



Standard Practice for Preparation and Use of Bent-Beam Stress-Corrosion Test Specimens¹

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1. Scope

1.1 This practice covers procedures for designing, preparing, and using bent-beam stress-corrosion specimens.

1.2 Different specimen configurations are given for use with different product forms, such as sheet or plate. This practice is applicable to specimens of any metal that are stressed to levels less than the elastic limit of the material, and therefore, the applied stress can be accurately calculated or measured (see **Note 1**). Stress calculations by this practice are not applicable to plastically stressed specimens.

NOTE 1—It is the nature of these practices that only the applied stress can be calculated. Since stress-corrosion cracking is a function of the total stress, for critical applications and proper interpretation of results, the residual stress (before applying external stress) or the total elastic stress (after applying external stress) should be determined by appropriate nondestructive methods, such as X-ray diffraction (**1**).²

1.3 Test procedures are given for stress-corrosion testing by exposure to gaseous and liquid environments.

1.4 The bent-beam test is best suited for flat product forms, such as sheet, strip, and plate. For plate material the bent-beam specimen is more difficult to use because more rugged specimen holders must be built to accommodate the specimens. A double-beam modification of a four-point loaded specimen to utilize heavier materials is described in **10.5**.

1.5 The exposure of specimens in a corrosive environment is treated only briefly since other practices deal with this aspect, for example, Specification **D1141**, and Practices **G30**, **G36**, **G44**, **G50**, and **G85**. The experimenter is referred to ASTM Special Technical Publication 425 (**2**).

1.6 The bent-beam practice generally constitutes a constant strain (deflection) test. Once cracking has initiated, the state of stress at the tip of the crack as well as in uncracked areas has changed, and therefore, the known or calculated stress or strain

values discussed in this practice apply only to the state of stress existing before initiation of cracks.

1.7 The values stated in SI units are to be regarded as standard. The inch-pound values in parentheses are provided for information.

1.8 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.* (For more specific safety hazard information see Section **7** and **12.1**.)

2. Referenced Documents

2.1 ASTM Standards:³

D1141 Practice for the Preparation of Substitute Ocean Water

G30 Practice for Making and Using U-Bend Stress-Corrosion Test Specimens

G36 Practice for Evaluating Stress-Corrosion-Cracking Resistance of Metals and Alloys in a Boiling Magnesium Chloride Solution

G44 Practice for Exposure of Metals and Alloys by Alternate Immersion in Neutral 3.5 % Sodium Chloride Solution

G50 Practice for Conducting Atmospheric Corrosion Tests on Metals

G85 Practice for Modified Salt Spray (Fog) Testing

2.2 NACE Documents:⁴

NACE TM0177-96 Laboratory Testing of Metals for Resistance to Specific Forms of Environmental Cracking in H₂S Environments

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *cracking time*—the time elapsed from the inception of test until the appearance of cracking.

¹ This practice is under the jurisdiction of ASTM Committee **G01** on Corrosion of Metals and is the direct responsibility of Subcommittee **G01.06** on Environmentally Assisted Cracking.

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² The boldface numbers in parentheses refer to a list of references at the end of this standard.

³ For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

⁴ Available from NACE International (NACE), 1440 South Creek Dr., Houston, TX 77084-4906, <http://www.nace.org>.