Underwater – Inspect the Condition of External Coating

1.0 Task Description

This task is to verify that the coating is intact (free from damage and/or degradation) and is adequately bonded to the pipe surface and to ensure proper documentation and reporting have occurred. This task is similar to Task 5.3 (Inspect the Condition of External Coating on Buried or Submerged Pipe) but contains steps or equipment that are unique to an underwater environment.

2.0 Knowledge Component

An individual performing this task must have knowledge of the following.

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Terms applicable to this task are as follows.

pipeline coating types
Pipeline coating types, at a minimum, may include one or more of the following.

asphalt coatings
A pipeline coating that consists of a naturally occurring material that is derived either by mining (e.g. gilsonite) or is a residue from the distillation of asphaltic petroleum. Asphalt coatings vary in their chemical and physical characteristics. Asphalt properly applied to steel or concrete surfaces has good adhesion properties, can be applied to thickness up to 100 to 200 mils, and is chemically stable with good resistance to water, most chemicals, and salts.

coal tar coatings
A pipeline coating that is manufactured by dissolving processed coal tar pitch, or a blend of these pitches, in suitable solvents. The coating is cured by evaporating the solvents. Coal tar coatings are made in different consistencies: those without any inert filler and those that contain inert materials to build film thickness. Coal tar coatings have good resistance to weak acids, alkalis, salts, seawater, and other aggressive atmospheres. This coating provides protection by the exclusion of moisture and air from the underlying surface.

extruded coatings
A dual layer pipeline coating that consists of an extruded polyethylene topcoat applied over a rubberized asphalt adhesive. Typically, the polyethylene coating or jacket is “yellow” in color. The nature of the high-density polyethylene outer jacket is formulated to protect the asphalt adhesive during handling and installation. While applied in thin layer, the asphalt adhesive provides the primary protection from corrosion consistent with the properties of an asphalt coating.

fusion-bonded epoxy coatings
A pipeline coating that consists of a powdered epoxy applied to a heated pipe by electrostatic methods (i.e. the powdered coating is attracted to the pipe by using the principles of static electricity). The powder gels and flows with the heat and then will cure and harden during cooling. The process creates a tight physical bond between the coating and the metal.

petrolatum coating products
Rust preventative products that contain petrolatum, which is a smooth, semisolid blend of mineral oil with waxes crystallized from residual-type petroleum lubricating oil. The wax molecules contain 30 to 70 carbon atoms and are straight chains with a few branches or naphthene rings.

shrink sleeve products

A shrink sleeve is a polymer sleeve that is applied to the pipe, most usually over a girth weld, and heated according to a specific procedure to cause the sleeve to shrink into place on the pipe, causing the adhesive to bond to the pipe and to the adjacent coatings it overlaps.

tape coatings
The tape system consists of a primer applied directly to the pipe surface, an inner-wrap tape layer that provides a corrosion barrier, and an outer-wrap tape layer that provides mechanical protection.

Coating Abnormalities

biological
Bacteria and fungi are the primary microorganisms that can act on coatings. There are two types of action. One type is the activity of a microorganism due to dirt and contamination on the coating. In this case, the bacteria or fungi merely live on the surface of the coating and do not necessarily affect its protective nature. The second type is where the microorganisms actually uses the coating for food and derive their energy from it. Under certain conditions, coatings can be rapidly disintegrated by this type of action.

bonding
The joining of the coating system and the pipeline in a manner where they are adhered or united by means of adhesive, heat, or pressure.

coating abnormalities
Change or failure of the coating attributed to one or several of the following: formulation related (e.g. checking, cracking, discoloration, and similar phenomena), improper coating selection, incompatibility with the surface over which it is applied, improper or poor surface preparation, improper application (e.g. inadequate thickness, pinholes, overspray, improper drying, and improper curing), adhesion related, structural surface issues (e.g. sharp edges, crevices, skip welds, and back-to-back angles), and exterior forces (e.g. chemical exposure, abrasion, reverse impact, and severe weathering).

coating disbondment
Failure of the bond between the coating and the pipe’s surface.

cracking—as it relates to coatings
A physical separation to otherwise bonded coating that has an appearance of fissures.

holiday
An undesirable discontinuity or break in the coating system. Electronic testing devices detect flaws in the protective coating.

Coating Methods

cigarette wrap
A method used to apply coating one wrap at a time around the circumference of the pipeline.

coating overlap
The amount one wrap of coating overlaps the adjacent wrap of coating.

field-applied coating

The application of the pipe coating is done in the field under variable environmental conditions. Typically, this includes the field coating of welded joints and/or fittings during original construction or, when required, during routine maintenance activities as the pipeline is exposed and the coating has been removed or repaired. The field coating may or may not be the same material as the parent pipe coating, but the application process and physical properties need to be compatible. Field coatings typically have a wider tolerance of surface preparation condition. The coating is typically hand applied but can be machine applied. Coating thickness and adhesion to the pipe surface can vary based on the consistency of the application.

manufacturer-applied coating
This application of the pipe coating is done in a coating mill or similar location under controlled environmental conditions. On-site testing is performed to ensure that the surface of the pipe is properly prepared, that the temperature of the pipe is controlled, that the applied coating thickness meets specifications, and that the pipe is free of coating voids or holidays. Additional on-site laboratory testing may include the following: cathodic disbondment testing, bend testing, adhesion testing, and abrasion/impact test. The pipe is shipped to the installation site in a precoated condition with the ends of the pipe prepared to facilitate welding and joining procedures.

spiral wrap
A method used to apply coating in a continuous fashion around the circumference of the pipeline.

Marine growth

The covering of marine plants, animals, and other organisms found on parts of man-made structures that are fully submerged in the sea or intermittently immersed during the tidal cycle. Marine growth can be described as either hard or soft; and can be categorized into different levels based on the thickness of the accumulated organisms.

Light fouling: Marine growth thickness is less than 300 microns (0.3 mm).

Moderate fouling: Marine growth thickness is between 300 microns (0.3 mm) and 1 mm.

Heavy fouling: Marine growth thickness is greater than 1 mm.

AOCs associated with the performance of this task include:

AOC Recognition	AOC Reaction
Blistering, checking, cracking, wrinkling, delamination, and disbondment.	Implement mitigation measures per operator's procedures.
Coating type found to be inconsistent with documentation	Document and notify the appropriate operator personnel.
Evidence of release; Stream of bubbles, globules of oil, oil slick, or rainbow sheen.	Discontinue the task and make immediate notifications.

3.0 Skill Component

To demonstrate proficiency of this task, an individual must perform the following steps:

Step	Action	Explanation
1	Inspect area for evidence of a release. If the inspection identifies integrity issues that are not safe, discontinue the task and make immediate notifications	Helps ensure that the pipeline is safe for operation and continued task performance. Look for a stream of bubbles, globules of oil, oil slick, or rainbow sheen.
2	Visual or tactile inspection to verify the type of existing coating.	It is necessary to be able to identify the type of coating that exists on the pipe so that a proper coating inspection can be conducted.

Step	Action	Explanation
3	Measure and classify marine growth.	Identify hard or soft growth and the percentage of coverage using visual or tactile inspection. Measure the thickness of marine growth using a probe, soft tape measure, or other appropriate equipment.
4	Examine the exposed coated pipe and determine if there are any flaws, holidays, or abnormalities in the coating.	Visual or tactile inspection of the coating is critical to identify potential risks that need further assessment to avoid future leaks or failures.
5	Identify the type(s) and location(s) of coating damage. There are a variety of methods to describe the location of the damage. One of the more common methods is to locate the damage circumferentially with respect to a clock face. The location of the seam weld and the longitudinal distance to the nearest girth weld are also typically reported.	The type(s) and location(s) of damage are used to determine later actions such as whether repairs are needed and, if so, what kind of repair is needed.
7	Document the findings and make notifications.	Follows the operator's policies/procedures for appropriate documentation, notification protocol, and actions required.