimens?

- A. Vibration cast**
- B. 3D printing**
- C. Wooden framing**
- D. Injection molding**

Vibration casting is a widely recognized method of forming test specimens, particularly in the context of refractory materials. This technique involves pouring the material into a mold and then applying vibrations to consolidate it. The vibrations help eliminate air pockets and ensure better density and structural integrity in the finished specimen. This method is crucial for achieving uniformity and consistency, which are essential for accurate testing results. While other methods like 3D printing, wooden framing, and injection molding have their own applications, they may not be as relevant or widely used in the context of forming test specimens for refractory materials. 3D printing is emerging in various manufacturing fields but is not traditionally associated with traditional refractory specimen formation. Wooden framing may be useful for some construction applications, but it lacks the precision required for testing materials. Injection molding, while effective for certain plastics and similar materials, is generally not applicable to the refractory context, where heat resistance and thermal properties are critical. Therefore, vibration casting is the preferred method due to its effectiveness in ensuring the quality and reliability of test specimens in the refractory industry.

9. What is a Test Specimen?

- A. A batch of refractory materials
- B. An individual cube, bar, or plate used for physical testing**
- C. A seal used in the installation of refractories
- D. A guideline document for testing procedures

A test specimen refers to a specific piece of material that is selected for evaluation through physical testing to assess properties such as strength, thermal resistance, or durability. This can take the form of a cube, bar, or plate, each of which is prepared and measured according to standard testing protocols to ensure accurate and consistent results. In the context of refractory materials, using an individual specimen enables precise determination of how that specific material will behave under application conditions. The properties assessed through these specimens are crucial for ensuring that refractories will perform as expected in different environments, such as high temperatures or corrosive atmospheres. The other choices do not accurately represent what a test specimen is. A batch of refractory materials refers to a quantity produced at one time, a seal pertains to installation techniques, and a guideline document lays out procedures rather than serving as a physical entity like a test specimen. Each of these is important in its own right but does not define the concept of a test specimen used in the context of physical testing.

10. How many months after a succeeding qualification test can the respective batch be re-qualified?

- A. 1 month
- B. 2 months
- C. 3 months**
- D. 4 months

The correct duration for re-qualifying a batch after a succeeding qualification test is three months. This time frame is established to ensure proper evaluation and adherence to industry standards. Re-qualifying too soon could compromise the integrity of the testing process and may not provide enough time to adequately assess any changes in quality control measures or procedures that might be relevant to the refractory materials and installation methods. This three-month period allows for necessary adjustments, retraining, and revisions to be implemented, ensuring that the personnel remain compliant with the rigorous standards set forth in the API 936 guidelines. It reflects an understanding that consistent performance and quality in the field of refractory installations demand time for review and improvements, which is critical for the safety and efficacy of refractory applications in industrial settings.