



Designation: A 48 – 94a<sup>ε1</sup>

## Standard Specification for Gray Iron Castings<sup>1</sup>

This standard is issued under the fixed designation A 48; 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 reappraisal. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reappraisal.

*This standard has been approved for use by agencies of the Department of Defense. This specification replaces Federal Specification QQ-I-652.*

<sup>ε1</sup> NOTE—Note 1 was added editorially in September 1998.

### 1. Scope

1.1 This specification covers gray iron castings intended for general engineering use where tensile strength is a major consideration. Castings are classified on the basis of the tensile strength of the iron in separately cast test bars.

1.1.1 This specification subordinates chemical composition to tensile strength.

1.2 Castings produced to this specification are graded on the basis of minimum tensile strength obtained in special test coupons designed to standardize cooling rate. The tensile strength developed in certain casting sections may vary from test coupon values (see X1.2).

1.3 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only.

NOTE 1—The text of this standard references notes and footnotes which provide explanatory material. These notes and footnotes (excluding those in tables and figures) shall not be considered as requirements of the standard.

### 2. Referenced Documents

#### 2.1 ASTM Standards:

A 644 Terminology Relating to Iron Castings<sup>2</sup>

E 8 Test Methods for Tension Testing of Metallic Materials<sup>3</sup>

#### 2.2 Military Standard:

MIL-STD-129 Marking for Shipment and Storage<sup>4</sup>

#### 2.3 Federal Standard:

Federal Standard No. 123 Marking for Shipment (Civil Agencies)<sup>4</sup>

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee A-4 on Iron Castings and is the direct responsibility of Subcommittee A04.01 on Gray Iron Castings.

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<sup>2</sup> Annual Book of ASTM Standards, Vol 01.02.

<sup>3</sup> Annual Book of ASTM Standards, Vol 03.01.

<sup>4</sup> Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

### 3. Terminology

#### 3.1 Definitions:

3.1.1 Definitions for many terms common to gray iron castings are found in Terminology A 644.

### 4. Classification

4.1 Castings ordered and produced in accordance with this specification are classified into a number of grades based on the properties of separately cast test bars (Table 1). Each class is designated by a number followed by a letter. The number indicates the minimum tensile strength of the separately cast test bar, and the letter indicates the size of the test bar. Examples of proper designations are as follows:

Gray Iron Castings, ASTM Specification A 48, Class 30B.

Gray Iron Castings, ASTM Specification A 48, Class 40C.

### 5. Ordering Information

5.1 Orders for material to this specification shall include the following information:

5.1.1 ASTM designation number and year of issue,

5.1.2 Class of iron required (see 4.1 and Table 1),

5.1.3 The size of the separately cast test bar (letter classification—A, B, C, or S) that best represents the thickness of the controlling section of the casting (see Table 2),

5.1.4 The tension test specimen (B or C) to be machined from test bar C (see 13.3, Table 3, and Fig. 1),

5.1.5 The tension test specimen to be machined from test bar S (see 13.4, Table 3, and Fig. 1),

5.1.6 Lot size (see Section 10),

5.1.7 Special requirements (see Section 6),

5.1.8 Saving tested specimens or unbroken test bars (see 15.1), and

5.1.9 Special preparation for delivery (see Section 19).

### 6. Special Requirements

6.1 When agreed upon in writing between the manufacturer and the purchaser, it may be necessary for the castings to meet special requirements as to hardness, chemical composition,

**TABLE 1 Requirements for Tensile Strength of Gray Cast Irons in Separately Cast Test Bars**

Class	Tensile Strength, min, ksi (MPa)	Nominal Test Bar Diameter, in. (mm)
No. 20 A	20 (138)	0.88 (22.4)
No. 20 B		1.2 (30.5)
No. 20 C		2.0 (50.8)
No. 20 S		Bars S <sup>A</sup>
No. 25 A	25 (172)	0.88 (22.4)
No. 25 B		1.2 (30.5)
No. 25 C		2.0 (50.8)
No. 25 S		Bars S <sup>A</sup>
No. 30 A	30 (207)	0.88 (22.4)
No. 30 B		1.2 (30.5)
No. 30 C		2.0 (50.8)
No. 30 S		Bars S <sup>A</sup>
No. 35 A	35 (241)	0.88 (22.4)
No. 35 B		1.2 (30.5)
No. 35 C		2.0 (50.8)
No. 35 S		Bars S <sup>A</sup>
No. 40 A	40 (276)	0.88 (22.4)
No. 40 B		1.2 (30.5)
No. 40 C		2.0 (50.8)
No. 40 S		Bars S <sup>A</sup>
No. 45 A	45 (310)	0.88 (22.4)
No. 45 B		1.2 (30.5)
No. 45 C		2.0 (50.8)
No. 45 S		Bars S <sup>A</sup>
No. 50 A	50 (345)	0.88 (22.4)
No. 50 B		1.2 (30.5)
No. 50 C		2.0 (50.8)
No. 50 S		Bars S <sup>A</sup>
No. 55 A	55 (379)	0.88 (22.4)
No. 55 B		1.2 (30.5)
No. 55 C		2.0 (50.8)
No. 55 S		Bars S <sup>A</sup>
No. 60 A	60 (414)	0.88 (22.4)
No. 60 B		1.2 (30.5)
No. 60 C		2.0 (50.8)
No. 60 S		Bars S <sup>A</sup>

<sup>A</sup>All dimensions of test bar S shall be as agreed upon between the manufacturer and the purchaser.

**TABLE 2 Separately Cast Test Bars for Use When a Specific Correlation Has Not Been Established Between the Test Bar and the Casting**

Thickness of the Wall of the Controlling Section of the Casting, in. (mm)	Test Bar
Under 0.25 (6)	S
0.25 to 0.50 (6 to 12)	A
0.51 to 1.00 (13 to 25)	B
1.01 to 2 (26 to 50)	C
Over 2 (50)	S

microstructure, pressure tightness, radiographic soundness, dimensions, surface finish, etc.

**7. Tensile Requirements**

7.1 Test bars representing castings conforming to this specification shall meet the requirements for tensile strength as described in Table 1.

**8. Dimensional Requirements**

8.1 The castings shall conform to the dimensions or drawings furnished by the purchaser, or, if there are no drawings, to the dimensions predicted by the pattern equipment supplied by the purchaser.

**9. Workmanship and Finish**

9.1 The surface of the casting shall be free of adhering sand, scale, cracks, and hot tears, as determined by visual examination.

9.2 No repairing by plugging or welding of any kind shall be permitted unless written permission is granted by the purchaser.

**10. Sampling**

10.1 A lot shall consist of one of the following:

10.1.1 All the metal poured from a single heating in a batch type melting furnace.

10.1.2 All the metal from two or more batch type melting furnaces poured into a single ladle or a single casting.

10.1.3 All the metal poured from a continuous melting furnace for a given period of time between changes in charge, processing conditions, or aim-for chemistry or 4 h, whichever is the shorter period.

10.1.3.1 The purchaser may agree to extend the 4-h time period to 8 h if the manufacturer can demonstrate sufficient process control to warrant such an extension.

**11. Cast Test Bars**

11.1 Test bars shall be separate castings poured from the same lot as the castings they represent and shall have dimensions as shown in Table 3. Allowance may be made for reasonable pattern draft within the tolerances shown in Table 3. Test bars A, B, and C are all standard test bars in the form of simple cylinders. Test bar S is special and is intended for use where the standard bars are not satisfactory.

11.2 The test bars shall be cast in dried, baked, or chemically bonded molds made mainly of an aggregate of siliceous sand with appropriate binders. The average grain size of the sand shall approximate that of the sand in which the castings are poured. Molds for the test bars shall be approximately at room temperature when poured. More than one test bar may be cast in a single mold, but each bar in the mold shall be surrounded by a thickness of sand which is not less than the diameter of the bar. A suitable design for a mold is shown in Fig. 2.

NOTE 2—The intent of these provisions is as follows: to prohibit the casting of test bars in molds of metal, graphite, zircon, light-weight aggregates, or other materials which would significantly affect the tensile strength of the iron; to prohibit control of tensile strength of the test bars by manipulation of the grain size of the sand; and to prohibit the casting of test bars in molds preheated substantially above room temperature.

11.3 Test bars that are intended to represent castings that are cooled in the mold to less than 900°F (480° C), before shakeout, shall be cooled in their molds to a temperature less than 900°F (480° C). They then may be cooled in still air to room temperature.

11.4 Test bars that are intended to represent castings that are hotter than 900°F (480° C), when shaken out of their molds,