



Standard Practice for Preparation and Use of Direct Tension Stress-Corrosion Test Specimens¹

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1. Scope

1.1 This practice covers procedures for designing, preparing, and using ASTM standard tension test specimens for investigating susceptibility to stress-corrosion cracking. Axially loaded specimens may be stressed quantitatively with equipment for application of either a constant load, constant strain, or with a continuously increasing strain.

1.2 Tension test specimens are adaptable for testing a wide variety of product forms as well as parts joined by welding, riveting, or various other methods.

1.3 The exposure of specimens in a corrosive environment is treated only briefly because other standards are being prepared to deal with this aspect. Meanwhile, the investigator is referred to Practices [G35](#), [G36](#), [G37](#), and [G44](#), and to ASTM Special Technical Publication 425 ([1](#)).²

2. Referenced Documents

2.1 ASTM Standards:³

[E8](#) Test Methods for Tension Testing of Metallic Materials
[G35](#) Practice for Determining the Susceptibility of Stainless Steels and Related Nickel-Chromium-Iron Alloys to Stress-Corrosion Cracking in Polythionic Acids

[G36](#) Practice for Evaluating Stress-Corrosion-Cracking Resistance of Metals and Alloys in a Boiling Magnesium Chloride Solution

[G37](#) Practice for Use of Mattsson's Solution of pH 7.2 to Evaluate the Stress-Corrosion Cracking Susceptibility of Copper-Zinc Alloys

[G44](#) Practice for Exposure of Metals and Alloys by Alternate Immersion in Neutral 3.5 % Sodium Chloride Solution

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.

3. Summary of Practice

3.1 This practice covers the use of axially loaded, quantitatively stressed ASTM standard tension test specimens for investigating the resistance to stress-corrosion cracking of metallic materials in all types of product forms. Consideration is given to important factors in the selection of appropriate specimens, the design of loading equipment, and the effects of these factors on the state of stress in the specimen as corrosion occurs.

4. Significance and Use

4.1 Axially loaded tension specimens provide one of the most versatile methods of performing a stress-corrosion test because of the flexibility permitted in the choice of type and size of test specimen, stressing procedures, and range of stress levels.

4.2 The uniaxial stress system is simple; hence, this test method is often used for studies of stress-corrosion mechanisms. This type of test is amenable to the simultaneous exposure of unstressed specimens (no applied load) with stressed specimens and subsequent tension testing to distinguish between the effects of true stress corrosion and mechanical overload ([2](#)). Additional considerations in regard to the significance of the test results and their interpretation are given in Sections [6](#) and [10](#).

4.3 Wide variations in test results may be obtained for a given material and specimen orientation with different specimen sizes and stressing procedures. This consideration is significant especially in the standardization of a test procedure for interlaboratory comparisons or quality control.

5. Test Specimens

5.1 Whenever possible, tension test specimens used in evaluating susceptibility to stress-corrosion cracking should conform to the dimensions of standard tension test specimens specified in Test Methods [E8](#), which contain details for specimens machined from various product forms.

5.2 A wide range of sizes for tension test specimens is possible, depending primarily upon the dimensions of the product to be tested. Because the stress-corrosion test results can be markedly influenced by the cross section of the test