
**NACE International
Standard Test Method**

**Evaluation of Pipeline and Pressure Vessel Steels
for Resistance to Hydrogen-Induced Cracking**

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Section 1: General

1.1 This standard establishes a test method for evaluating the resistance of pipeline and pressure vessel steels to HIC caused by hydrogen absorption from aqueous sulfide corrosion.

1.1.1 Details are provided on the size, number, location, and orientation of test specimens to be taken from each steel product form—pipes, plates, fittings, and flanges.

1.1.2 Special procedures or requirements for testing small-diameter (nominal diameter [DN] 50 through 150, nominal pipe size [NPS] 2 through 6), thin-wall (up to 6 mm [0.2 in] wall thickness), electric-resistance welded (ERW) and seamless pipes are included. The test specimens taken from small-diameter, thin-wall pipes shall be tested in the same manner as the test specimens taken from other pipes except as otherwise stated in this standard.

1.2 The test method consists of exposing unstressed test specimens to one of the two standard test solutions—Test Solution A, a solution consisting of sodium chloride (NaCl) and acetic acid (CH₃COOH) dissolved in distilled or deionized water saturated with H₂S at ambient temperature and pressure; or Test Solution B, a synthetic seawater solution saturated with H₂S at ambient temperature and pressure. After a specified time the test specimens are removed and evaluated.

1.3 The test method is not intended to duplicate service conditions. It is intended to provide reproducible test environments capable of distinguishing the susceptibility of different steel samples to HIC in a relatively short time. NOTE: The length of the test may not be sufficient to develop maximum cracking in any given steel, but has been found to be adequate for the purpose of this test.

1.4 This standard does not include acceptance or rejection criteria; however, guidance is provided in NACE MR0175/ISO⁽¹⁾ 15156,⁵ Part 2, Section 8 and Annex B of EFC⁽²⁾ 16.⁶

Section 2: Reagents

2.1 The reagents for Test Solution A shall be nitrogen gas for purging, H₂S gas, NaCl, CH₃COOH, and distilled or deionized water. The reagents for Test Solution B shall be nitrogen gas for purging, H₂S gas, and synthetic seawater.

NOTE: H₂S is highly toxic and must be handled with caution. See Appendix A (nonmandatory).

2.2 The NaCl and CH₃COOH shall be reagent grade chemicals.

2.3 The gases shall be reagent grade or chemically pure gases and the water shall be distilled or deionized. See Appendix B (nonmandatory).

2.4 The synthetic seawater shall be prepared in accordance with ASTM⁽³⁾ Standard D1141,⁷ Stock Solutions No. 1 and No. 2 (without heavy metal ions).

⁽¹⁾ International Organization for Standardization (ISO), 1 ch. de la Voie-Creuse, Case postale 56, CH-1211, Geneva 20, Switzerland.

⁽²⁾ European Federation of Corrosion, 1 Carlton House Terrace, London, SW1Y 5DB, U.K.

⁽³⁾ ASTM International (ASTM), 100 Barr Harbor Dr., West Conshohocken, PA 19428-2959.