

AERONAUTICAL MATERIAL SPECIFICATION

Society of Automotive Engineers, Inc.
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AMS 5316

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Revised

DUCTILE IRON CASTINGS (NODULAR) 80,000 psi Tensile

1. **ACKNOWLEDGMENT:** A vendor shall mention this specification number in all quotations and when acknowledging purchase orders.
2. **COMPOSITION:** Shall be as follows, treated with magnesium as necessary to meet the tensile and microstructure requirements.

Carbon	3.2 - 4.0
Manganese	0.8 max
Silicon	1.7 - 2.5
Phosphorus	0.08 max

- 2.1 Silicon may be as high at 2.8% if phosphorus is not over 0.05% for castings 1/2 in. thick and under.

3. **CONDITION:** As cast, normalized, or normalized and tempered.

4. TECHNICAL REQUIREMENTS:

- 4.1 **Casting:** A melt shall be the metal poured from a single magnesium-treated ladle of 5000 lb or less.

4.2 Test Specimens:

- 4.2.1 **Tensile Test Coupons:** Shall be standard keel blocks as shown in Figure 1, unless purchaser permits use of "Y" blocks as shown in Figure 2. Coupons shall be cast with each melt of metal for castings and, when requested, shall be supplied with the castings. Coupons shall be cast in open molds made of suitable core sand, shall be poured directly after pouring the castings, and shall be left in the mold until black. Metal for the coupons shall be part of the melt which is used for the castings. Molding practice, and the coupon size when use of "Y" blocks is permitted, shall be such that cooling rates of castings and coupons are substantially the same.

- 4.2.2 **Chemical Analysis Specimens:** For carbon determinations, a chilled pencil type specimen shall be cast from each melt, or a solid sample shall be cut from the tensile test coupon or specimen from each melt.

4.3 Tensile Properties:

- 4.3.1 **Tensile Test Specimens:** Standard tensile test specimens (0.357 in. diameter at the reduced parallel section from 1/2 in. "Y" block, 0.505 in. diameter at the reduced parallel section from other tensile test coupons) cut from the coupons as shown in Figures 1 and 3 shall conform to the following requirements:

Tensile Strength, psi	80,000 min
Yield Strength at 0.2% Offset or at 0.0090 in. in 2 in. Extension Under Load ($E = 24,000,000$), psi	60,000 min
Elongation, % in 4D	3 min

Section 7C of the SAE Technical Board rules provides that: "All technical reports, including standards approved and practices recommended, are advisory only. Their use by anyone engaged in industry or trade is entirely voluntary. There is no agreement to adhere to any SAE standard or recommended practice, and no commitment to conform to or be guided by any technical report, in formulating and approving technical reports, the Board and its Committees will not investigate or consider patents which may apply to the subject matter. Prospective users of the report are responsible for protecting themselves against liability for infringement of patents."

- 4.3.2 Castings: When tensile properties of actual castings are determined for acceptance, tensile properties of specimens cut from sections of castings shall conform to the following requirements:

Tensile Strength, psi	80,000 min
Yield Strength at 0.2% Offset or at 0.0090 in.	
in 2 in. Extension Under Load ($E = 24,000,000$), psi	60,000 min
Elongation, % in 4D	2 min

- 4.4 Hardness: Castings and test coupons shall have hardness of Brinell 202-269; hardness of castings from each lot and of test coupons representing them shall be substantially the same.

- 4.5 Microstructure: Shall consist of spheroidal graphite in matrix of ferrite and fine pearlite, essentially free from flake graphite and carbide.

5. QUALITY:

- 5.1 Castings shall be uniform in quality and condition, sound, and free from foreign materials and from internal and external defects detrimental to fabrication or to performance of parts. Castings shall have smooth surfaces and shall be well cleaned.
- 5.2 When castings are broken for fracture test, the fracture shall have uniform color and be substantially free from oxides and other defects.
- 5.3 Inspection standards and procedures shall be as agreed upon by purchaser and vendor.
- 5.4 Castings shall not be repaired by plugging, welding, or other methods, without written permission from purchaser.

6. REPORTS:

- 6.1 Unless otherwise specified, the vendor of castings shall furnish with each shipment three copies of a report of the results of tests for chemical composition of each melt and for tensile properties of the test coupons representing each melt. This report shall include the purchase order number, melt number, material specification number, part number, and quantity from each melt.
- 6.2 Unless otherwise specified, the vendor of finished or semi-finished parts shall furnish with each shipment three copies of a report showing the purchase order number, material specification number, contractor or other direct supplier of castings, part number, and quantity. When castings for making parts are produced or purchased by the parts vendor, that vendor shall inspect castings from each melt represented, and shall include in the report a statement that the castings conform, or shall include copies of laboratory reports showing the results of tests to determine conformance.

7. IDENTIFICATION: Castings shall be identified in accordance with the latest issue of AMS 2804.

to determine conformance to the requirements of this specification,

8. APPROVAL:

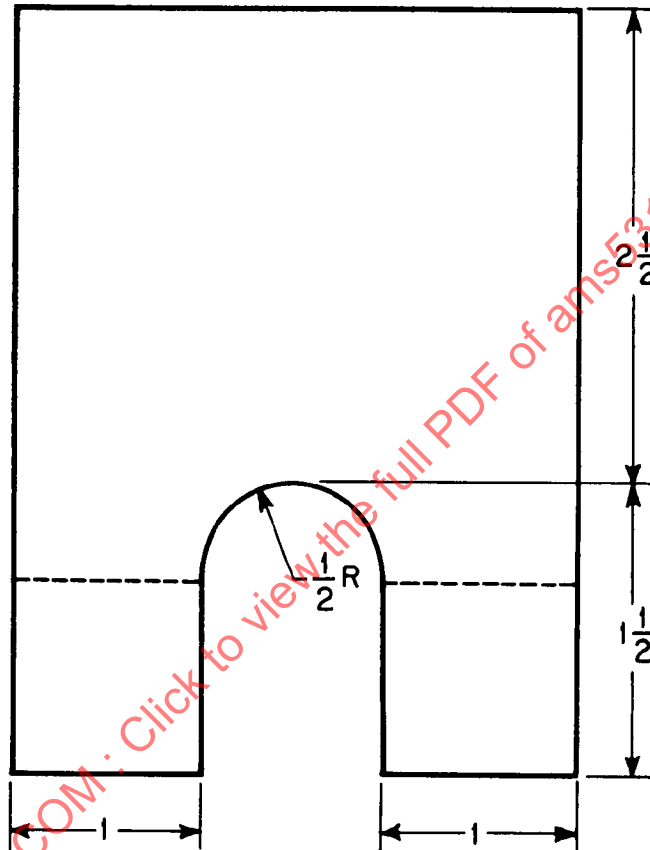
- 8.1 To assure uniformity of quality, sample castings from new or reworked patterns shall be approved by purchaser, unless such approval be waived.
- 8.2 Vendor shall use the same foundry practices and the same heat treating procedures for production castings as for approved sample castings. If necessary to make any change, vendor shall notify purchaser prior to the first shipment of castings incorporating such change.

9. REJECTIONS: Castings not conforming to this specification or to authorized modifications will be subject to rejection.

NOTE. SIMILAR SPECIFICATIONS: (a) This specification exceeds the minimum requirements of MIL-I-111466(ORD), Class 4, dated 21 September 1951.

(b) MIL-I-111466; and ASTM A339-51T, Grade 80-60-03 are listed for information only and shall not be construed as acceptable alternates unless all requirements of this AMS are met.

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Length of Block shall be 6 in.

Figure 1