Society of Automotive Engineers, Inc.
400 COMMONWEALTH DRIVE, WARRENDALE, PA. 15096

# AEROSPACE MATERIAL SPECIFICATION

AMS 5371A
Superseding AMS 5371
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## STEEL CASTINGS, SAND, CORROSION AND HEAT RESISTANT
## 19.5Cr - 9.5Ni (Low Carbon)



1. SCOPE:

1.1 Form: This specification covers a corrosion and heat resistant steel in the form of sand castings.

1.2 Application: Primarily for parts requiring both corrosion and heat resistance up to 800°F (427°C), especially where such parts are welded during fabrication; for parts requiring oxidation resistance up to 1500°F (816°C) but useful at the higher temperatures only when stresses are low; and for parts requiring resistance to fuming nitric acid.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications (AMS) shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

2.1 SAE Publications: Available from Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2350 - Standards and Test Methods
AMS 2635 - Radiographic Inspection
AMS 2645 - Fluorescent Penetrant Inspection
AMS 2804 - Identification, Castings

2.2 ASTM Publications: Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM A262 - Detecting Susceptibility to Intergranular Attack in Stainless Steels
ASTM E10 - Brinell Hardness of Metallic Materials
ASTM E353 - Chemical Analysis of Stainless, Heat-Resisting, Maraging, and Other Similar Chromium-Nickel-Iron Alloys

2.3 Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

2.3.1 Federal Standards:

Federal Test Method Standard No. 151 - Metals; Test Methods

2.3.2 Military Standards:

MIL-STD-794 - Parts and Equipment, Procedures for Packaging and Packing of

3. TECHNICAL REQUIREMENTS

3.1 Composition: Shall conform to the following percentages by weight, determined by wet chemical methods in accordance with ASTM E353, by spectrographic methods in accordance with Federal Test Method Standard No. 151, Method 112, or by other approved analytical methods:

| | min | max |
|---|---|---|
| Carbon | -- | 0.050 |
| Manganese | 1.00 - | 2.00 |
| Silicon | 0.75 - | 1.50 |
| Phosphorus | -- | 0.04 |
| Sulfur | -- | 0.04 |
| Chromium | 18.00 - | 21.00 |
| Nickel | 8.00 - | 11.00 |
| Molybdenum | -- | 0.75 |
| Copper | -- | 0.75 |

3.2 Condition: Solution heat treated free from continuous carbide network.

3.3 Casting: A melt shall be the metal poured from a single furnace charge.

3.4 Heat Treatment: Castings shall be solution heat treated by heating to 2000°F ± 50 (1093.3°C ± 28), holding at heat for not less than 30 min. per inch (25 mm) of maximum section thickness but in no case less than 30 min., and cooling in air.

3.5 Properties: Castings shall conform to the following requirements:

3.5.1 Hardness: Not higher than 170 HB or equivalent, determined in accordance with ASTM E10.

3.5.2 Embrittlement: Specimens cut from castings, after sensitizing treatment, shall show no evidence of intercrystalline surface attack when examined microscopically after being exposed to the copper/copper sulfate/sulfuric acid test in accordance with ASTM A262, Practice E.

3.6 Quality:

3.6.1 Castings shall be uniform in quality and condition, sound, and free from foreign materials and from internal and external imperfections deterimental to fabrication or to performance of parts. Castings shall have smooth surfaces and shall be well cleaned. Metallic shot or grit shall not be used for final cleaning, unless otherwise permitted.

3.6.2 Castings shall be produced under radiographic control, unless otherwise specified. This control shall consist of radiographic examination of castings in accordance with AMS 2635 until proper foundry technique, which will produce castings free from harmful internal imperfections, is established for each part number and of production castings as necessary to ensure maintenance of satisfactory quality.

3.6.3 When specified, castings shall be subject to fluorescent penetrant inspection in accordance with AMS 2645.

3.6.4 Radiographic, fluorescent penetrant, and other quality standards shall be as agreed upon by purchaser and vendor.

3.6.5 Castings shall not be repaired by peening, plugging, welding, or other methods without written permission from purchaser.

3.6.5.1 When permitted in writing by purchaser, defects in castings may be removed and the castings repaired by welding provided the weld repair area has properties comparable to those of the parent metal. Repair welds shall be subjected to the same inspection procedures and acceptance standards required of the casting and the weld repair areas shall be suitably marked to facilitate inspection. The repair welding shall be performed prior to any heat treatment and nondestructive testing specified herein.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of castings shall supply all samples and shall be responsible for performing all required tests. Results of such tests shall be reported to the purchaser as required by 4.5. Purchaser reserves the right to perform such confirmatory testing as he deems necessary to ensure that the castings conform to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests to determine conformance to composition (3.1), hardness (3.5.1), and quality (3.6) requirements are classified as acceptance or routine control tests.

4.2.2 Qualification Tests: Tests to determine conformance to embrittlement (3.5.2) requirements are classified as qualification or periodic control tests.

4.2.2.1 For direct U.S. Military procurement, qualification test material and supporting test data shall be submitted to the cognizant qualification agency as directed by the request for procurement, the procuring activity, or the contracting officer.

4.3 Sampling: Shall be in accordance with the following:

4.3.1 One casting from each melt.

4.3.2 Two preproduction castings in accordance with 4.4.1 of each part number.

4.4 Approval:

4.4.1 Sample castings from new or reworked patterns and the casting procedure shall be approved by purchaser before castings for production use are supplied, unless such approval be waived.

4.4.2 Vendor shall establish for production of sample castings of each part number the control factors of processing which will produce acceptable castings; this shall constitute the approved casting procedure and shall be used for producing production castings. If necessary to make any change in control factors of processing, vendor shall submit for reapproval a statement of the proposed changes in processing and, when requested, sample castings. No production castings incorporating the revised operations shall be shipped prior to receipt of reapproval.

4.4.2.1 Control factors for producing castings include, but are not limited to, the following:

- Type of furnace and its capacity
- Size of furnace charge
- Furnace atmosphere
- Fluxing or deoxidation procedure
- Gating and risering practices
- Pouring temperature (variation of ±50°F (±28°C) from the established limit is permissible)
- Solidification and cooling procedures
- Cleaning operations
- Methods of routine inspection

4.4.2.1.1 Any of the above control factors of processing considered proprietary by the vendor may be assigned a code designation. Each variation in such factors shall be assigned a modified code designation.