



Standard Test Method for Qualifying Coatings for Use on A490 Structural Bolts Relative to Environmental Hydrogen Embrittlement¹

This standard is issued under the fixed designation F2660; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method defines the procedures and tests to evaluate the effect of a coating system on the susceptibility to environmental hydrogen embrittlement (EHE) of an ASTM A490 high strength structural bolt.

1.2 This test method shall qualify a coating system for use with any size of A490 bolts (that is, $\frac{1}{2}$ to 1- $\frac{1}{2}$ in.) high strength structural bolts, relative to EHE.

1.3 The characteristic to be evaluated by this test method is the susceptibility to EHE caused by hydrogen generated from corrosion protection of the steel bolt by sacrificial galvanic corrosion of the coating. Testing shall be performed on coated, specimen ASTM A490 bolts manufactured to the maximum susceptible tensile strength values (see Table 1) of the bolt (see Section 5 Specimen Bolt Requirements). The internal hydrogen embrittlement (IHE) susceptibility will also be inherently evaluated when the EHE is tested through this test method. There is no need for a separate IHE susceptibility test.

1.4 The values stated in inch-pound units are to be regarded as standard. No other units of measurement are included in this standard.

1.5 *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.*

2. Referenced Documents

2.1 ASTM Standards:²

A490 Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength

E4 Practices for Force Verification of Testing Machines

E8/E8M Test Methods for Tension Testing of Metallic Materials

F519 Test Method for Mechanical Hydrogen Embrittlement Evaluation of Plating/Coating Processes and Service Environments

F606 Test Methods for Determining the Mechanical Properties of Externally and Internally Threaded Fasteners, Washers, Direct Tension Indicators, and Rivets

F1624 Test Method for Measurement of Hydrogen Embrittlement Threshold in Steel by the Incremental Step Loading Technique

F1789 Terminology for F16 Mechanical Fasteners

F2078 Terminology Relating to Hydrogen Embrittlement Testing

G3 Practice for Conventions Applicable to Electrochemical Measurements in Corrosion Testing

G15 Terminology Relating to Corrosion and Corrosion Testing (Withdrawn 2010)³

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

G82 Guide for Development and Use of a Galvanic Series for Predicting Galvanic Corrosion Performance

2.2 Research Council on Structural Connections:

Specification for Structural Joints Using High Strength Bolts (LRFD) Load and Resistance Factor Design

Specification for Structural Joints Using High Strength Bolts (ASD) Allowable Stress Design

2.3 Other References:

Townsend Jr., H. E., Met Trans, V6A, April, 1976

Raymond, L., The Susceptibility of Fasteners to Hydrogen Embrittlement and Stress Corrosion Cracking: Fastener System Design. In J. H. Bickford, & S. Nassar, Handbook of Bolts and Bolted Joints, New York, USA: Marcel Dekker, Inc., 1998, pp. 723-756

2.4 International Standards Organization (ISO):

ISO 17025 General Requirements for the Competence of Testing and Calibration Laboratories

3. Terminology

3.1 Definitions:

³ The last approved version of this historical standard is referenced on www.astm.org.

¹ This test method is under the jurisdiction of ASTM Committee F16 on Fasteners and is the direct responsibility of Subcommittee F16.01 on Test Methods. Current edition approved Nov. 1, 2013. Published December 2013. Originally approved in 2012 as F2660-12. DOI: 10.1520/F2660-13.

² 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.