Common Covered Task 401
Examination of Buried Pipe When Exposed

Directions

This training guide is to be used by a Veriforce Authorized Evaluator/Trainer and Trainee during on-the-job training (OJT) or prior to an evaluation as a resource. (S) Indicates a demonstration or skill task; (K) indicates a knowledge task.

OJT Reminder

OJT is an active hands-on process. Practice should be as similar to the actual job task as possible. However, if the training is being provided on an actual job site while a covered task is actually being performed, the Evaluator either needs to be qualified on that covered task or be assisted by someone who is qualified on the covered task. The Evaluator should closely monitor the Trainee's practices to ensure safe and correct task performance. At no time should a non-qualified individual perform, or train for, a covered task unless directed and observed by a qualified individual. However, if the ***"span of control"*** for that particular covered task is "1:0" (requiring only qualified individuals to perform the covered task), the training must be simulated. Training is simulated by "walking through" the task and simulating all actual manipulations (valves, switches, tools, etc.) an individual would use during the performance of a covered task. Simulating includes the use of safety and administrative requirements as if the task were being performed live. Refer to the Veriforce Evaluator Training Program for more on how to conduct formal OJT.

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Recommended Student Training or Resources:

- DOT 49 CFR 192.328(a)(1)
- DOT 49 CFR 192.459
- DOT 49 CFR 195.569

Knowledge: Explain what is required prior to performing this task.

Pipeline Operator-Approved Procedures and Appropriate Equipment/Material

Prior to performing this task, you will need to have the pipeline operator-approved procedures as well as the appropriate equipment and materials. The procedures will outline requirements for performing this task that are specific to the pipeline operator. Operators may also have specific requirements regarding the type of equipment that can be used to perform this task.

Therefore, it's important to follow the specific requirements of the procedures and only use operator-approved equipment. Doing so can ensure the task is performed correctly and according to the pipeline operator's standards.

Knowledge: Describe when an inspection of coating on buried pipe is required.

Over 98% of pipelines are buried. No matter how well these pipelines are designed, constructed, and protected, once in place, they are subjected to environmental abuse, external damage, coating disbondments, inherent mill defects, soil movements, instability, and third party damage.

For this reason, the Department of Transportation (DOT) has adopted regulations (§192.459 and §195.569) which require that whenever any portion of a buried pipeline is exposed, the exposed portion must be examined for evidence of external corrosion if the pipe is bare, or if the coating is deteriorated.

Knowledge: Describe the types of defects that might be discovered during a coating inspection.

In this objective, we will discuss how to identify and describe the types of coating defects that may be discovered during a coating inspection. The defects include the following:

- Disbonded coating
- Appearance of moisture under coating (blisters)
- Cracks
- Evidence of soil stress
- Lack of coating

Disbonded Coating

Disbonding creates gaps between the coating and pipe surface that fill with ground water, introducing microorganisms that create corrosion cells.

A disbonded coating can contain an active corrosion cell that is undetectable until serious damage has occurred to the pipe wall.

To identify disbonded coating, look for coatings that are peeling, flaking, wrinkling, separated from the pipeline, or have an asymmetrical look.

Peeling, resulting from improper adhesion of the coating, is often related to expansion or contraction of the coating material to the extent it loses its surface adhesion.

Generally, peeling is the result of improper surface preparation prior to the application of the coating.

Flaking is also a result of improper adhesion of the coating.

Flaking occurs because the coating material cures (dries) too quickly or beyond the desired level of flexibility, and in reaching this inflexible state, it shrinks and cracks. These pieces start to curl on the ends; which causes them to pull away from the pipeline.

Wrinkles are another indication of disbonded coating. Wrinkles occur as a result of extreme temperature change, soil stress where the soil shifts, or by applying the coatings too thickly.

Wrinkles may also occur during expansion of the coating, if the coating surface expands more rapidly than the body of the coating during the curing (or drying time). Wrinkling appears as a rough, crinkled surface.

Cracks

Cracks are breaks in a coating that extend through to the substrate (or surface of the pipe).

Cracking may occur, due to coating formula errors or thick film application. If the coating was applied very thick, and then subsequently the pipe contracted and/or expanded, the coating will crack during curing (or drying time).

Appearance of Moisture Under Coating

Blisters are potential indicators of moisture under coating. A blister is a raised area, often dome shaped (small or large), that results from loss of adhesion between the coating and the pipe. Very small blisters may be called pinhead blisters or pepper blisters.

They may be filled with liquid or air.

Blisters are created from moisture or from hydrogen gas that forms on the pipeline surface under the coating.

Evidence of Soil Stress

Soil stress is the main cause of pipeline coating failure.

This stress is brought about in certain soils that are alternately wet and dry, which creates forces that may split or cause thin areas.

Soil stress effects can be seen on coatings as wrinkling, blistering, or cracking.

Lack of Coating

Lack of coating can be caused by many reasons such as improper application, soil stress, moisture under the coating, etc.

Regardless of the reason, anytime a lack of coating or coating damage is discovered, it should be documented and immediately reported to the proper pipeline operator representative.

Knowledge:	Describe the types of defects that might be discovered during inspection of the exposed pipe.

You've learned about what to look for during a coating inspection. In this objective, you will learn what to look for during an inspection of exposed pipe. Keep in mind both of these inspections can take place at the same time. There are several defects that you need to pay attention to when conducting an inspection of exposed pipe.

Pitting

Pitting is a serious form of randomly occurring, highly localized corrosion. Pitting is characterized by small indentations or cavities in the pipe surface. The depth of penetration is much greater than the diameter of the area affected. Pitting is one of the most destructive forms of corrosion, if neglected; even a single pit can cause extensive pipeline damage.

Once pits are identified, they must be measured to determine the remaining wall thickness. Document the location and notify the proper pipeline operator representative.

Scale

Scale is a dense, cohesive material that forms a tightly adhering mass on a metallic surface. Scale is different from mill scale. Mill scale is the black gunk that coats mild steel when you buy it. It is the residue left from the manufacturing process. Examine the pipe for any black mill scale, black dust, or any kind of deposit buildup.

Rust, Discoloration, and Corrosion By-Products

Carefully look for any unusual colors in the deposits over corroded areas and after removal of the old coating while the surface is fresh. Discoloration indicates the beginning of rusting/corrosion.

Wrinkles

Pipe wrinkles are also formed when the pipe is bent incorrectly. Wrinkles can lead to accelerated corrosion.

Other Physical Damage

Physical damage can include buckles, gouges, dents, damaged couplings, defective weld patches, grooves, scratches, or arc burns. If applicable, try to determine the cause of the physical damage (e.g., heavy equipment damaged pipe, improper construction activities).

Examine the pipe for anything unusual. Regardless of the size of the physical damage, all damage should be documented, and reported immediately to the proper pipeline operator representative.

Knowledge: Describe how to perform an inspection of pipe and coating.

Inspections of pipe and coating should be conducted in the ditch with the pipe - not from the top of the ditch.

Too many times pipe defects and major coating problems go undetected from inadequate examinations.

Prior to performing a pipe and coating inspection, ensure that, at a minimum, the following safety measures have been met.

- The pipeline has been excavated properly without damage to the pipeline.
- If anticipated (or expected), only enter after testing the atmosphere of the excavated area for hazardous gases. Proceed when the air is safe or proper personal protective equipment has been provided.
- Ensure that the trench follows excavation safety procedures (e.g. access and exit ramps, ladders, etc.)

Note: Refer to your procedures for specific and additional safety requirements regarding work in and around excavations.

Once the necessary safety measures have been taken, you can begin to conduct the inspection. Start by looking for signs of soil discoloration, wetness, or fungus prior to removing the dirt completely away from the pipe.

Next, examine the pipe and coating thoroughly, and look for damage. It is easy to overlook minor damage, especially minor coating defects which can lead to significant corrosion damage later on.

Note the overall appearance of the pipe and coating, paying close attention to any bulges, sags, wrinkles, water or mud dripping from the coating, rocks penetrating the coating, melted areas, and discoloration of the coating.

Knowledge:	Describe conditions that may warrant extending the inspection beyond the exposed area.

Inspections beyond the exposed area may be necessary if any of the following conditions extend beyond the wall of the excavation:

- Continuation of an individual pitting area
- Coating failure
- Significant general corrosion
- Any mechanical defect
- Exposed metal surface

The assumption must be made the damage will extend **beyond** the excavated area.

The DOT requires the pipeline operator to investigate **circumferentially** and **longitudinally** beyond the exposed portion (by visual examination, indirect method, or both) to determine whether additional corrosion requiring remedial action exists in the vicinity of the exposed portion.

Anytime coating damage, corrosion, or physical damage is discovered on the pipeline, it is important to notify the proper pipeline operator immediately, and document as much as you can about the situation (e.g., location, extent, observations, etc.). Proper identification of the coatings and damage will help facilitate the repair of the area.

Abnormal Operating Conditions (AOCs)

Candidates are required to possess the ability to **RECOGNIZE** and **REACT** to the listed AOCs for each task. Be prepared to answer questions concerning additional AOCs that may be relevant. Evaluators may ask questions about AOCs throughout the evaluation.

An AOC is defined in **49 CFR §§ 192.803** and **195.503** as:

A condition identified by the pipeline operator that may indicate a malfunction of a component or deviation from normal operations that may:

- Indicate a condition exceeding design limits; or
- Result in a hazard(s) to persons, property, or the environment.

Recognize: Unintentional releases, vapors, or hazardous atmosphere could be signs that an abnormal operating condition has occurred. Examples could include, but are not limited to:

- Blowing gas
- Puddles
- Dead vegetation

- Vapors from casing vents

React/Respond: Proper reactions/responses to take in the event of an unintentional release, vapors, or hazardous atmosphere include the following:

- Eliminate potential ignition sources.
- Move to a safe location.
- Notify emergency response personnel, as appropriate.
- Notify the designated pipeline operator representative.

Recognize: Material defects, anomalies, or physical damage of pipe or a component that have impaired or are likely to impair the serviceability of the pipeline are abnormal operating conditions. Examples could include, but are not limited to:

- Damaged risers
- Damaged coating
- Dents
- Gouges

React/Respond: Proper reactions/responses to take in the event of material defects, anomalies, or physical damage of pipe or a component that have impaired or are likely to impair the serviceability of the pipeline include the following:

- Stop the activity and notify the designated pipeline operator representative.
- Mark the location so it may be easily located.

Recognize: Failure or malfunction of pipeline component(s) is an abnormal operating condition. Examples could include, but are not limited to:

- Valve leaking
- Pipe support failure
- Mechanical fitting failure

React/Respond: Proper reactions/responses to take in the event of a failure or malfunction of pipeline component(s) include the following:

- Stop the activity.
- Protect the public, property, and the environment.
- Notify the designated pipeline operator representative.

Recognize: Corrosion on a pipeline component that has impaired or is likely to impair the serviceability of the pipeline is considered an abnormal operating condition. Some examples could include, but are not limited to:

- Evidence of damaged coating or loss of adhesion
- Notable metal loss
- Evidence of excess soil stress

React/Respond: Proper reactions/responses to take in the event of corrosion on a pipeline component that has impaired or is likely to impair the serviceability of the pipeline include the following:

- Notify the designated pipeline operator representative.

Glossary

AOC
abnormal operating condition

CCT
common covered task

CFR
Code of Federal Regulations