



Designation: A197/A197M – 00 (Reapproved 2023)<sup>ε1</sup>

## Standard Specification for Cupola Malleable Iron<sup>1</sup>

This standard is issued under the fixed designation A197/A197M; 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.*

<sup>ε1</sup> NOTE—A misspelling in 13.2 was editorially corrected in November 2023.

### 1. Scope

1.1 This specification covers malleable irons for castings made by the cupola process.

1.2 Without knowledge of casting geometry and process details, quantitative relationships cannot be stated between the properties of the iron in the various locations of a casting and those of a test bar cast from the same iron.

1.3 The values stated in either inch-pound units or SI units are to be regarded separately as standard. Within the text, the SI units are shown in brackets. The values stated in each system are not exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in nonconformance with the specification.

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

### 2. Referenced Documents

2.1 *ASTM Standards:*<sup>2</sup>

[A247 Test Method for Evaluating the Microstructure of Graphite in Iron Castings](#)

[A644 Terminology Relating to Iron Castings](#)

[E8/E8M Test Methods for Tension Testing of Metallic Materials](#)

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee A04 on Iron Castings and is the direct responsibility of Subcommittee A04.02 on Malleable and Ductile Iron Castings.

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

### 3. Terminology

3.1 *Definitions*—Definitions for many terms common to iron castings are found in Terminology [A644](#).

### 4. Classification

4.1 Iron produced for castings ordered under this specification is classified in a single grade and is qualified by tests on separately cast test bars. Separately cast test bars shall be poured from the same lot of iron as the castings they represent and shall be heat treated with those castings.

### 5. Ordering Information

5.1 The purchase order for castings ordered under this specification shall state the specification designation and the year in which the specification was issued.

5.2 Any options or special additions to the basic requirements of this specification shall be clearly and fully stipulated.

### 6. Chemical Composition

6.1 The chemical composition of the iron shall be such as to produce the mechanical properties required by this specification.

### 7. Mechanical Requirements

7.1 Factors influencing the properties of castings and their relationship to those of test specimens and separate test castings are discussed in [Appendix X1](#).

7.2 *Tensile Test:*

7.2.1 *Tensile Test Specimens:*

7.2.1.1 The tensile test specimens shall be cast to the form and dimensions shown in [Figs. 1 and 2](#) using the same kind of molding material used for the production castings.

7.2.1.2 All test specimens shall be suitably identified with the designation of the pour period.

7.2.1.3 All test specimens shall be heat treated in the same production furnace and for the same cycles as the castings they represent.

7.2.2 *Tensile Test Method:*

7.2.2.1 Perform the tensile test on unmachined specimens.

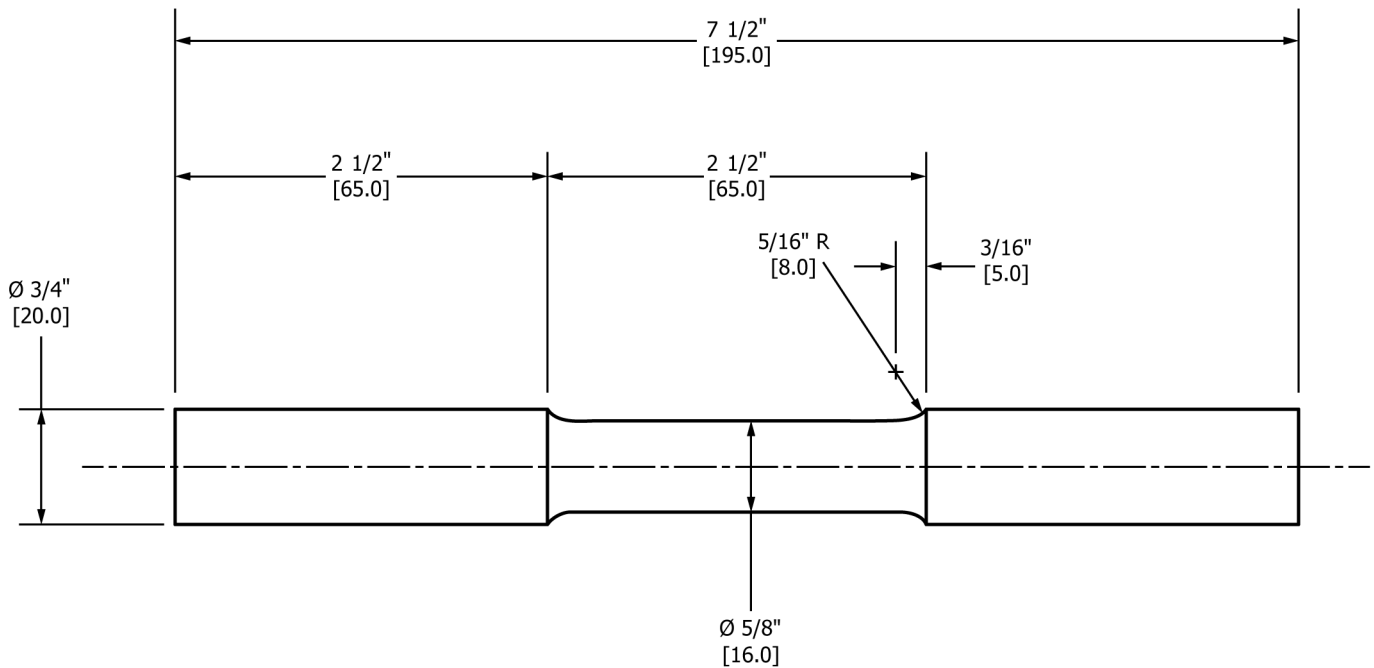
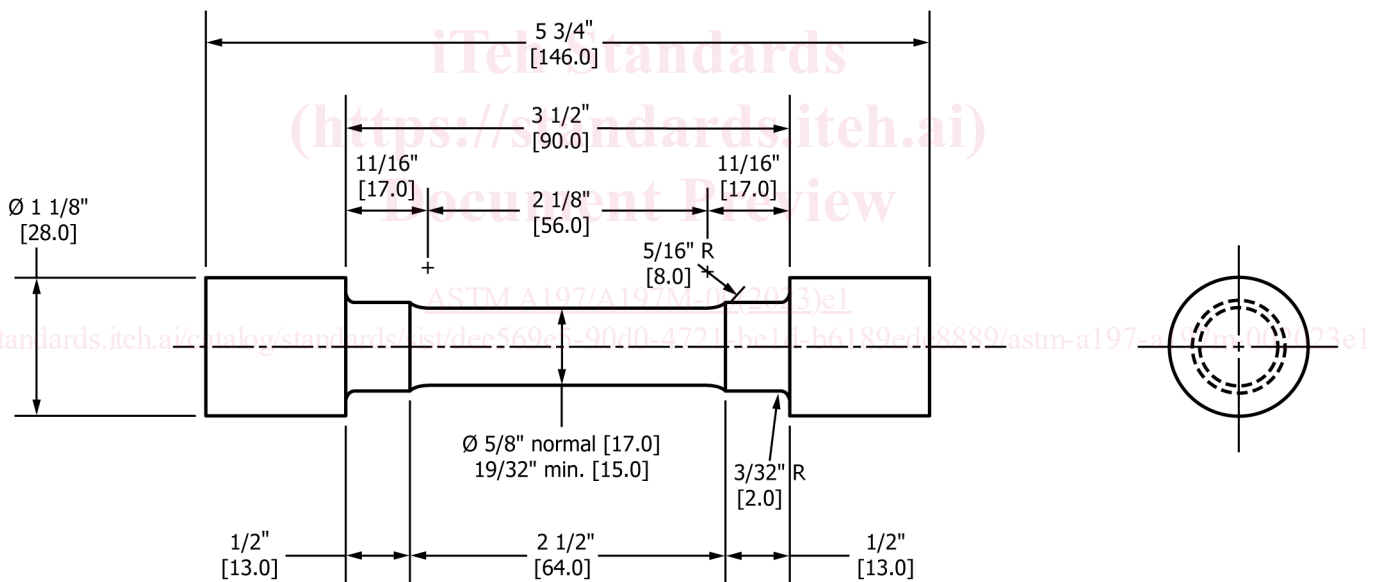


FIG. 1 Tension Test Specimen



NOTE 1—Modifications may be made in the dimensions indicated above for those details of the specimen outside of the gage length as required by testing procedure and equipment.

FIG. 2 Alternative Unmachined Tension Test Specimen

7.2.2.2 *Gage Length*—The gage length of the standard tensile specimen shall be  $2.00 \pm 0.01$  in. [ $50.0 \pm 0.03$  mm].

7.2.2.3 *Cross-Sectional Area*—The diameter used to compute the cross-sectional area shall be the average between the largest and smallest diameters in that section of the 2 in. [50 mm] gage length having the smallest diameter and shall be measured to the nearest 0.001 in. [0.02 mm]. No cast bar having a mean diameter less than 0.590 in. [15 mm] shall be accepted for test.

7.2.2.4 *Speed of Testing*—After reaching a stress equivalent to approximately half of the anticipated yield stress, the speed of the moving head of the testing machine shall not exceed 0.50 in./min [12.5 mm/min] through the breaking load.

7.2.2.5 *Yield Strength*—While the values for yield point and yield strength are not identical, they are sufficiently close for most applications to be used interchangeably. They shall be determined by an approved technique described in Test Methods E8/E8M or by an equivalent method. If determined as yield