# DUMPS ARENA

## Welding Inspection and Metallurgy Exam

### API API-577

### Version Demo

**Total Demo Questions: 12**

**Total Premium Questions: 129**

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# Topic Break Down

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QUESTION NO: 1

A radiographic examination of a groove weld shows a long, straight, dark indication parallel to the weld axis near a fusion boundary. Which discontinuity is most consistent with this appearance?

**A.** Lack of fusion.

**B.** Rounded porosity.

**C.** Slag inclusion.

**D.** Undercut.

**ANSWER: A**

**Explanation:**

Lack of fusion is a planar discontinuity that can occur between deposited weld metal and the base metal or a previous weld pass. When its orientation is favorably aligned with the radiation beam, it can appear as a linear dark indication near a fusion boundary. The dark image results from reduced effective material thickness along the unfused interface. Rounded porosity normally appears as rounded dark indications, while slag inclusions are often irregular and may not follow a straight fusion boundary. Undercut is a surface profile condition at the weld toe and is not the most likely explanation for an internal linear indication near the fusion boundary.

**QUESTION NO: 2**

A â€œmill certificate" is a/an:

**A.** Analysis of the chemical elements in an ingot.

**B.** Chemical analysis of a base metal to be welded.

**C.** List of the chemical and mechanical properties specified by a purchaser.

**D.** Product analysis of mechanical properties of a base metal.

**E.** Certified record of the actual chemical composition and mechanical test results for a material heat or lot.

**ANSWER: E**

**Explanation:**

A mill certificate, commonly called a mill test report or material test certificate, is the manufacturer's certified record of the material actually produced and tested. It provides traceable, lot- or heat-specific results that demonstrate conformance with the applicable material specification. In welding inspection, the key information normally includes the material identification, heat number, product form and dimensions, chemical composition, mechanical-test results, applicable specification and grade, and certification by the manufacturer. These records allow the inspector to establish that the base material used for fabrication has the required properties and can be traced to its production heat. The stated chemical and mechanical values are actual reported test results for the supplied product, rather than merely a purchaser's requested values or a limited analysis of only one characteristic. This function aligns with the certification documentation described by EN 10204, which addresses inspection documents supplied for metallic products, and with the material-verification role covered in the API welding-inspector body of knowledge. See BSI's overview of EN 10204 inspection documents and API's Welding Inspection and Metallurgy certification information.

**QUESTION NO: 3**

Remote examination of welds may use aids such as telescopes, borescopes, fiberscopes, cameras, or other suitable instruments provided they have:

**A.** Good perception and the inspection would be approximately equal to a direct visual exam.

**B.** Sensitivity to find possible defects that a direct visual exam would produce.

**C.** A resolution at least equivalent to that which is attained by direct visual examination.

**D.** A greater acuity than the eye and the inspection would be better than a direct visual.

**ANSWER: C**

**Explanation:**

**A resolution at least equivalent to that which is attained by direct visual examination.** is correct because remote visual examination is intended to provide an acceptable alternative where direct access or line-of-sight examination is impractical. The remote viewing system must therefore resolve relevant weld-surface conditions with at least the same effectiveness as a direct visual examination performed under suitable conditions. Resolution is the instrument's ability to distinguish closely spaced features and is essential for detecting and evaluating visible discontinuities, weld profile conditions, and other surface indications. API 577 describes visual examination as including direct and remote techniques, with remote instruments such as borescopes, fiberscopes, mirrors, and cameras used when access is limited. The adequacy of the remote method depends on whether it provides examination capability equivalent to direct viewing for the intended inspection. This requirement focuses on the quality and discernment of the image produced by the system rather than simply magnification or a generalized claim of improved eyesight. For further visual-examination background, see the API 577 Welding Inspection and Metallurgy publication information and the ASNT visual testing overview.

## QUESTION NO: 4

According to the PQR 8025, does the thickness range qualified concur with the thickness range as stated on the WPS 802?

**A.** Yes, but only for thicknesses greater than .280"

**B.** No, the material thickness on the PQR should be .375"

**C.** Yes, the PQR qualifies the ranges as stated on the WPS

**D.** No, the PQR thickness should have been .560"

**ANSWER: C**

**Explanation:**

Yes, the PQR qualifies the ranges as stated on the WPS. Procedure qualification records establish the supporting test data for a welding procedure specification, including the deposited-weld-metal and base-metal thickness ranges qualified by the test coupon. For the thickness recorded on PQR 8025, the applicable thickness-qualification rule produces the same qualified range stated on WPS 802. Therefore, the WPS thickness limits are supported by the PQR rather than extending beyond the range established by qualification testing. This verification is important because a WPS must remain within the limits qualified by its supporting PQR whenever thickness is an essential-variable consideration. The governing approach is consistent with the procedure-qualification framework in ASME BPVC Section IX, particularly the thickness qualification tables and variables used to establish WPS limits. API 577 also emphasizes that an inspector must be able to review WPSs and PQRs together and confirm that the WPS variables and qualified ranges are properly supported by the PQR. See ASME BPVC Section IX and API Welding Inspection and Metallurgy certification information.

## QUESTION NO: 5

Rules for qualifying welding operators using radiography on a production weld require what minimum weld length to be examined?

**A.** 6 in. (150 mm)

**B.** 12 in. (300 mm)

**C.** 24 in.(600 mm)

**D.** 36 in. (900 mm)

**ANSWER: B**

**Explanation:**

**12 in. (300 mm)** is the required minimum radiographic examination length when qualifying a welding operator using a production weld. ASME Section IX distinguishes the performance-qualification rules applicable to welding operators from those applicable to welders. Under the welding-operator qualification provisions, radiography of a production weld must cover at least 12 in. (300 mm) of weld. The examination is used as objective evidence that the operator can produce weld quality meeting the applicable radiographic acceptance requirements under the qualified procedure and production conditions. This requirement is especially relevant where the welding operator controls mechanized or automatic welding equipment: qualification must demonstrate acceptable results over a sufficient continuous production-weld length, rather than relying on a very short sampled area. API 577 welding-inspection guidance directs inspectors to apply the ASME Section IX performance-qualification requirements when reviewing welder and welding-operator qualification records. The governing code edition adopted by the construction code or contract should always be confirmed, since qualification records must be evaluated against the applicable edition and its referenced requirements. See ASME's BPVC Section IX overview and API's API 577 information page.

**QUESTION NO: 6**

A "mill certificate" is a/an:

**A.** Analysis of the chemical elements in an ingot.

**B.** Chemical analysis of a base metal to be welded.

**C.** List of the chemical and mechanical properties specified by a purchaser.

**D.** Product analysis of mechanical properties of a base metal.

**E.** Certified report of actual chemical composition and mechanical test results for a material heat or lot.

**ANSWER: E**

**Explanation:**

A certified report of actual chemical composition and mechanical test results for a material heat or lot is the correct definition of a mill certificate. Also commonly called a mill test report or material test report, it is issued by the material manufacturer and provides traceable evidence that the supplied product was tested and conforms to the applicable material specification and purchase requirements. The report normally identifies the manufacturer, material grade, heat number, product form and dimensions, and the governing specification. It then records the actual heat or product chemistry and the results of required mechanical tests, such as tensile strength, yield strength, elongation, and, where applicable, impact properties or hardness. Welding inspectors use the certificate to verify that base material is correctly identified, that its properties are suitable for the intended service, and that material traceability is maintained from receipt through fabrication. The inspection-document framework in EN 10204 distinguishes certificates that report specific inspection results from general statements of compliance. API 577 also addresses material identification, documentation, and verification responsibilities relevant to welding inspection; see the API 577 publication page.

**QUESTION NO: 7**

A liquid penetrant examination is planned on the ground cap of an austenitic stainless-steel weld. The surface contains deep grinding marks and local surface roughness. What should be done before applying penetrant?

**A.** Apply a heavier developer coating to fill the grinding marks

**B.** Prepare the surface to a smooth, clean condition

**C.** Magnetize the weld before applying penetrant

**D.** Increase penetrant dwell time until the surface is fully saturated

## ANSWER: B

**Explanation:**

The surface should be **prepared to a smooth, clean condition without smearing or masking discontinuities**. Liquid penetrant examination depends on capillary action to draw penetrant into surface-breaking discontinuities and then permit excess penetrant to be removed from the surrounding surface. Deep grinding marks, scale, oil, moisture, and excessive roughness can retain penetrant and create confusing nonrelevant indications. Magnetic particle examination is not an alternative for austenitic stainless steel because the material is generally nonferromagnetic.

## QUESTION NO: 8

What is(are) the most appropriate action(s) to prepare an in-service carbon steel piping system that has been in caustic service for welding?

**A.** Neutralize and clean the surface within 6 in. (150 mm) of weld bevels

**B.** Steam out the piping system and dry

**C.** Verify with pH paper that any surface liquid is “basic"

**D.** Grind the surfaces near the bevel to remove contaminants

## ANSWER: A

**Explanation:**

Neutralize and clean the surface within 6 in. (150 mm) of weld bevels is the most appropriate preparation because residual caustic on carbon steel can create both personnel hazards and welding-quality concerns. Before welding, the area adjacent to the joint must be rendered safe and free of process residue so that caustic is not concentrated by welding heat, trapped at the joint, or introduced into the weld area. Neutralization addresses the chemical hazard presented by alkaline residue, while cleaning removes deposits from the base-metal surfaces that will be heated and welded. The specified 6 in. (150 mm) zone provides a practical minimum area around the bevel for a clean weld-preparation surface and for avoiding contamination during fit-up and welding. This preparation is particularly important for piping that has operated in caustic service because carbon steel may be susceptible to caustic-related damage mechanisms under certain service and thermal conditions. The work should be performed under the owner-user’s established isolation, cleaning, gas-testing, and hot-work controls, with verification that the system and local work area are safe for welding. API 577 addresses welding inspection and fabrication practices: API Standard 577. API’s damage-mechanism guidance includes caustic-service considerations for refinery equipment: API Recommended Practice 571.

## QUESTION NO: 9

A fabrication crew proposes using oxyfuel cutting to prepare a groove in Type 316 austenitic stainless steel. What is the principal reason this process is generally unsuitable for this material?

**A.** Its chromium-rich oxide resists the oxidation reaction needed for oxyfuel cutting

**B.** Its thermal conductivity is too low to permit localized heating

**C.** Its magnetic properties prevent stable oxygen flow

**D.** Its weld metal will always become martensitic after cutting

## ANSWER: A

**Explanation:**

Oxyfuel cutting is generally unsuitable because austenitic stainless steel forms a **refractory chromium-rich oxide** that does not sustain the rapid oxidation reaction required for conventional oxyfuel cutting. In carbon steel, the oxidation of iron provides the heat and fluid oxide necessary to continue the cut. Stainless steel is more commonly prepared by methods such as plasma arc cutting, machining, grinding, or other approved thermal-cutting processes, followed by any required edge conditioning. The issue is not that stainless steel has insufficient thermal conductivity or that it cannot be welded after appropriate preparation.

## QUESTION NO: 10

What is a discontinuity?

**A.** An interruption in the normal physical structure of a material.

**B.** An imperfection which is detectable with NDE.

**C.** The response or evidence from the application of NDE.

**D.** A departure of a quality characteristic from its intended condition.

## ANSWER: A

**Explanation:**

**An interruption in the normal physical structure of a material.** is the correct definition of a discontinuity in welding inspection terminology. A discontinuity is a broad descriptive term for any break, interruption, or non-uniformity in a material's normal physical structure or properties. In welds, examples can include porosity, incomplete fusion, cracks, slag inclusions, or undercut. The term itself does not decide whether the condition is acceptable for service; its significance depends on the applicable construction code, material, service conditions, location, size, orientation, and acceptance criteria. Inspectors must therefore identify and characterize discontinuities through visual examination or other examination methods, then evaluate them against the governing requirements. This distinction is important in API welding inspection practice because a discontinuity becomes a rejectable defect only when it exceeds the applicable acceptance criteria. The wording is consistent with the standardized nondestructive-examination vocabulary in ASTM E1316, which defines a discontinuity as an interruption in the normal physical structure or configuration of a part. See ASTM E1316, Standard Terminology for Nondestructive Examinations and the API Standard 577 information page.

## QUESTION NO: 11

For what maximum outside diameter may a radiographic technique be used in which the radiation passes through two walls and the weld in both walls is viewed for acceptance?

**A.** 1.5 in. (38.0 mm)

**B.** 2.5 in. (63.5 mm)

**C.** 3 in.(76.2 mm)

**D.** 3.5 in. (90.0 mm)

## ANSWER: D

**Explanation:**

**3.5 in. (90.0 mm)** is the maximum outside diameter for the described double-wall, double-image radiographic technique. Under the radiographic examination provisions commonly applied to pressure-retaining welds, this technique is permitted for pipe or similar cylindrical components with a nominal outside diameter of 3½ in. (89 mm) or less. The source is positioned so that radiation traverses both walls, producing images of the weld on both the source-side and film-side walls; both images are evaluated for acceptance. This arrangement is particularly practical for small-diameter pipe because placing the film inside the component or obtaining a single-wall exposure may not be feasible. Proper technique selection remains important: image placement, source alignment, geometric unsharpness, density, and required image quality indicators must still satisfy the applicable examination requirements so that each weld image is suitable for acceptance evaluation. API 577 addresses welding inspection knowledge and directs inspectors to understand and apply the governing construction-code and nondestructive-examination requirements. The dimensional limit is established in the radiographic examination rules of

ASME BPVC Section V, Article 2. See ASME BPVC Section V: Nondestructive Examination and API Welding Inspector certification information.

## QUESTION NO: 12

The change in shape (deformation) that a test specimen experiences when it is stressed or loaded is called:

**A.** Yield.

**B.** Strain.

**C.** Stress.

**D.** Plasticity.

## ANSWER: B

**Explanation:**

**Strain.** is correct because strain is the measure of deformation produced in a material by an applied load. In tensile testing, it is commonly expressed as the change in a specimen's length divided by its original gauge length, making it a dimensionless quantity (often reported as a percentage). A test specimen elongates when subjected to tensile loading, and that resulting relative elongation is its tensile strain. Strain may be elastic, meaning the material returns to its original dimensions when the load is removed, or plastic, meaning a permanent deformation remains after unloading. This distinction is fundamental to interpreting tensile-test results used in welding inspection and metallurgy, including yield behavior, tensile properties, and ductility. Stress is the internal force per unit area associated with the applied load, while strain specifically describes the material's resulting dimensional or shape change. ASTM's terminology for mechanical testing defines strain as the change in length per unit length, and standard engineering mechanics references likewise define it as deformation normalized by original dimension. See ASTM E6, Standard Terminology Relating to Methods of Mechanical Testing and Encyclopaedia Britannica: Strain.