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Standard Practice

High-Voltage Electrical Inspection of Pipeline Coatings

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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 is one commonly used method of detecting such defects. Before the first issuance of this standard practice, there had not been a national standard for electrical inspection of pipeline coatings other than Section 3.13 of the 1966 edition of AWWA(1) Standard C203,[1] which was only applicable to coal-tar coatings. Several specifications have been written by operating companies for high-voltage electrical inspection of protective coatings, but these apply only to specific coatings.

Following the principles of this standard will improve holiday detection of pipeline coatings. This standard is intended to be used by pipeline operating companies, pipeline contractors, pipeline inspection services, and pipeline coating mills. This standard was developed through the joint efforts of representatives of coating manufacturers, coating applicators, holiday detector manufacturers, corrosion specialists, and other personnel concerned with the construction of underground pipeline facilities.

This standard involves testing all pipeline coatings, including coatings on in-service pipelines and new or replacement coatings. Procedures for low-voltage wet sponge testing and high-voltage spark testing of new coatings on conductive substrates are provided in NACE SP0188.[2]

This standard was originally prepared in 1974 by Task Group (TG) T-10D-9, “Coating Inspection,” and Work Group T-10D-9a, “Electrical Inspection,” components of Unit Committee T-10D, “Protective Coating Systems.” It was reaffirmed in 1993 and 1998 by Unit Committee T-10D. It was reaffirmed in 2004 and 2011 by Specific Technology Group (STG) 03, “Coatings and Linings, Protective—Immersion and Buried Service.” This standard is issued by NACE International under the auspices of STG 03.

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*. The terms *shall* and *must* are used to state a requirement, and are considered mandatory. The term should is used to state something good and is recommended, but is not considered mandatory. The term *may* is used to state something considered optional.

(1) American Water Works Association (AWWA), 6666 W. Quincy Avenue, Denver, CO 80235.

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Contents

Section 1: General

1.1 Electrical inspection (holiday detection) is a test of the continuity of a protective coating. This type of inspection does not provide information concerning coating resistance, bond, physical characteristics, or the overall quality of the coating, nor is it intended to do so. It detects bubble or blister-type voids, cracks, thin spots, and foreign inclusions or contaminants in the coating that are of such size, number, or conductivity as to significantly lower the electrical resistance or dielectric strength of the coating.

1.2 An initial electrical inspection, performed as soon after the application of the coating as practical, serves to check the materials and the application procedures. A final coating inspection, performed before lowering-in operations, will disclose any defect or damage (except disbonding) that has occurred during the construction period.

1.3 This standard presents acknowledged techniques for the use of holiday detectors currently used on pipeline coatings and presents a table of minimum testing voltages for various coating thicknesses. These minimum testing voltages do not apply to thin-film coatings (i.e., coating materials usually applied by a fusion-bonding process). Thin-film pipeline coatings are generally applied to a dry film thickness less than 0.5 mm (20 mil).

Section 2: Definitions

Holiday: A discontinuity in a protective coating that exposes unprotected surface to the environment.

Holiday detector: A device for locating discontinuities in a coating.

Pulse-type detector: A type of holiday detector that supplies a high-voltage pulse of very short duration (e.g., a pulse duration of 0.0002 seconds at a rate of 30 pulses per second).

Section 3: Testing Voltages

3.1 All testing voltages in this standard refer to direct current (DC) or peak alternating current (AC) values.

3.2 The minimum testing voltage in volts (V) for a particular coating thickness shall be within 20% of the value determined using Equation (1) or (2), or as shown in Table 1:

$$\text{Testing Voltage} = 7{,}900\sqrt{t} \quad (1)$$

where t = average coating thickness in mm;

$$\text{Testing Voltage} = 1{,}250\sqrt{t} \quad (2)$$

where t = average coating thickness in mil.