

AEROSPACE MATERIAL SPECIFICATION

AMS 1431

Issued 1-1-90

Submitted for recognition as an American National Standard

COMPOUND, DEICING/ANTI-ICING Solid

1. SCOPE:

- 1.1 Form: This specification covers deicing and anti-icing compounds in the form of a solid.
- 1.2 Applications: Primarily for use on airport runways, taxiways, ramps, walkways, and other ground surfaces as required to remove or to prevent formation of frost, snow, and ice.
- 1.3 Precautions: This deicing/anti-icing formulation may be mildly toxic and contact with human skin and eyes should be avoided. Prolonged exposure to concentrations exceeding the established threshold limit values (TLV) for the product or its major components should also be avoided.
- 1.4 Safety-Hazardous Materials: While the materials, methods, applications, and processes described or referenced in this specification may involve the use of hazardous materials, this specification does not address the hazards which may be involved in such use. It is the sole responsibility of the user to ensure familiarity with the safe and proper use of any 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 SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order.

- 2.1 SAE Publications: Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

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2.1.1 Aerospace Material Specifications:

- AMS 2470 - Anodic Treatment of Aluminum Alloys, Chromic Acid Process
- AMS 2475 - Protective Treatments, Magnesium Alloys
- AMS 2825 - Material Safety Data Sheets
- AMS 4037 - Aluminum Alloy Sheet and Plate, 4.4Cu - 1.5Mg - 0.60Mn, (2024; -T3 Flat Sheet, -T351 Plate), Solution Heat Treated
- AMS 4041 - Aluminum Alloy Sheet and Plate, Alclad, 4.4Cu - 1.5Mg - 0.60Mn, (Alclad 2024 and 1-1/2 Alclad 2024-T3 Flat Sheet; 1-1/2 Alclad 2024-T351 Plate)
- AMS 4049 - Aluminum Alloy Sheet and Plate, Alclad, 5.6Zn - 2.5Mg - 1.6Cu - 0.23Cr, (Alclad 7075; -T6 Sheet, -T651 Plate), Solution and Precipitation Heat Treated
- AMS 4376 - Magnesium Alloy Plate, 3.0Al - 1.0Zn, (AZ31B-H26), Cold Rolled and Partially Annealed
- AMS 4911 - Titanium Alloy Sheet, Strip, and Plate, 6Al - 4V, Annealed
- AMS 5045 - Steel Sheet and Strip, 0.25 maximum Carbon, Hard Temper

2.2 ASTM Publications: Available from ASTM, 1916 Race Street, Philadelphia, PA 19103-1187.

- ASTM C 672 - Scaling Resistance of Concrete Surfaces Exposed to Deicing Chemicals
- ASTM C 871 - Chemical Analysis of Thermal Insulation Materials for Leachable Chloride, Fluoride, Silicate, and Sodium Ions
- ASTM D 1193 - Reagent Water
- ASTM D 1568 - Sampling and Chemical Analysis of Alkylbenzene Sulfonates
- ASTM E 70 - pH of Aqueous Solutions with the Glass Electrode
- ASTM E 203 - Water Using Karl Fischer Reagent
- ASTM F 483 - Total Immersion Corrosion Test for Aircraft Maintenance Chemicals
- ASTM F 484 - Stress Cracking of Acrylic Plastics in Contact with Liquid or Semi-Liquid Compounds
- ASTM F 485 - Effects of Cleaners on Unpainted Aircraft Surfaces
- ASTM F 502 - Effects of Cleaning and Chemical Maintenance Materials on Painted Aircraft Surfaces
- ASTM F 519 - Mechanical Hydrogen Embrittlement Testing of Plating Processes and Aircraft Maintenance Chemicals
- ASTM F 945 - Stress Corrosion of Titanium Alloys by Aircraft Engine Cleaning Materials
- ASTM F 1110 - Sandwich Corrosion Test
- ASTM F 1111 - Corrosion of Low-Embrittling Cadmium Plate by Aircraft Maintenance Chemicals

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 Specification:

- MIL-P-83310 - Plastic Sheet, Polycarbonate, Transparent

2.3.2 Military Standards:

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

2.4 APHA Publications: Available from American Public Health Association, 1015 Eighteenth Street, NW, Washington, DC 20036.

Standard Methods for the Examination of Water and Waste Water

3. TECHNICAL REQUIREMENTS:

3.1 Material:

3.1.1 Composition: The composition of the compound shall be as defined by 3.1.1.1, 3.1.1.2, 3.1.1.3, and 3.1.1.4. It shall contain additives such as coating agents, corrosion inhibitors, etc as required to produce a product meeting the requirements of 3.2.

3.1.1.1 Vendor shall determine the product chemical analysis in accordance with ASTM C 871. Analytical methods used shall be included in the report.

3.1.1.2 Total water content shall be determined in accordance with ASTM C 871 or ASTM E 203 and content reported.

3.1.1.3 pH shall be determined in accordance with ASTM E 70 and the value reported.

3.1.1.4 The level of soluble chloride in the compound on a dry basis shall not exceed 250 ppm, determined in accordance with APHA Standard Methods for the Examination of Water and Waste Water, Method 112A.

3.1.2 Characteristics: Compound characteristics as defined in 3.1.2.1, 3.1.2.2, and 3.1.2.3 shall be determined.

3.1.2.1 Vendor shall evaluate the compound's industrial hygiene and toxicology characteristics including, but not limited to, oral and dermal toxicity, plus oral, dermal, ocular, and inhalation sensitivity.

3.1.2.2 Vendor shall evaluate the compound's ecological behavior to include, but not be limited to, phytotoxicity, impact on groundwater and soils, products of decomposition, component fats, and BOD.

3.1.2.3 Vendor shall provide a phase diagram relating product dilution to freeze point. Delivered product shall be within 4°C (7°F) of the preproduction value.

3.2 Properties: The compound shall conform to the following requirements, determined in accordance with specified test methods on compound diluted with ASTM D 1193, Type III, water:

3.2.1 Corrosion of Metal Surfaces: Test dilutions of 5% and 15% by weight solids, taking into account water contained in the compound, shall be used for 3.2.1.1 and 3.2.1.2. Dilutions of 15% by weight solids shall be used for 3.2.1.3, 3.2.1.4, 3.2.1.5, and 3.2.1.6.

- 3.2.1.1 Sandwich Corrosion: Specimens, after test, shall show a rating not greater than 1 or not worse than ASTM D 1193, Type III, water, determined in accordance with ASTM F 1110.
- 3.2.1.2 Total Immersion Corrosion: The diluted compound shall neither show evidence of corrosion nor cause a weight change of any test panel greater than the following, determined in accordance with ASTM F 483:

Test Panel	Weight Change mg/cm ² per 24 hours
AMS 4037 Aluminum Alloy, anodized as in AMS 2470	0.3
AMS 4041 Aluminum Alloy	0.3
AMS 4049 Aluminum Alloy	0.3
AMS 4376 Magnesium Alloy, dichromate treated as in AMS 2475	0.2
AMS 4911 Titanium Alloy	0.1
AMS 5045 Carbon Steel	0.8

- 3.2.1.3 Low-Embrittling Cadmium Plate: Test panels, coated with low-embrittling cadmium plate, shall not show a weight change greater than 0.3 mg/cm² per 24 hours, determined in accordance with ASTM F 1111.
- 3.2.1.4 Hydrogen Embrittlement: The compound shall be non-embrittling, determined in accordance with ASTM F 519, Type 1a, 1c, or 2a.
- 3.2.1.5 Stress Corrosion Resistance: Diluted compound shall not cause cracks in AMS 4911 titanium alloy, determined in accordance with ASTM F 945.
- 3.2.1.6 Residue: The compound shall leave no residue or stains on AMS 4049 aluminum alloy, determined as in 3.2.1.6.1.
- 3.2.1.6.1 Two 2 x 6 inch (51 x 152 mm) panels of AMS 4049 aluminum alloy shall be cleaned with acetone and immersed in the diluted compound so as to cover approximately one-half of the panel. After the compound has been applied, the panels shall be placed at 45 degrees $\pm$ 5 from horizontal in an oven maintained at 38°C $\pm$ 1 (100°F $\pm$ 2) for 30 minutes $\pm$ 1, removed from the oven, rinsed with room temperature methyl ethyl ketone, allowed to dry, and the treated and untreated areas of the panels examined visually and compared for the presence of residue and stains.
- 3.2.2 Effect on Non-Metals: Test dilutions of 15% by weight solids, taking into account water contained in the compound, shall be used for 3.2.2.1, 3.2.2.2, and 3.2.2.3.

- 3.2.2.1 Effect on Transparent Plastic: The diluted compound shall not craze, stain, or discolor Type C acrylic plastics, determined in accordance with ASTM F 484. The compound shall not craze, stain, or discolor MIL-P-83310 polycarbonate plastic or polysulfone plastic, determined in accordance with test procedures specified in ASTM F 484 on specimens stressed for 30 minutes $\pm$ 2 to an outer fiber stress of 3000 psi (20.7 MPa).
- 3.2.2.2 Effect on Painted Surfaces: The compound shall neither decrease the paint film hardness by more than two pencil hardness levels nor shall it produce any streaking, discoloration, or blistering of the paint film, determined in accordance with ASTM F 502.
- 3.2.2.3 Effect on Unpainted Surfaces: The compound, tested in accordance with ASTM F 485, shall neither produce streaking nor leave any stains requiring polishing to remove.
- 3.2.2.4 Scaling Resistance: The condition of the surface shall have a rating not greater than 2, determined in accordance with ASTM C 672 except that a 25% by volume solution of the compound in tap water shall be substituted for calcium chloride.
- 3.3 Quality: The compound, as received by purchaser, shall be uniform, free-flowing, and free from foreign material detrimental to usage of the compound.
4. QUALITY ASSURANCE PROVISIONS:
- 4.1 Responsibility for Inspection: The vendor of compound 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 compound conforms to the requirements of this specification.
- 4.2 Classification of Tests:
- 4.2.1 Acceptance Tests: Tests for composition (3.1.1) are acceptance tests and shall be performed on each lot.
- 4.2.2 Periodic Tests: Tests for corrosion of metal surfaces (3.2.1) and effects on non-metals (3.2.2) are periodic tests and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser.
- 4.2.3 Preproduction Tests: Tests for all technical requirements of this specification are preproduction tests and shall be performed prior to or on the initial shipment of the compound to a purchaser, when a change in ingredients and/or processing requires reapproval as in 4.4.2, and when purchaser deems confirmatory testing to be required.