

**AEROSPACE
MATERIAL
SPECIFICATION**

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Superseding AMS 7730D

Depleted Uranium Castings

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1. SCOPE:**1.1 Form:**

This specification covers depleted uranium in the form of castings.

1.2 Application:

Primarily for use as aircraft cast counterweights where it is desirable to produce compound contours without machining and where space limitations require the use of a high-density material. Applications in oxidizing atmospheres necessitate a protective coating.

1.3 Alloy covered by this specification is radioactive. All applicable rules and regulations pertaining to handling of radioactive material and all licensing provisions for use of such material should be observed. It is the sole responsibility of the user of this material to ensure familiarity with the safe and proper use of hazardous materials and to take necessary precautionary measures to ensure the health and safety of all personnel involved.

2. APPLICABLE DOCUMENTS:

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

2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

| | |
|----------|---|
| AMS 2350 | Standards and Test Methods |
| AMS 2360 | Room Temperature Tensile Properties of Castings |
| AMS 2645 | Fluorescent Penetrant Inspection |
| AMS 2646 | Contrast Dye Penetrant Inspection |

2.2 ASTM Publications:

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

ASTM E8 Tension Testing of Metallic Materials

2.3 U.S. Government Publications:

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

2.3.1 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 methods agreed upon by purchaser and vendor:

| | min | max |
|---------|-------|------|
| Uranium | 99.00 | -- |
| Carbon | -- | 0.07 |

3.2 Condition:

As cast and nickel-cadmium plated (See 3.5).

3.3 Casting:

Melting and casting shall be performed in vacuum unless melting and casting under inert atmosphere are permitted by purchaser. Molds shall be made of graphite or insoluble refractory material unless special casting techniques are used to prevent contamination with foreign materials. Extreme care shall be exercised to avoid contact of the molten metal with more soluble refractories such as those containing silica.

3.4 Test Specimens:

Tensile specimens shall be cast to represent each heat of metal in castings, shall be cast in molds made of the same mold material as used for the castings, heated to the same temperature as the molds for the castings, and shall be cooled at approximately the same rate as the castings. The specimens shall be of standard proportions in accordance with ASTM E8 with 0.250 in. (6.25 mm) diameter at the reduced parallel gage section and shall be cast to size or machined from actual castings or from integrally-cast or separately-cast coupons of adequate size to yield such specimens.

3.5 Plating:

Cleaning and plating shall be accomplished on all parts such that a continuous, smooth, pore-free, crack-free, adherent, plated finish is produced. Plating shall consist of a sulfamate nickel deposit applied to a thickness of 0.001 - 0.003 in. (0.02 - 0.08 mm) followed by a deposit of cadmium applied to a thickness of 0.001 - 0.003 in. (0.02 - 0.08 mm) with supplementary chromate treatment. All sharp edges and corners shall be broken prior to plating.

3.6 Properties:

Castings and integrally-cast or separately-cast representative tensile specimens produced in accordance with 3.4 shall conform to the following requirements:

3.6.1 Separately-Cast or Integrally-Cast Specimens:

3.6.1.1 Tensile Properties: Shall be as follows, determined in accordance with ASTM E8:

| | |
|------------------------------------|----------------------|
| Tensile Strength, min | 70,000 psi (485 MPa) |
| Yield Strength at 0.2% Offset, min | 35,000 psi (240 MPa) |
| Elongation in 4D, min | 6% |

3.6.2 Castings:

3.6.2.1 Tensile Properties: When specified on the drawing or when agreed upon by purchaser and vendor, tensile specimens conforming to ASTM E8 shall be machined from castings selected at random from each lot. Property requirements for such specimens shall be as specified on the drawing or as agreed upon by purchaser and vendor and may be defined as specified in AMS 2360.

3.6.2.2 Density: Shall be not lower than 0.673 lb per cu in. (18.63 Mg/m³).

3.6.2.3 Radiation Emission: The radiation emission of the casting, at the surface of the casting, shall be not greater than 220 mR (56.8 μ C/kg) per hr, beta plus gamma. After nickel-cadmium plating, the radiation emission shall be not greater than 210 mR (54.2 μ C/kg) per hour.

3.6.2.3.1 The radiation emission values of 3.6.2.3 are valid only if measured with a beta-gamma survey meter having a scale of 0 - 250 mR (0 - 64.5 μ C/kg) per hr with a full scale accuracy of \pm 10%. If any other instrument is used, conversion shall be required.

3.7 Quality:

3.7.1 Castings:

3.7.1.1 Castings, as received by purchaser, shall be uniform in quality and condition, sound and free from foreign materials and from imperfections detrimental to usage of the castings.

3.7.1.1.1 Castings shall have smooth surfaces and shall be well cleaned.

3.7.1.2 Repair of minor imperfections by inert-gas-shielded fusion welding is permitted; the repair shall not be detrimental to fabrication or to usage of parts and shall be free from cracks, porosity, and other harmful imperfections, determined by fluorescent penetrant inspection in accordance with AMS 2645 or contrast dye penetrant inspection in accordance with AMS 2646.

3.7.1.3 Surface imperfections may be removed with suitable grinders or other tools but the blending of imperfections shall not result in dimensions outside drawing limits.

3.7.2 Plating: Shall be smooth, fine grained, adherent to all surfaces of the finished part, and free from cracks, blisters, pits, nodules, and other defects.

3.7.2.1 All plated parts shall be fluorescent penetrant inspected in accordance with AMS 2645 or contrast dye penetrant inspected in accordance with AMS 2646 to ensure the absence of porosity and cracks in the finished plating.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

The vendor of castings shall supply all samples for vendor's tests 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 sample and to perform any confirmatory testing deemed necessary to ensure that the castings conform to the requirements of this specification.

4.2 Classification of Tests:

Tests to determine conformance to all technical requirements of this specification are classified as acceptance tests and as preproduction tests and shall be performed prior to or on the initial shipment of a casting to a purchaser, on each heat or lot as applicable, when a change in material, processing, or both requires reapproval as in 4.4.2, and when purchaser deems confirmatory testing to be required.

4.2.1 For direct U.S. Military procurement, substantiating test data and, when requested, preproduction test material shall be submitted to the cognizant agency as directed by the procuring activity, the contracting officer, or the request for procurement.

4.3 Sampling:

Shall be in accordance with the following; a lot shall be all castings of the same configuration from the same heat of molten metal and nickel-cadmium plated in the same batch.

4.3.1 Composition: One casting from each heat.

4.3.2 Tensile Properties:

4.3.2.1 At least one separately-cast tensile specimen in accordance with 3.4 or integrally-cast coupons from each lot except when properties of specimens machined from castings are required.

- 4.3.2.2 One or more castings from each lot when properties of specimens machined from castings are required. Size, location, and number of specimens machined from castings shall be as specified on the drawing or as agreed upon by purchaser and vendor. When size, location, and number of specimens are not specified, not less than two tensile specimens, one from the thickest section and one from the thinnest section, shall be cut from a casting or castings from each lot.
- 4.3.3 Density and Radiation Emission: One casting from each lot.
- 4.3.4 When a statistical sampling plan and acceptance quality level (AQL) have been agreed upon by purchaser and vendor, sampling shall be in accordance with such plan in lieu of sampling as in 4.3.1, 4.3.2, and 4.3.3 and the report of 4.5 shall state that such plan was used.
- 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 by purchaser.
- 4.4.2 Vendor shall establish for production of sample castings of each part number parameters for the process control factors which will produce acceptable castings; these shall constitute the approved casting procedure and shall be used for producing production castings. If necessary to make any change in parameters for the process control factors, vendor shall submit for reapproval a statement of the proposed changes in processing and, when requested, sample castings, test specimens, or both. Production castings incorporating the revised operations shall not 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
 - Mold refractory formulation
 - Mold back-up material
 - Gating practices
 - Mold preheating and metal pouring temperatures; variations of $\pm 25^{\circ}\text{F}$ ($\pm 15^{\circ}\text{C}$) from established limits are acceptable
 - Solidification and cooling procedures
 - Cleaning operations
 - Nickel-Cadmium plating procedures
 - Methods of inspection
- 4.4.2.1.1 Any of the above process control factors for which parameters are considered proprietary by the vendor may be assigned a code designation. Each variation in such parameters shall be assigned a modified code designation.