



## Standard Recommended 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 recommended practice, there had not been a national standard for electrical inspection of pipeline coatings other than AWWA<sup>(1)</sup> Standard C 203-66,<sup>1</sup> Section 3.13, which is 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 personnel in pipeline operating companies, pipeline contractors, pipeline inspection services, and pipeline coating mills.

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 can be found in NACE Standard RP0188.<sup>2</sup>

This standard was originally prepared in 1974 by Task Group T-10D-9 on Coating Inspection and Work Group T-10D-9a on Electrical Inspection, components of Unit Committee T-10D on Protective Coating Systems. It was reaffirmed with editorial revisions in 1993 and 1998. It was reaffirmed again in 2004 by Specific Technology Group (STG) 03 on Protective Coatings and Linings—Immersion/Buried. 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 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*, 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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<sup>(1)</sup> American Water Works Association (AWWA), 6666 W. Quincy Avenue, Denver, CO 80235.

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Standard  
Recommended Practice**

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**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 lower the electrical resistance or dielectric strength of the coating significantly.

1.2 Use of a holiday detector should be at the discretion of the coating inspector. An initial holiday inspection, performed as soon after the application of the coating as practicable, 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 recommended voltages for various coating thicknesses. These recommendations 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 mils).

**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 which 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 DC or peak AC values.

3.2 The minimum testing voltage for a particular coating thickness shall be within 20% of the value determined from 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 mils.

**Table 1: Minimum Testing Voltage for Various Coating Thicknesses(A)**

Coating Thicknesses		Testing Voltage
(mm)	(mils)	
0.51	20	6,000
0.79	31	7,000
1.6	62	10,000
2.4	94	12,000
3.2	125	14,000
4.0	156	16,000
4.8	188	17,000
13	500	28,000
16	625	31,000
19	750	34,000

<sup>(A)</sup> Thin-film coatings are not covered by this standard.