Passcert

Higher Quality, better service!

Q&A

Http://www.passcert.com

We offer free update service for one year.

Exam : **NACE-CIP3-001**

Title : Senior Certified Coatings Inspector Peer Review Oral Exam

Version : DEMO

1.Field Situation
A carbon steel tank intended for Reverse Osmosis (RO) water immersion service was lined with a 100% solid epoxy coating. Only six months after being placed into service, the tank was drained for its annual inspection. The inspector found widespread, dense blistering (Size 4, Dense per ASTM D714) across the immersed areas. The contractor insists the coating batch was defective and demands compensation from the manufacturer.

Question
As a Level 3 Senior Coatings Inspector, how should you respond to investigate the root cause?

Inspector Approach
● Identify failure mechanism: Suspect osmotic blistering vs. non-osmotic blistering based on the immersion environment.
● Gather evidence: Retrieve project history, including Daily Inspection Reports, environmental logs, Product Data Sheets (PDS), and batch records to rule out mixing/application anomalies.
● Perform verification tests: Carefully physically dissect several intact blisters. Note any odor (lack of solvent smell). Test the liquid inside the blister with pH paper (acidic liquid indicates corrosion cell). Perform a Bresle patch test on the underlying bare steel substrate to check for soluble salt concentrations.
● Determine root cause: If the substrate shows high levels of chlorides or sulfates, the root cause is osmotic blistering due to inadequate surface preparation (failure to remove soluble contaminants prior to coating). RO water has a very low ionic concentration, which creates a massive concentration gradient and osmotic driving force when soluble salts are trapped beneath the semi-permeable epoxy film.
● Recommend corrective action: Document the findings objectively to dismiss the "defective paint" claim. Recommend complete removal of the failed coating, thorough decontamination of the substrate (e.g., high-pressure water washing/wet abrasive blasting), and reapplication according to the specification.
Answer:
RO water is highly purified and lacks dissolved solids. When a coating is applied over a substrate contaminated with soluble salts, the coating acts as a semi-permeable membrane. The pure RO water is drawn through the coating to dilute the higher concentration of salts on the steel surface. This creates hydraulic (osmotic) pressure that physically pushes the coating off the substrate, resulting in blisters filled with acidic liquid.
Related Standards / References
● ASTM D714 (Standard Test Method for Evaluating Degree of Blistering of Paints)
● ISO 8502-6 & ISO 8502-9 (Extraction and analysis of soluble salts)
● NACE SP0178 (Design, Fabrication, and Surface Finish Practices for Tanks and Vessels to Be Lined for Immersion Service)

2.Field Situation
On a newly constructed highway overpass, the structural steel was coated with a three-coat system: Zinc-Rich Epoxy primer, Micaceous Iron Oxide (MIO) Epoxy intermediate, and an Aliphatic Polyurethane (PU) topcoat. Two weeks after the topcoat application, the inspector performs random adhesion checks and finds that the PU topcoat can be peeled off in large sheets, resembling "plastic wrap." The back of the peeled PU is highly glossy and smooth. The underlying MIO epoxy remains perfectly intact on the

steel, exhibiting a hard, slick surface.

Question
As a Level 3 Senior Coatings Inspector, how should you respond to this failure mode and determine the cause?

Inspector Approach
● Identify failure mechanism: Classify the defect strictly as an intercoat adhesion failure (adhesive failure at the epoxy/polyurethane interface).
● Gather evidence: Review the Daily Inspection Reports. Cross-reference the exact date and time the intermediate coat was applied against the date/time the topcoat was applied. Check the environmental logs (temperature/UV exposure) during that window.
● Perform verification tests: Consult the epoxy manufacturer's Product Data Sheet (PDS) to determine the maximum recoat window at the documented ambient temperatures. Map out the extent of the failure using tape tests (ASTM D3359) or pull-off tests (ASTM D4541).
● Determine root cause: The glossy back of the topcoat and the hard/slick intermediate coat indicate that the maximum recoat window was exceeded. The epoxy had fully cross-linked and "hardened off," resulting in reduced chemical bonding potential and insufficient mechanical adhesion (lack of surface profile) for the topcoat.
● Recommend corrective action: The failed topcoat must be entirely removed. The intact MIO epoxy must be sweep-blasted (or mechanically scarified) to remove gloss and create a mechanical anchor profile, cleaned, and then recoated with the PU topcoat as per manufacturer recommendations.
Answer:
Epoxy coatings cure via a chemical cross-linking process. If a topcoat is applied within the specified recoat window, its solvents can slightly bite into the underlying epoxy, creating a chemical bond. Once the epoxy is fully cured (especially accelerated by high temperatures or direct sunlight), it becomes an impermeable, slick barrier. Topcoats applied past this window rely entirely on mechanical adhesion, which requires physical roughening of the surface.
Related Standards / References
● ASTM D3359 (Measuring Adhesion by Tape Test)
● Manufacturer’s Product Data Sheet (Maximum Recoat Windows based on temperature).
● SSPC-SP 16 (Brush-Off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals - often used as a baseline for sweep blasting).

3.Field Situation
A structural steel platform in a marine atmospheric environment has been in service for only one year. The coating system on flat, unobstructed steel surfaces is in excellent condition. However, virtually all weld seams, flange edges, and bolt holes exhibit dense pinpoint rusting and early coating breakdown. The contractor argues that the environment is too severe and points out that the Dry Film Thickness (DFT) on the flat surfaces meets the specification.

Question
As a Level 3 Senior Coatings Inspector, how should you evaluate this localized failure and respond to the contractor?

Inspector Approach

● Identify failure mechanism: Recognize this as a localized geometry-driven failure (edge effect/weld contamination), rather than a systemic environmental failure.
● Gather evidence: Review the surface preparation reports, specifically looking for sign-offs on weld slag removal, spatter grinding, and edge chamfering/radiusing. Review application logs to see if stripe coating was mandated and documented.
● Perform verification tests: Take micro-DFT measurements on the sharp edges using specialized probes if available, or visually examine the failed edges under magnification. Investigate the rusted welds for evidence of trapped weld flux or porosity.
● Determine root cause: Liquid coatings naturally draw away from sharp edges during curing due to surface tension, resulting in insufficient DFT at the apex of the edge. Additionally, unremoved weld spatter or hygroscopic weld flux creates physical and chemical weak points that initiate rapid localized corrosion.
● Recommend corrective action: Reject the contractor's "severe environment" excuse based on localized evidence. Recommend spot repair: mechanical tool cleaning or spot blasting of the failed areas, mandatory grinding of sharp edges (min 2mm radius), application of a brush-applied stripe coat on all welds and edges, followed by a full topcoat.

Answer:

Coating liquids are subject to surface tension, which pulls the coating away from sharp 90-degree angles during the solvent evaporation and curing phase. This leaves only a fraction of the intended DFT on the edge. Furthermore, the Heat Affected Zone (HAZ) of a weld often has a different metallurgical structure and profile, while weld flux residue is highly hygroscopic and promotes under-film corrosion if not rigorously removed before blasting.

Related Standards / References

● SSPC-PA 1 (Good Painting Practice - Stripe Coating sections).
● ISO 8501-3 (Preparation grades of welds, edges and other areas with surface imperfections).
● NACE SP0178 (Weld profile and edge grinding requirements).

4.Field Situation

During mid-summer, a contractor is spraying a fast-drying phenolic epoxy on the exterior of a storage tank exposed to direct sunlight. At noon, the steel surface temperature reaches 55°C (131°F). Shortly after application, the film appears dry to the touch, but upon closer visual inspection with a magnifier, you observe thousands of microscopic craters and tiny holes across the surface.

Question

As a Level 3 Senior Coatings Inspector, how should you define this defect, explain its mechanism, and direct the subsequent steps?

Inspector Approach

● Identify failure mechanism: Identify the defect as solvent popping (or pinholing due to rapid solvent evaporation).
● Gather evidence: Review the daily environmental logs to establish the exact steel temperature at the time of application. Check the PDS for the absolute maximum allowable substrate temperature. Verify

the mixing logs to see if an unapproved fast-evaporating thinner was used.
● Perform verification tests: Measure the DFT to see if excessive thickness contributed to the trapped solvent. Conduct a visual assessment over the entire sun-exposed area to map the extent of the porosity.
● Determine root cause: The steel temperature exceeded the manufacturer's maximum limits. The heat caused the solvent within the coating to boil and vaporize rapidly, while simultaneously causing the surface of the coating to skin over. The expanding solvent vapor ruptured the semi-cured skin, leaving open craters that the coating could no longer flow back to seal.
● Recommend corrective action: Do not allow the contractor to simply apply a second coat over the porous surface, as this will trap air in the craters and cause further blistering. The defective, porous coating must be sanded or sweep-blasted down to a sound, pore-free layer. Reapplication must be scheduled during cooler periods (early morning/late evening) or by utilizing manufacturer-approved slow thinners (retarders).

Answer:

Applying coatings to excessively hot substrates is just as dangerous as applying them near the dew point. Solvent popping compromises the integrity of the barrier protection, leaving direct pathways for moisture and oxygen to reach the substrate or underlying coats. Proving the root cause requires the inspector to correlate the physical defect with the recorded environmental data and the PDS limitations.
Related Standards / References
● Manufacturer's PDS (Maximum Substrate Temperature & Thinner guidelines).
● SSPC-PA 1 (Shop, Field, and Maintenance Painting of Steel).

5.Field Situation
On a bridge structural steel project, the specification requires an Inorganic Zinc-Rich (IOZ) primer with a target DFT of 3 to 4 mils (75-100 µm). Due to poor spray technique, the inspector measures the actual DFT in a large section at 8 to 10 mils (200-250 µm). After curing, the surface in this thick area exhibits widespread, network-like cracking, resembling a dried riverbed. The contractor’s project manager proposes: "Let's just apply a thinned-down epoxy intermediate coat to seal it; the epoxy will seep into the cracks, bind it together, and keep the project on schedule."

Question

As a Level 3 Senior Coatings Inspector, how should you respond to the contractor's repair proposal?

Inspector Approach

● Identify failure mechanism: Identify the network cracking as "Mud Cracking," a severe structural failure of the coating film, not merely a cosmetic defect.
● Gather evidence: Conduct a thorough DFT survey across the affected steel members to precisely delineate the boundaries of the over-applied IOZ.
● Perform verification tests: Use a coin rub test or tape adhesion test over the mud-cracked area to demonstrate to the contractor that the IOZ lacks internal cohesive strength and is friable.
● Determine root cause: The root cause is gross over-application exceeding the IOZ's formulation limits. IOZ is a heavily pigmented silicate coating; when applied too thickly, the differential shrinkage stresses during the curing process exceed the coating's cohesive strength, causing it to fracture itself.
● Recommend corrective action: Categorically reject the contractor's repair proposal. Applying a topcoat

over mud-cracked IOZ will cause the topcoat's curing stresses to pull the friable zinc completely off the substrate. The defective coating must be removed until sound coating or the bare substrate is reached, and repaired according to the approved coating system procedure (usually re-blasting the affected area and re-applying at the correct DFT).

Answer:

Inorganic Zinc primers are exceptionally sensitive to thickness. If applied too thin, they do not provide adequate galvanic protection. If applied too thick, they inevitably mud-crack. A Level 3 inspector must recognize that mud cracking indicates a total loss of film integrity. Sealing a broken foundation with a strong topcoat is an engineering fallacy that guarantees catastrophic delamination in the field.

Related Standards / References

- SSPC-PA 2 (Procedure for Determining Conformance to Dry Coating Thickness Requirements - specifically dealing with max thickness restrictions).
- Manufacturer’s PDS (Strict maximum DFT limitations for IOZ).
- SSPC-Paint 20 (Zinc-Rich Primers).