

**FLUID, DEICING/ANTI-ICING, RUNWAYS AND TAXIWAYS**  
Glycol Base

1. SCOPE:

1.1 Form: This specification covers a corrosion-inhibited, biodegradable, chemical deicing/anti-icing material in the form of a liquid.

1.2 Application: Primarily for use on airport runways and taxiways for the prevention and removal of frozen deposits of frost and ice.

1.3 Precautions:

1.3.1 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.

1.3.2 Caution should be exercised in the use of aqueous glycol deicing/anti-icing solutions in and around aircraft having silver or silver-coated electrical/electronic circuitry. Dehydrolysis reactions which result in fire may occur when such aqueous glycol solutions contact silver or silver-coated circuits such as defectively insulated wires, switches, or circuit breakers which are carrying direct current.

1.3.3 Airport authorities are required to ascertain the friction coefficient of the runway after application of the deicing/anti-icing fluid.

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.

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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.

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 max 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 D 56 - Flash Point by Tag Closed Tester
- ASTM D 891 - Specific Gravity of Liquid Industrial Chemicals
- ASTM D 1177 - Freezing Point of Aqueous Engine Coolant Solution
- ASTM D 1193 - Reagent Water
- ASTM D 1568 - Sampling and Chemical Analysis of Alkylbenzene Sulfonates
- ASTM D 4057 - Manual Sampling of Petroleum and Petroleum Products
- ASTM D 4177 - Automatic Sampling of Petroleum and Petroleum Products
- ASTM E 70 - pH of Aqueous Solutions with the Glass Electrode
- 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

2.2 (Continued):

- ASTM F 1105 - Preparing Aircraft Cleaning Compounds, Liquid Type, Solvent-Based, for Storage Stability Testing
- 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 Naval Publications and Forms Center, Attn: NPODS, 5801 Tabor Avenue, Philadelphia, PA 19120-5099.

2.3.1 Military Specifications:

- MIL-P-25690 - Plastic, Sheets and Parts, Modified Acrylic Base, Monolithic, Crack Propagation Resistant

2.3.2 Military Standards:

- MIL-STD-290 - Packaging of Petroleum and Related Products

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: The composition of the fluid shall be a glycol-base and shall otherwise be optional with the manufacturer. The fluid may contain urea, formamide, and corrosion inhibitors, etc, as required to produce a product meeting the requirements of 3.2.

3.1.1 Biodegradability: The fluid shall be not less than 90% biodegradable. Results of biodegradability studies conducted in accordance with "Standard Methods for the Examination of Water and Waste Water," for biodegradability and bioassays shall, when requested by purchaser, be provided by the fluid manufacturer to purchaser and shall contain not less than the following information:

- 3.1.1.1 A statement of ecological behavior of the fluid.
- 3.1.1.2 The total oxygen demand (TOD) of the fluid, expressed in pounds of oxygen per pound of fluid.
- 3.1.1.3 Percent of the fluid degraded in five days.
- 3.1.1.4 Presence, in percent by weight, of nitrate.

3.2 Properties: The fluid shall conform to the following requirements; tests shall be performed in accordance with specified test methods on the product in concentrated form:

3.2.1 Flash Point: Shall be not lower than 100°C (212°F), determined in accordance with ASTM D 93.

3.2.2 Specific Gravity: Shall be within ±0.015 of the preproduction value established in 4.2.3, determined in accordance with ASTM D 891.

3.2.3 pH: Shall be within ±0.5 units of the preproduction value established in 4.2.3, determined in accordance with ASTM E 70.

3.2.4 Freezing Point:

3.2.4.1 Shall not exceed -23°C (-10°F), determined in accordance with  
 Ø ASTM D 1177.

3.2.4.2 Shall be not greater than +4C (+7F) degrees from the preproduction  
 Ø value established in 4.2.3, determined in accordance with ASTM D 1177.

3.2.5 Corrosion of Metal Surfaces:

3.2.5.1 Sandwich Corrosion: Specimens, after test, shall show corrosion not  
 Ø worse than that on the control panels that have been treated with synthetic tap water. If control panels are not run, specimens, after test, shall show a rating not worse than 1, determined in accordance with ASTM F 1110.

3.2.5.2 Total Immersion Corrosion: The fluid 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 <sup>2</sup> 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

3.2.5.3 Low-Embrittling Cadmium Plate: Test panels, coated with low-embrittling  
 Ø cadmium plate, shall not show a weight change greater than 0.3 mg/cm<sup>2</sup> per 24 hours, determined in accordance with ASTM F 1111.

3.2.5.4 Stress-Corrosion Resistance: The fluid shall not cause cracks in  
 AMS-4911 titanium alloy, determined in accordance with ASTM F 945.

- 3.2.6 Hydrogen Embrittlement: The fluid shall be non-embrittling, determined in accordance with ASTM F 519, Type 1a, 1c, or 2a.
- 3.2.7 Effect on Transparent Plastic: The fluid, heated to  $65^{\circ}\text{C} \pm 5$  ( $149^{\circ}\text{F} \pm 9$ ), shall not craze, stain, or discolor MIL-P-25690 stretched acrylic plastic, determined in accordance with ASTM F 484.
- 3.2.8 Effect on Painted Surfaces: The fluid, heated to  $65^{\circ}\text{C} \pm 5$  ( $149^{\circ}\text{F} \pm 9$ ), 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.
- 3.2.9 Effect on Unpainted Surfaces: The fluid, tested in accordance with ASTM F 485, shall neither produce streaking nor leave any stains requiring polishing to remove.
- 3.2.10 Rinsibility: The fluid shall be completely rinsible in tap water, determined in accordance with 3.2.10.1
- 3.2.10.1 A 75 x 200 mm (3 x 8 inch) panel of clear glass shall be cleaned to provide a surface free of waterbreak, dried, and coated with the deicer/anti-icer fluid by pouring the fluid over the panel while it is held in a horizontal position. The coated panel shall be inclined at an angle of approximately 45 degrees for 10 minutes  $\pm 0.5$ , then placed in a horizontal position for 24 hours  $\pm 0.25$  at room temperature. After the 24 hour exposure, the panel shall be rinsed in tap water for 5 - 6 minutes, followed by a rinse with ASTM D 1193, Type IV, water, allowed to air dry at ambient temperature, and examined for visible traces of the deicer/anti-icer fluid.
- 3.2.11 Pavement 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 deicer/anti-icer fluid in tap water shall be substituted for calcium chloride.
- 3.2.12 Storage Stability: The fluid, tested in accordance with ASTM F 1105, shall neither show separation from exposure to heat or cold nor show an increase in turbidity greater than a control sample equally diluted 1:1 with ASTM D 1193, Type III, water.
- 3.2.13 Performance: The fluid, used in accordance with manufacturer's recommendations, shall remove accumulated frozen deposits of frost and ice from airport taxiways and runways. Acceptance criteria and method of test shall be as agreed upon by purchaser and vendor.
- 3.3 Quality: The fluid, as received by purchaser, shall be homogeneous, uniform in color, and free from skins, lumps, and foreign materials detrimental to usage of the fluid.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of the fluid shall supply all samples for vendor's tests and shall be responsible for performing all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the fluid conforms to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests for flash point (3.2.1), specific gravity (3.2.2), and pH (3.2.3) are acceptance tests and shall be performed on each lot.

4.2.2 Periodic Tests: Tests for freezing point (3.2.4), corrosion of metal surfaces (3.2.5), hydrogen embrittlement (3.2.6), effect on transparent plastic (3.2.7), effect on painted surfaces (3.2.8), effect on unpainted surfaces (3.2.9), rinsibility (3.2.10), and pavement scaling resistance (3.2.11) 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 are preproduction tests and shall be performed prior to or on the initial shipment of the fluid 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.

4.2.3.1 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, contracting officer, or request for procurement.

4.3 Sampling and Testing: Shall be in accordance with all applicable requirements of 4.3.1 or 4.3.2; a lot shall be all fluid produced in one continuous manufacturing operation from the same batches of raw materials and presented for vendor's inspection at one time:

4.3.1 Drum Shipments: ASTM D 1568.

4.3.2 Bulk Shipments: ASTM D 4057 or ASTM D 4177.

4.4 Approval:

4.4.1 Sample fluid shall be approved by purchaser before fluid for production use is supplied, unless such approval be waived by purchaser. Results of tests on production fluid shall be essentially equivalent to those on the approved sample.