Designation: A 319 – 71 (Reapproved 1995)

AMERICAN SOCIETY FOR TESTING AND MATERIALS
100 Barr Harbor Dr., West Conshohocken, PA 19428
Reprinted from the Annual Book of ASTM Standards. Copyright ASTM

Standard Specification for Gray Iron Castings for Elevated Temperatures for Non-Pressure Containing Parts[1]

This standard is issued under the fixed designation A 319; 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 three classes of gray iron suitable for castings exposed to temperatures encountered in such service as grate bars, stoker links, stoker parts, oil still furnace parts, firebox parts, ingot molds, glass molds, caustic pots, and metal melting pots.

NOTE 1—This specification is general, covering cast irons normally used for the above types of service, at temperatures as high as 1400°F (760°C). It is not intended to imply that all three classes are suitable throughout this entire temperature range without regard to actual service stresses. Some are suitable for long service at the lower temperatures only, unless low stresses are involved.

1.2 The three classes of gray iron covered by this specification are as follows:

1.2.1 *Class I*, possessing superior resistance to thermal shock,

1.2.2 *Class II*, possessing average resistance to thermal shock and a moderately good tensile strength (tensile strengths above 30 000 psi (207 MPa) may be expected), and

1.2.3 *Class III*, possessing a higher tensile strength than either Classes I or II (tensile strengths as high as 40 000 psi (276 MPa) may be expected).

1.3 The values stated in inch-pound units are to be regarded as the standard.

2. Referenced Documents

2.1 *ASTM Standards:*

A 48 Specification for Gray Iron Castings[2]

3. Manufacture

3.1 The melting procedure shall be optional with the foundry.

4. Physical Requirements

4.1 Some of the gray cast irons described in this specification are deliberately made of a soft, low-strength iron for resistance to thermal shock, and strength requirements are unnecessary. For applications in which a strength requirement is essential, room temperature tensile strengths may be specified up to those prescribed for Class 40 in Specification A 48.

5. Machinability

5.1 All machinable castings shall be limited in hardness at such locations on the castings as designated by the purchaser. The maximum hardness at the locations on castings that are to be machined shall be a matter of agreement between the manufacturer and the purchaser.

6. Chemical Composition

6.1 It is the intention of this specification to classify these irons in accordance with their carbon content equivalent calculated as follows:

$$\text{Carbon content equivalent} = C + 0.3\,(Si + P) \quad (1)$$

where:

C = carbon content, %,
Si = silicon content, %, and
P = phosphorus content, %,

6.2 The carbon content equivalent and the minimum carbon content for the various classes shall be as prescribed in Table 1. Table 2 prescribes the allowable silicon ranges predicated on the basis of various permissible carbon contents. It is recommended that embrittling impurities be held to the following maximum limits:

Phosphorus, max, %	0.60
Sulfur, max, %	0.15

6.3 The three basic classes may be alloyed with chromium. When chromium is present as an alloying element, each class shall be subdivided into types designated as follows:

Type	Chromium, %
A	0.20–0.40
B	0.41–0.65
C	0.66–0.95
D	0.96–1.20

6.4 All irons may be alloyed to increase the strength and to improve and stabilize the structure for elevated-temperature service. The alloying elements, which, in addition to chromium, are commonly added to improve these properties, are copper, molybdenum, nickel, and vanadium. Any combination of these alloying elements that assists in resisting oxidation or surface deterioration or in stabilizing the structure or retaining strength at elevated temperatures, may be used.

[1] 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.

Current edition effective Oct. 25, 1971. Originally issued 1948. Replaces A319 – 53.

[2] *Annual Book of ASTM Standards*, Vol 01.02.