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Standard Practice

Holiday Detection of Fusion-Bonded Epoxy External Pipeline Coatings of 250 to 760 μm (10 to 30 mil)

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Foreword

Detection and correction of defects in protective coatings are important factors in an effective corrosion control program. High-voltage electrical inspection of pipeline coatings prior to installation is one method in general use. Prior to issuance of this NACE International standard, there had been no U.S. standard for electrical inspection of fusion-bonded epoxy pipeline coatings. Although several specifications have been written by operating companies for high-voltage electrical inspection of protective coatings, they apply only to specific coatings. This standard is intended to serve the needs of pipeline owners, coating applicators, coating inspectors, and other interested parties in the electrical inspection of fusion-bonded epoxy pipe coatings.

This standard practice was originally prepared in 1990 by NACE International Work Group T-10D-9c on Electrical Inspection and its parent, Task Group T-10D-9 on Coating Inspection, a component of Unit Committee T-10D on Protective Coating Systems. This standard was developed through the joint efforts of representatives of coating manufacturers and applicators, holiday detector equipment manufacturers, corrosion specialists, and others concerned with the construction of underground pipeline facilities. Unit Committee T-10D reaffirmed the standard in 1995. This standard was reaffirmed in 2001 by Specific Technology Group (STG) 03 on Protective Coatings and Linings—Immersion/Buried. It was reaffirmed by STG 03 in 2007 and is issued by NACE International under the auspices of STG 03.

These recommendations apply only to fusion-bonded epoxy pipeline coatings, which are generally applied at a dry-film thickness of 250 to 760 µm (10 to 30 mil). For other types of patching materials and joint wrap, the manufacturer of the material should be consulted for holiday detection voltages. Conformance to the principles of this standard improves methods of holiday detection and, therefore, the effectiveness of the coating.

In NACE standards, the terms *shall*, *must*, *should*, and *may* are used in accordance with the definitions of these terms in the NACE Publications Style Manual, 4th ed., Paragraph 7.4.1.9. *Shall* and *must* are used to state mandatory requirements. The term *should* is used to state something considered good and is recommended but is not mandatory. The term *may* is used to state something considered optional.

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Contents

Section 1: General

1.1 This standard presents recommended techniques in the operation of holiday detector equipment currently used on fusion-bonded epoxy (FBE) pipeline coatings following shop application of the coating and prior to on-site installation of the coated pipeline. It also presents recommended voltages for various coating thicknesses. Guidelines for establishing minimum requirements to ensure proper application and performance of plant-applied, fusion-bonded epoxy coatings are presented in NACE Standard RP0394.[1]

1.2 Electrical inspection (holiday detection) is a test of the continuity of a protective coating. This type of inspection is not intended to provide information on coating resistivity, bond, physical characteristics, or the overall quality of the coating. It detects voids, cracks, foreign inclusions, or contaminants in the coating that are of such size, number, or conductivity to significantly lower the electrical resistance or dielectric strength of the coating.

1.3 Use of a holiday detector shall be under the direction of a qualified coating inspector, such as a NACE-certified coating inspector. An initial holiday detector inspection, performed as soon as practical after the application of the coating, assists in verifying conformance to specifications for the materials and the application procedures. Before the coated pipe is placed in the ground, a final electrical coating inspection discloses coating discontinuities or damage that may have occurred during the shipping, storage, or construction period.

Section 2: Definitions

Continuous Direct Current (DC) Voltage Holiday Detector: A holiday detector that supplies a continuous DC test voltage. The continuous DC-type holiday detector is often used in very arid, sandy, or rocky areas and in coating plants where moisture and contamination conditions are controlled. The continuous DC test voltage holiday detector cannot be used where continuous moisture is present on the surface of the coating. For proper inspection using continuous DC output test voltage, other than in coating plant operations, the fusion-bonded epoxy coating surface must be dry.

Generated Test Voltages: With two types of commercially available detectors, generated output test voltages are used for the electrical inspection of fusion-bonded epoxy pipeline coatings. They are commonly described as *pulse-DC* and *continuous-DC* test voltages.

Holiday: A discontinuity in a protective coating that exposes unprotected surface to the environment. For the purpose of this standard, the term is used interchangeably with *discontinuity.*

Holiday Detector: An electrical device that locates discontinuities in the protective coating.

Pulse-DC Voltage Holiday Detector: A holiday detector that supplies a high DC voltage pulse of a very short duration (such as 0.0002 seconds at a rate of 30 pulses or more per second). The pulse-type holiday detector is the most common type used in the industry.

Section 3: Testing Voltages

3.1 All holiday detector output test voltages in this standard refer to pulse-DC and continuous-DC values.

3.2 The minimum effective applied output test voltage is dependent on coating thickness, atmospheric conditions, electrode configuration, and grounding conditions. Therefore, the applied test voltage varies from case to case.

3.3 To determine the minimum effective applied test voltage for a given set of field conditions, the following field calibration should be performed daily:

3.3.1 Make a holiday 790 µm (0.031 in.) in diameter through the FBE coating. Ensure that the hole extends completely through the coating to the metal substrate.

3.3.2 Start with the lowest test voltage setting of the holiday detector and slowly increase the test voltage until the manufactured holiday can be positively detected at normal operating speeds (see Paragraphs 5.3 and 9.2 and Section 6).

3.3.3 This method of test voltage adjustment shall be performed while the exploring electrode and grounding are in the expected operating positions. If the above