Common Covered Task 426
Inspect Pipe Coating with Holiday Detector

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 192.455(a)
- DOT 49 CFR 192.457(a)
- DOT 49 CFR 192.461
- DOT 49 CFR 192.479
- DOT 49 CFR 195.561
- 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 the use and calibration of equipment required for holiday detection.

Holiday Detectors are devices used to minimize the effects of corrosion by detecting pinholes or voids (**holidays**) in coating. Holidays are also known as pinholes, voids, or discontinuities in a protective coating that expose unprotected surface to the environment.

These detectors detect bubbles or blister-type voids, nicks, scrapes, cracks, thin spots (or weak spots), and foreign inclusions or contaminants in the coating that are of such size, number, or conductivity as to lower the electrical resistance or dielectric strength of the coating significantly.

A holiday detector simply applies a voltage to the outside of the coating. With both the pipe and the holiday detector connected to the ground, a **hole** in the coating will cause a spark to jump (or "**arc**") from the electrode to the pipe to complete the circuit. When a complete circuit is formed, a signal (also known as a "**jeep**") is activated on the holiday detector.

Electrodes are used to transfer voltage from the holiday detector to a surface. Various designs are available to meet type and size requirements. Rolling spring electrodes are normally used in the inspection of pipes because they move easily along the pipe. However, circular brush and sponge electrodes can also be used. Flat brush electrodes are used for flat surfaces. Brush materials can be of brass, steel, or conductive neoprene construction. Internal electrodes are for testing internal pipe coatings.

In a pulse-type detector, the pulse rate will dictate the electrode travel speed. The higher the pulse rate, the higher the speed of travel. In a nonpulse-type detector, the travel speed is dictated by the mechanics of application and the response time of the machine. To set proper electrode travel speed, test known holidays in the coating, and attempt to detect the holiday at various travel speeds.

In order to complete the circuit, proper grounding is critical. The pipe must be electrically grounded to the earth at one or more points. Grounding is achieved by direct-wire connection, or by connecting both pipe and holiday detector to the earth as a common ground. If not in contact with the earth, the pipe should be connected to the earth by a driven ground rod or metal pin.

In some cases, the holiday detector is grounded by the use of a flexible ground wire that is connected to the ground terminal of the detector and trailed along the surface of the earth.

In dry, sandy, or rocky areas where earth resistivity prevents effective holiday detection, the direct wire connection between the pipe and holiday detector ground terminal should be maintained.

Prior to conducting holiday testing:

- Make sure the detector is calibrated.
- Make sure the coating is dry and properly cured. False signals can be produced if the coating surface has moisture on it;
    - Atmospheric moisture is unlikely to cause operational concerns (refer to the holiday detector's manufacturing guidelines).
- Remove all foreign materials that may cause an increase in the distance between the electrode and the coated surface; and
- Check with the coating manufacturer on the maximum temperature of the coating during inspection
    - For example, the maximum temperature at which fusion bonded coatings can be inspected is 195˚F (90˚C).
    - Refer to your pipeline operator specifications.

Caution

Holiday detectors can create an arc or spark.

- Use of a holiday detector in or around combustible or flammable environments can result in an explosion.
- Consult with the pipeline operator and/or safety representative regarding hazardous atmospheres.

Holiday detectors can cause electrical shock hazards to the user and those in close proximity if not used correctly.

- Refer to the manufacturer guidelines and consult a physician regarding the use with a pace-maker.

Holiday detectors have certain limitations.

1. Even though pinholes can be seen, the detector may not sound. Generally, it is because the pinholes have not penetrated through to the metal.
    a. Conversely, the detector may sound to indicate the presence of a void when none exists because the coating itself may be conductive as a result of metallic pigmentation.
2. Holiday detectors do not provide information concerning coating resistance, bond, physical characteristics, or the overall quality of the coating.

Knowledge: Describe the voltage limitations of the equipment being used.

Voltage Limitations

The minimum test voltage depends on coating thickness, atmospheric conditions, electrode, and ground conditions. Therefore, each test voltage will vary.

Refer to the NACE standards for minimum testing voltages for various coating thicknesses; the coating's manufacturer data sheet for maximum test voltages; and the pipeline operator's requirements.

Exceeding voltage limitations can damage the coating. If you use it on too high a voltage, and leave it on long enough, it can penetrate the pores and cause a holiday.

A field calibration test should be performed each day to determine the minimum effective applied test voltage.

1. Make a holiday approximately .031 inches in diameter through the coating to the metal surface.
2. Start with the lowest voltage setting on the holiday detector. Then slowly increase the test voltage until the holiday can be detected at normal operating speed.

Note: The electrode and grounding should be at the expected operating positions. If conditions change, readjust the test voltage setting.

Skill: Demonstrate the use of a holiday detector.

To properly operate a holiday detector refer to the specific make/model manufacturer guidelines. Generally, most detectors basically function on the same operating principle:

1. Ensure the pipeline is properly grounded. Place the holiday detector on the pipeline to be inspected ensuring the detector ground cable is properly connected to the detector and the other end lying on the ground (not hooked to the ground rod).
    a. A good ground return system, for both the pipe and the detector, will always provide the best and most reliable inspection. The pipe to be inspected must be grounded from the bare pipe to earth at some point along the pipe. If individual joints of the pipe are to be inspected, that are not electrically connected, each joint must be grounded.
2. Attach the high voltage direct current probe with the positive (+) side to the detector coil and the negative (-) side to the pipeline.
3. Set the voltage to the correct setting as per company specification.
4. Turn on the Holiday Detector.
5. Inspect coating.
6. Mark holidays for repair (using a Sharpie or appropriate marker).

Holiday detectors should be used as soon as time and conditions permit; after coating has been applied and properly cured; and if possible, again prior to final project completion. When electrical inspection is conducted at the time of coating application, voids in the coating can be readily located and repaired. It also allows the applicator the opportunity to develop better coating application techniques.

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:

- Pinhole leaks or blowing gas near holiday
- Puddles

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:

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

- Notable metal loss detected at holiday

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