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INCH-POUND
MIL-C-24707/5
27 January 1989

MILITARY SPECIFICATION

CASTINGS, DUCTILE IRON AND AUSTENITIC DUCTILE IRON

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers ductile iron and austenitic ductile iron for Military applications.

1.2 Classification. Ductile iron shall be furnished in the following grades and types, as specified (see 6.2):

Grade 60-45-15 (ASTM A 395)
Grade D-2 (ASTM A 439), type I or II
Grade D-2C (ASTM A 439), type I or II

Type I - No magnetic restrictions.
Type II - Low relative magnetic permeability.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specification. The following specification forms a part of this document to the extent specified herein. Unless otherwise specified, the issue of this document is that listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation (see 6.2).

SPECIFICATION

MILITARY

MIL-C-24707 - Castings, Ferrous, General Specification for.

(Unless otherwise indicated, copies of federal and military specifications are available from the Naval Publications and Forms Center (ATTN: NPODS), 5801 Tabor Avenue, Philadelphia, PA 19120-5099.)

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Sea Systems Command, SEA 55Z3, Department of the Navy, Washington, DC 20362-5101 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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2.2 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted are those listed in the issue of the DoDISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DoDISS are the issues of the documents cited in the solicitation.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

A 342 - Standard Test Methods for Permeability of Feebly Magnetic Materials.

A 395 - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures. (DoD adopted)

A 439 - Standard Specification for Austenitic Ductile Iron Castings.

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

(Nongovernment standards and other publications are normally available from the organizations that prepare or distribute the documents. These documents also may be available in or through libraries or other informational services.)

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 General. Ductile iron castings shall be acquired in accordance with the requirements of MIL-C-24707, the applicable ASTM specification, and the following:

3.2 Mechanical properties. Mechanical properties of grades D-2 and D-2C shall conform to ASTM A 439 and those for grade 60-45-15 shall conform to table I. When specified in the contract or order (see 6.2), the mechanical properties of grade 60-45-15 shall conform to those of ASTM A 395.

TABLE I. Mechanical property requirements, grade 60-45-15.

Tensile strength ksi (minimum)	Yield strength 0.2 percent offset ksi (minimum)	Elongation percent (minimum)	Brinell hardness
60	40	18	143-187

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3.3 Magnetic permeability. When type II is specified (see 1.2 and 6.2) the relative magnetic permeability of grades D-2 and D-2C for first article and quality conformance testing shall not exceed 1.2. Unless otherwise specified (see 6.2), the field shall be 0.5 oersteds for first article testing.

3.4 Microstructure. The microstructure requirement of ASTM A 395 shall be required for grade 60-45-15 and shall not be used in lieu of the tension tests.

3.5 Heat treatment. Grade 60-45-15 shall be ferritizing annealed in accordance with ASTM A 395. Unless otherwise specified (see 6.2), grades D-2 and D-2C shall be stress-relieved or stabilized in accordance with ASTM A 439.

4. QUALITY ASSURANCE PROVISIONS

4.1 Quality assurance provisions shall be in accordance with MIL-C-24707 and as specified herein.

4.2 First article testing. First article testing shall consist of measurement of the relative magnetic permeability of a casting or cast test block and casting hardness. Unless otherwise specified (see 6.2), first article sampling shall be in accordance with MIL-C-24707.

4.3 Quality conformance inspection.

4.3.1 Magnetic permeability. Unless otherwise specified (see 6.2), test shall be made on actual castings. All castings shall be tested.

4.3.2 Microstructure. One microstructure specimen shall be examined for each lot of grade 60-45-15.

4.3.3 Hardness. Each casting shall be tested for hardness.

4.4 Test methods.

4.4.1 Magnetic permeability test. For quality conformance testing, the relative magnetic permeability (μ) shall be measured as less than that of a calibrated standard in accordance with ASTM A 342, method 6. For first article tests, the normal magnetic permeability (μ) shall be measured in accordance with ASTM A 342, method 1, 2, or 3. Methods 1, 2, and 3 may be used for measuring a (μ) 1 to 4 and method 6 may be used for measuring a (μ) of less than 2.5.

5. PACKAGING

5.1 Packaging shall be in accordance with MIL-C-24707.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

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6.1 Intended use. Grade 60-45-15 ductile iron is intended for shock and wear-resisting applications such as engine blocks, pumps, compressors, gears, hydraulic equipment, and valves. Grades D-2 and D-2C are intended for heat resisting and nonmagnetic applications.

6.2 Acquisition requirements. In addition to the acquisition requirements of MIL-C-24707, acquisition documents must specify the following:

(a) Title, number, and date of this specification.
(b) Grade and type required (see 1.2 and 3.3), applicable ASTM specification.
(c) Issue of DoDISS to be cited in the solicitation and, if required, the specific issue of individual documents referenced (see 2.1.1 and 2.2).
(d) When the mechanical properties of grade 60-45-15 shall conform to the properties of ASTM A 395 (see 3.2).
(e) When magnetic field strength is other than specified (see 3.3).
(f) When grades D-2 and D-2C are not required to be heat treated (see 3.5).
(g) When the sampling for the first article magnetic permeability testing is other than specified (see 4.2).
(h) When the test specimen for quality conformance inspection is other than specified (see 4.3.1).

6.3 Supersession data. The supersession data for the applicable grades are as follows:

Previous specification	Replacement specification
	MIL-C-24707/5
MIL-I-24137, class A	ASTM A 395, grade 60-45-15
class B	ASTM A 439, grade D-2
class C	ASTM A 439, grade D-2C

6.4 Subject term (key word) listing.

Magnetic permeability
Microstructure

Custodians:
Army - MR
Navy - SH
Air Force - 20

Review activities:
Army - AR, MI
Navy - AS, YD, OS
Air Force - 84

User activities:
Navy - MC
Army - ME

Preparing activity:
Navy - SH
(Project MECA-0333)