



Designation: A 842 – 85 (Reapproved 2004)

Standard Specification for Compacted Graphite Iron Castings¹

This standard is issued under the fixed designation A 842; 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 specification covers castings made of compacted graphite iron, which is described as cast iron with the graphite in compacted (vermiform) shapes and essentially free of flake graphite.

1.2 The values stated in SI units are to be considered as the standard.

1.3 No precise quantitative relationship can be stated between the properties of iron in the various locations of the same casting and those of a test bar cast from the same iron (see [Appendix X1](#)).

2. Referenced Documents

2.1 *ASTM Standards*:²

A 247 Test Method for Evaluating the Microstructure of Graphite in Iron Castings

E 8M Test Methods for Tension Testing of Metallic Materials (Metric)

2.2 *Federal Standard*:³

Fed. Std. No. 123 Marking for Shipment (Civil Agencies)

2.3 *American National Standard*:⁴

MIL-STD-129 Marking for Shipment and Storage

3. Ordering Information

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

3.1.1 ASTM designation and year of issue,

3.1.2 Grade of compacted graphite iron required as identified in [Table 1](#),

3.1.3 Special properties if required, (see [4.1](#) and [10.1](#)),

3.1.4 If samples other than those identified in [Section 9](#) are required,

¹ 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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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 Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

⁴ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036.

TABLE 1 Tensile Requirements

	Grade ^A 250	Grade 300	Grade 350	Grade 400	Grade ^B 450
Tensile strength, min, MPa	250	300	350	400	450
Yield strength, min, MPa	175	210	245	280	315
Elongation in 50 mm, min, %	3.0	1.5	1.0	1.0	1.0

^A The 250 grade is a ferritic grade. Heat treatment to attain required mechanical properties and microstructure shall be the option of the manufacturer.

^B The 450 grade is a pearlitic grade usually produced without heat treatment with addition of certain alloys to promote pearlite as a major part of the matrix.

3.1.5 Certification if so designated by the purchaser, and

3.1.6 Special preparation for delivery if required.

4. Chemical Composition

4.1 It is the intent of this specification to subordinate chemical composition to mechanical properties; however, any chemical requirement may be specified by agreement between the manufacturer and the purchaser.

5. Microstructure Requirements

5.1 Compacted graphite cast iron shall be examined metallographically for the acceptable graphite formation.

5.2 The metallographic examination shall be performed on a casting, a separately cast test coupon, as shown in [Fig. 1](#) or on a test lug from a casting. The test coupon or casting lug shall represent the last metal from the treated batch. The casting lug dimension and location will be agreed on by manufacturer and purchaser.

5.3 When castings are produced to this specification by treating the iron in the mold for graphite form control, the manufacturer may use separately cast test coupons or cut test specimens from castings to qualify conformance of the microstructure requirements. When separately cast test coupons are used, the test coupons shall have a chemical composition representative of that in the castings, produced from that iron poured, and having a cooling rate equivalent to that obtained through use of test molds as shown in [Figs. 1-4](#). The size of the cast coupon representing the castings shall be the option of the purchaser. In case no option is expressed, the manufacturer shall make the choice. When test specimens are to be taken from a casting, the location shall be agreed on by the purchaser and the manufacturer and documented on the casting drawing.

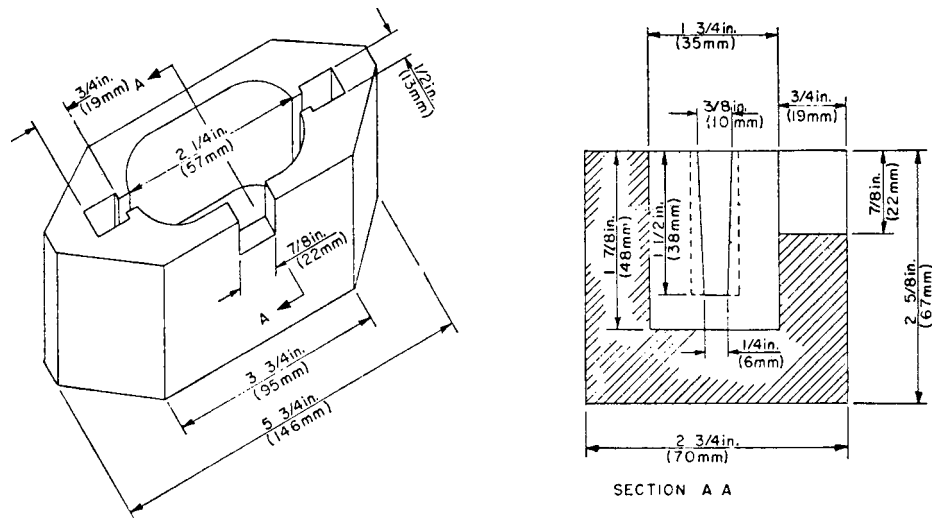


FIG. 1 Test Coupon for Microscopical Examination of Compacted Graphite Iron

NOTE—The length of the keel block shall be 6 in. (152 mm).

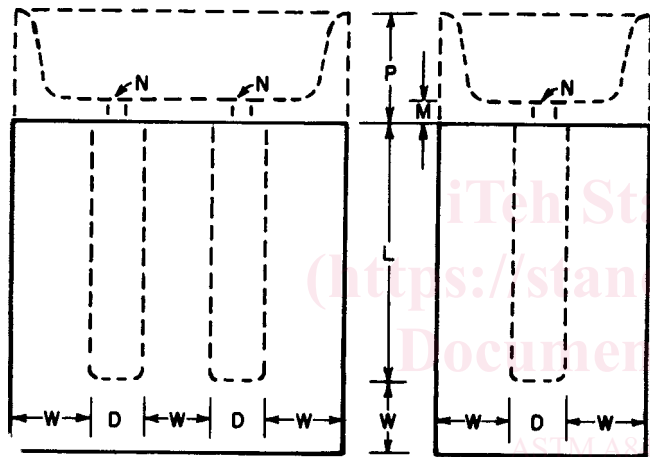
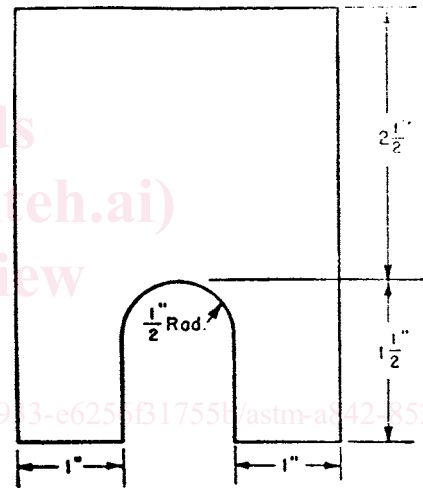


FIG. 2 Design and Dimensions for Mold for Separately Cast Cylindrical Test Bars



Metric Equivalents			
in.	mm	in.	mm
1/2	12.7	1 1/2	38.1
1	25.4	2 1/2	63.5

FIG. 3 Keel Block

Methods E 8M. Other methods may be used by mutual agreement between manufacturer and purchaser.

7. Cast Test Bars

7.1 Test bars shall be separate castings poured from the same iron as the castings they represent. The 30-mm diameter cylindrical test bar shall be used as described in Table 2 and shown in Fig. 2.

7.2 Test coupons may also be cast to the size and shape of the keel block or modified keel block shown in Fig. 3 and Fig. 4, respectively.

7.3 Test bars and test coupons shall be cast in dried, baked, or chemically bonded molds consisting of an aggregate of silica sand with the appropriate binders. All molds shall have a

It is the manufacturer's required responsibility to maintain adequate controls and documentation to assure the customer that test specimen microstructures are representative of microstructure in the castings shipped.

5.4 The acceptable graphite formation in the microstructure of the test coupon or casting lug shall contain 80 % minimum Type IV graphite (see Plate 1, Graphite Form Types of Test Method A 247). The percentage graphite can be arrived at by using the manual particle count, semiautomatic, or automatic image analysis methods. Whichever method is used, the procedure should be agreed on between the manufacturer and the purchaser.

5.5 Unless otherwise specified, the matrix microstructure of castings covered by this specification shall be substantially free of primary cementite.

6. Tensile Requirements

6.1 The iron as represented by the test specimens shall conform to the requirements for tensile properties, as identified in Table 1.

6.2 The yield strength presented in Table 1 shall be determined at 0.2 % offset by the offset method as described in Test