

# Holiday Detection of Internal Tubular Coatings of 355 to 760 $\mu\text{m}$ (14 to 30 mils) Dry-Film Thickness

This NACE International standard represents a consensus of those individual members who have reviewed this document, its scope, and provisions. Its acceptance does not in any respect preclude anyone, whether he or she has adopted the standard or not, from manufacturing, marketing, purchasing, or using products, processes, or procedures not in conformance with this standard. Nothing contained in this NACE standard is to be construed as granting any right, by implication or otherwise, to manufacture, sell, or use in connection with any method, apparatus, or product covered by letters patent, or as indemnifying or protecting anyone against liability for infringement of letters patent. This standard represents minimum requirements and should in no way be interpreted as a restriction on the use of better procedures or materials. Neither is this standard intended to apply in all cases relating to the subject. Unpredictable circumstances may negate the usefulness of this standard in specific instances. NACE assumes no responsibility for the interpretation or use of this standard by other parties and accepts responsibility for only those official NACE interpretations issued by NACE in accordance with its governing procedures and policies which preclude the issuance of interpretations by individual volunteers.

Users of this NACE standard are responsible for reviewing appropriate health, safety, environmental, and regulatory documents and for determining their applicability in relation to this standard prior to its use. This NACE standard may not necessarily address all potential health and safety problems or environmental hazards associated with the use of materials, equipment, and/or operations detailed or referred to within this standard. Users of this NACE standard are also responsible for establishing appropriate health, safety, and environmental protection practices, in consultation with appropriate regulatory authorities if necessary, to achieve compliance with any existing applicable regulatory requirements prior to the use of this standard.

**CAUTIONARY NOTICE:** NACE standards are subject to periodic review, and may be revised or withdrawn at any time in accordance with NACE technical committee procedures. NACE requires that action be taken to reaffirm, revise, or withdraw this standard no later than five years from the date of initial publication and subsequently from the date of each reaffirmation or revision. The user is cautioned to obtain the latest edition. Purchasers of NACE standards may receive current information on all standards and other NACE publications by contacting the NACE FirstService Department, 15835 Park Ten Place, Houston, TX 77084-5415 (telephone +1 281-228-6200).

## ABSTRACT

*This NACE standard test method was prepared as a guide for evaluating the application of polymeric coatings of 250 to 760  $\mu\text{m}$  (10 to 30 mils) to the internal surfaces of metallic tubular goods used in the oil and gas industry. This NACE standard provides a nondestructive test method for the detection of holidays in a nonconductive coating film that has been applied to the inner wall (bore) of oilfield tubular goods. The apparatus and the recommended procedure for conducting the test are described, as are methods of reporting the test data. This standard is maintained by Task Group 450.*

## KEYWORDS

*holiday, dry-film thickness, wet probe, dry probe*



## Foreword

*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 is 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.*

This NACE standard provides a nondestructive test method for evaluating the application of polymeric coatings of 355 to 760  $\mu\text{m}$  (14 to 30 mils) to the internal surfaces of metallic tubular goods used in the oil and gas industry. This test method is based on the current technology and experience of the petroleum production industry. NACE Standard TM0384<sup>1</sup> addresses holiday detection of internal tubular coatings of less than 330  $\mu\text{m}$  (13 mils) dry-film thickness. This standard is intended for end users, manufacturers, applicators, corrosion engineers, and quality inspectors of internally coated metallic tubular goods.

This NACE standard was originally prepared in 1986 by Task Group (TG) T-1G-9, "Holiday Testing of Plastic Linings," a component of Unit Committee T-1G, "Protective Coatings, Elastomers, and other Nonmetallic Materials for Oilfield Use," and was reaffirmed by T-1G in 1989 and 1994. It was reaffirmed in 2002 by Specific Technology Group (STG) 33, "Oil and Gas Production—Nonmetallics and Wear Coatings (Metallics)," and revised in 2015 by TG 450 "Review of NACE Standard TM0186." STG 33 is comprised of representatives from the oil and gas industry including consumers, producers, and interested individuals. This standard is issued by NACE International under the auspices of STG 33.

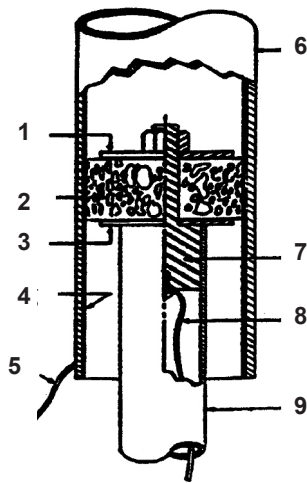
# Holiday Detection of Internal Tubular Coatings of 355 to 760 $\mu\text{m}$ (14 to 30 mils) Dry-Film Thickness

1.	General .....	4
2.	Test Apparatus .....	4
3.	Calibration and Test Procedure.....	5
4.	Reporting Test Data .....	6
	References.....	6

## Figures

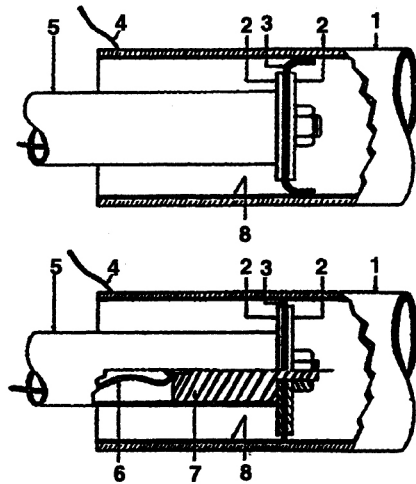
Figure 1	Wet Probe .....	4
Figure 2	Dry Probe.....	4

FIGURE 1: Wet Probe



- 1 Back up plate
- 2 Probe (wetted sponge)
- 3 Back up plate
- 4 Coating
- 5 Ground lead
- 6 Metallic tubular good
- 7 Metallic conductor
- 8 High voltage lead
- 9 Lance

FIGURE 2: Dry Probe



- 1 Metallic tubular good
- 2 Back up plates for probe (each side)
- 3 Probe (rubber)
- 4 Ground lead (to ground terminal of detector)
- 5 Lance
- 6 High-voltage lead (to terminal of detector)
- 7 Metal conductor
- 8 Coating

## Section 1: General

- 1.1 This NACE standard provides a nondestructive test method for the detection of holidays in a nonconductive coating film that has been applied to the inner wall (bore) of oilfield metallic tubular goods. The apparatus and the procedure for performing the test are described, as are methods of reporting the test data.
- 1.2 The test method applies to coatings that have a specified dry-film thickness of 355 to 760  $\mu\text{m}$  (14 to 30 mils). It is valid only for coatings that have not been in service or previously tested with a salt solution. When holiday testing is performed on coatings that have been in service or that have been previously tested for holidays with a salt solution, there is a possibility of misleading results arising from surface contamination or salt bridging. The coating surface shall be free of materials that give added electrical insulation or that may mechanically damage the coating during the test.
- 1.3 This test method is not intended as a means of predicting the service life or service performance of these coatings.
- 1.4 A "holiday" is defined as a discontinuity in a protective coating that exposes unprotected surface to the environment. For the purposes of this test method, it means an area in an applied nonconductive coating that exhibits electrical conductivity when exposed to a known impressed voltage.
- 1.5 The voltage range for holiday detection shall be 4 to 12 V direct current (DC) per  $\mu\text{m}$  (100 to 300 V [DC] per mil) of dry-film thickness. The test voltage is determined by the type of probe, the maximum specified dry-film thickness, the type of coating application, and the customer. The voltage shall be measured between the probe and the metallic tubular good.

## Section 2: Test Apparatus

Apparatus and materials required to perform this holiday test include a probe, a lance, a detector, and a conductive solution for the wet probe.

- 2.1 **Probe**—A wet probe or a dry probe may be used to conduct this test. Both probe types provide acceptable results. The calibration and test procedure (see Section 3) are identical for both probe types. Probe type shall be specified by the customer.
  - 2.1.1 **Wet Probe**—The probe shall be a circular piece of sponge, conductive when wetted with a conductive water (e.g., tap water, not deionized or distilled). The sponge shall be 50 mm (2 in) thick and shall be cut sufficiently larger than the inside diameter of the metallic tubular good to ensure 360° of contact throughout the length (see Figure 1).
  - 2.1.2 The wetting solution used to wet the probe shall be tap water (not deionized or distilled).
  - 2.1.3 **Dry Probe**—The probe shall be a circular piece of dry conductive silicone rubber that is 3.0 mm (0.13 in) thick and cut sufficiently larger than the inside diameter of the metallic tubular good to ensure 360° of contact throughout the length (see Figure 2). Either of the probe configurations shown in Figures 1 and 2 may be used if the 360° contact with the coating is obtained. The minimum test voltage shall be 4 V per  $\mu\text{m}$  (100 V per mil) of maximum specified dry-film thickness (see paragraph 1.4).