



Standard Practices for Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steels¹

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This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope*

1.1 These practices cover the following five tests:

1.1.1 *Practice A*—Oxalic Acid Etch Test for Classification of Etch Structures of Austenitic Stainless Steels (Sections 4 to 13, inclusive),

1.1.2 *Practice B*—Ferric Sulfate-Sulfuric Acid Test for Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steels (Sections 14 to 25, inclusive),

1.1.3 *Practice C*—Nitric Acid Test for Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steels (Sections 26 to 36, inclusive),

1.1.4 *Practice E*—Copper-Copper Sulfate-Sulfuric Acid Test for Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steels (Sections 37 to 46, inclusive), and

1.1.5 *Practice F*—Copper-Copper Sulfate-50 % Sulfuric Acid Test for Detecting Susceptibility to Intergranular Attack in Molybdenum-Bearing Austenitic Stainless Steels (Sections 47 to 58, inclusive).

1.2 The Oxalic Acid Etch Test is a rapid method of identifying, by simple etching, those specimens of certain stainless steel grades that are essentially free of susceptibility to intergranular attack associated with chromium carbide precipitates. These specimens will have low corrosion rates in certain corrosion tests and therefore can be eliminated (screened) from testing as “acceptable.” The etch test is applicable only to those grades listed in the individual hot acid tests and classifies the specimens either as “acceptable” or as “suspect.”

1.3 The ferric sulfate-sulfuric acid test, the copper-copper sulfate-50 % sulfuric acid test, and the nitric acid test are based on weight loss determinations and, thus, provide a quantitative measure of the relative performance of specimens evaluated. In contrast, the copper-copper sulfate-16 % sulfuric acid test is

based on visual examination of bend specimens and, therefore, classifies the specimens only as acceptable or nonacceptable.

1.4 The presence or absence of intergranular attack in these tests is not necessarily a measure of the performance of the material in other corrosive environments. These tests do not provide a basis for predicting resistance to forms of corrosion other than intergranular, such as general corrosion, pitting, or stress-corrosion cracking.

NOTE 1—See [Appendix X1](#) for information regarding test selection.

1.5 The values stated in SI units are to be regarded as standard. The inch-pound equivalents are in parentheses and may be approximate.

1.6 *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.* Some specific hazards statements are given in [10.1](#), [20.1.1](#), [20.1.9](#), [31.3](#), [34.4](#), [53.1.1](#), and [53.1.10](#).

2. Referenced Documents

2.1 *ASTM Standards*:²

[A370 Test Methods and Definitions for Mechanical Testing of Steel Products](#)

[A380/A380M Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems](#)

[D1193 Specification for Reagent Water](#)

[E3 Guide for Preparation of Metallographic Specimens](#)

2.2 *ASME Code*:³

[ASME Boiler & Pressure Vessel Code, Section IX](#)

2.3 *ACS Specifications*:⁴

[Reagent Chemicals, Specifications and Procedures](#)

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.

³ Available from American Society of Mechanical Engineers (ASME), ASME International Headquarters, Two Park Ave., New York, NY 10016-5990, <http://www.asme.org>.

⁴ Available from American Chemical Society (ACS), 1155 Sixteenth Street, NW, Washington, DC 20036, <http://www.acs.org>

¹ These practices are under the jurisdiction of ASTM Committee A01 on Steel, Stainless Steel and Related Alloys and are the direct responsibility of Subcommittee A01.14 on Methods of Corrosion Testing.

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