



Designation: A604/A604M – 07 (Reapproved 2017)

Standard Practice for Macroetch Testing of Consumable Electrode Remelted Steel Bars and Billets¹

This standard is issued under the fixed designation A604/A604M; 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.

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

1. Scope

1.1 This practice² covers testing and inspection and is applicable to bars, billets, and blooms of carbon, alloy, and stainless steel which have been consumable electrode remelted.

1.2 For the purpose of this practice, the consumable electrode remelting process is defined as a steel refining method wherein single or multiple electrodes are remelted into a crucible producing an ingot which is superior to the original electrode by virtue of improved cleanliness or lower gas content or reduced chemical or nonmetallic segregation. See [Appendix X1](#) and [Appendix X2](#) for descriptions of applicable remelting processes.

1.3 This practice and the accompanying comparison macrographs³ are generally applicable to steel bar and billet sizes up to 225 in.² [1450 cm²] in transverse cross section.

1.4 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the 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.*

¹ This practice is under the jurisdiction of ASTM Committee A01 on Steel, Stainless Steel and Related Alloys and is the direct responsibility of Subcommittee A01.06 on Steel Forgings and Billets.

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² ASTM Committee A01 gratefully acknowledges the help of the AISI Committee on General Metallurgy in preparing the appendix, assembling the macroetch photographs, and assisting with the text of this practice.

³ A complete set of the 20 macrographs on glossy paper available from ASTM International Headquarters. Order Adjunct No. [ADJA0604](#). Original adjunct produced in 1985.

2. Referenced Documents

2.1 *ASTM Standard*:⁴

[E381 Method of Macroetch Testing Steel Bars, Billets, Blooms, and Forgings](#)

2.2 *ASTM Adjunct*:³

Adjunct to A604/A604M Practice for Macroetch Testing of Consumable Electrode Remelted Steel Bars and Billets

3. Description of Macroetch Testing

3.1 This practice employs the action of an acid or other corrosive agent to develop the characteristics of a suitably prepared specimen. After etching, the sections are compared visually, or at a very low magnification, if necessary for clarification of conditions, to standard plates describing the various conditions which may be found. Materials react differently to etching reagents because of variations in chemical composition, method of manufacture, heat treatment, and many other variables.

4. Significance and Use

4.1 Macroetch testing, as described herein, is a method for examining and rating transverse sections of bars and billets to describe certain conditions of macro segregation which are often characteristic of consumable electrode remelted materials.

4.2 This practice is not intended to define major defects such as those described by Method [E381](#).

5. Application

5.1 When material is furnished subject to macroetch testing and inspection under this practice, the manufacturer and purchaser should be in agreement concerning the following:

5.1.1 The stage of manufacture at which the test shall be conducted,

5.1.2 The number and location of the sections to be tested,

⁴ 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.