
Standard Specification for Gray Iron Castings

AASHTO Designation: M 105-09 (2018)

Technical Subcommittee: 4f, Metals

Release: Group 2 (June)



**American Association of State Highway and Transportation Officials
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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 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 from special test specimens designed to standardize cooling rate. The tensile strength developed in certain casting sections may vary from test specimen values. (See Appendix X1.2.)
- 1.3. The values stated in SI units are to be regarded as the standard.
- 1.4. AASHTO M 306 may be specified for drainage structure castings such as frames, grates, rings, and covers for inlets, manholes, and other structures if loading requirements exceed normal highway loading or if more restrictive dimensional tolerances are required.

2. REFERENCED DOCUMENTS

- 2.1. *AASHTO Standard:*
 - M 306, Drainage, Sewer, Utility, and Related Castings
- 2.2. *ASTM Standards:*
 - A 644, Standard Terminology Relating to Iron Castings
 - E 8/E 8M, Standard Test Methods for Tension Testing of Metallic Materials
- 2.3. *Military Standard:*
 - MIL-STD-129, Marking for Shipment and Storage¹
- 2.4. *Federal Standard:*
 - Fed. Std. No. 123, Marking for Shipment (Civil Agencies)

3. TERMINOLOGY

- 3.1. *Definitions of Terms Specific to This Standard:*
 - 3.1.1. *manufacturer*—a producing foundry/facility where iron is melted and poured into molds.

- 3.1.2. *supplier*—an agent, representative, or organization that provides castings that it did not manufacture.
- 3.1.3. *purchaser*—the end user of the casting.
- 3.2. The preceding terms and definitions are specific to this specification. ASTM A644 contains other terms and definitions relating to gray iron castings.

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 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 cast test bar, and the letter indicates the size of the test bar. Examples of proper designations are as follows:
- Gray Iron Castings, M 105, Class 30B
 - Gray Iron Castings, M 105, Class 40C

5. ORDERING INFORMATION

- 5.1. *Orders for material to this specification shall include the following information:*
- 5.1.1. AASHTO designation number and year of issue;
- 5.1.2. Class of iron required (Section 4.1 and Table 1);
- 5.1.3. The size of the cast test bar (letter classification—A, B, C, or S) that best represents the thickness of the controlling section of the casting (Table 3);
- 5.1.4. The tension test specimen (B or C) to be machined from test bar C (Section 11.3, Table 2, and Figure 2);
- 5.1.5. The tension test specimen to be machined from test bar S (Section 11.4, Table 2, and Figure 2);
- 5.1.6. Lot size (Section 14);
- 5.1.7. Special requirements (Section 7);
- 5.1.8. Saving tested specimens or unbroken test bars (Section 16.4); and
- 5.1.9. Special preparation for delivery (Section 18).

6. TENSILE REQUIREMENTS

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

Table 1—Requirements for Tensile Strength of Gray Cast Irons in Cast Test Bars

Class	Tensile Strength, Min, MPa [ksi]	Nominal Test Bar, Dia, mm [in.]	Class	Tensile Strength, Min, MPa [ksi]	Nominal Test Bar, Dia, mm [in.]
No. 20A	138 [20]	22.4 [0.88]	No. 45A	310 [45]	22.4 [0.88]
No. 20B		30.5 [1.2]	No. 45B		30.5 [1.2]
No. 20C		50.8 [2.0]	No. 45C		50.8 [2.0]
No. 20S		Bar S ^a	No. 45S		Bar S ^a
No. 25A	172 [25]	22.4 [0.88]	No. 50A	345 [50]	22.4 [0.88]
No. 25B		30.5 [1.2]	No. 50B		30.5 [1.2]
No. 25C		50.8 [2.0]	No. 50C		50.8 [2.0]
No. 25S		Bar S ^a	No. 50S		Bar S ^a
No. 30A	207 [30]	22.4 [0.88]	No. 55A	379 [55]	22.4 [0.88]
No. 30B		30.5 [1.2]	No. 55B		30.5 [1.2]
No. 30C		50.8 [2.0]	No. 55C		50.8 [2.0]
No. 30S		Bar S ^a	No. 55S		Bar S ^a
No. 35A	241 [35]	22.4 [0.88]	No. 60A	414 [60]	22.4 [0.88]
No. 35B		30.5 [1.2]	No. 60B		30.5 [1.2]
No. 35C		50.8 [2.0]	No. 60C		50.8 [2.0]
No. 35S		Bar S ^a	No. 60S		Bar S ^a
No. 40A	276 [40]	22.4 [0.88]			
No. 40B		30.5 [1.2]			
No. 40C		50.8 [2.0]			
No. 40S		Bar S ^a			

^a All dimensions of test bar S shall be as agreed on between the manufacturer and the purchaser.

7. SPECIAL REQUIREMENTS

- 7.1. When agreed on in writing between the manufacturer and the purchaser, it may be necessary for the castings to meet special requirements regarding hardness, chemical composition, microstructure, pressure tightness, radiographic soundness, dimensions, surface finish, etc.

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.