



AEROSPACE MATERIAL SPECIFICATION

AMS1424™**REV. T**Issued 1993-01
Revised 2025-04

Superseding AMS1424S

Fluid, Aircraft Deicing/Anti-Icing, SAE Type I

RATIONALE

This document has been revised to include clarifications of glycol concentrations in 1.1.2 and fluid qualification requirements in 1.5. The requirements for specific gravity and surface tension have been removed. Sections 3.2.4 related to refractive index, 4.2.3 related to fluid requalification requirements, and 4.4.2.1 related to recycled glycol have been revised per the recommendations of their respective working groups.

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1. SCOPE

1.1 Form

This foundation specification (AMS1424T) and its associated category specifications (AMS1424/1 and AMS1424/2) cover a deicing/anti-icing material in the form of a fluid.

1.1.1 Foundation and Category Specifications

This foundation specification establishes the requirements for all Type I deicing/anti-icing fluids, defines glycol (conventional and non-conventional) based and non-glycol based fluids, and contains additional properties and requirements that apply to both glycol (conventional and non-conventional) and non-glycol based products.

1.1.2 Fluid Concentration

Type I deicing/anti-icing fluid is supplied in different forms: concentrate or ready-to-use (dilute).

1.1.2.1 Concentrate

Fluid supplied as concentrate, typically containing 80 to 92% glycol, shall be diluted before use, as this concentration may exceed its acceptable aerodynamic limit. Consult the fluid manufacturer for the maximum usable concentration.

1.1.2.2 Ready-to-Use

Fluid supplied as ready-to-use does not require additional dilution before use. To achieve the desired lowest operational use temperature (LOUT), the concentration of the ready-to-use fluid may need to be adjusted. Consult the fluid manufacturer for guidance.

1.2 Application

The fluid is generally used heated and either diluted with water or as supplied for the removal of deposits of ice, snow, and frost on exterior aircraft surfaces prior to takeoff.

1.2.1 Consult the aircraft manufacturer's maintenance manual and service letters to determine any restrictions relating to the use of deicing/anti-icing fluids for type and model of aircraft being treated (refer to AS6285).

1.2.2 The manufacturer shall determine and report the LOUT for the recommended dilutions of their fluid(s).

1.2.2.1 The LOUT for an SAE Type I fluid is the lowest temperature at which the fluid has been tested and qualified in accordance with the appropriate aerodynamic acceptance tests (see 3.5.3) while maintaining the 18 °F (10 °C) freezing point buffer (refer to AS6285).

1.3 Precautions

1.3.1 The deicing/anti-icing formulation may be mildly toxic, and contact with human skin and eyes should be avoided. Prolonged exposure to concentrations of vapor and wind-borne mists should be avoided. Consult the manufacturer's Safety Data Sheet for further information.

1.3.2 A fluid meeting all other requirements of this specification may not meet the aerodynamic acceptance test criteria in the concentrated form. This fluid shall only be used diluted to the ratios that meet the aerodynamic acceptance test criteria.

1.3.3 The fluid should be used with extreme care when applied in the immediate vicinity of heaters or engine exhausts.

1.3.4 Reserved

1.3.5 Slippery conditions may exist on the ground or on equipment following deicing/anti-icing procedures.

- 1.3.6 A fluid meeting this specification is unique to the manufacturer and may be adversely affected by mixing with other aircraft deicing/anti-icing fluids. Adverse effects may also result from the mixing of glycol (conventional and non-conventional) based and non-glycol based aircraft deicing/anti-icing fluids and should be tested prior to use. Users of AMS1424/1 and AMS1424/2 Type I fluids shall ensure that the Type I fluid is compatible with the AMS1428 Type II, Type III, or Type IV fluid that is used in combination with the Type I fluid.
- 1.3.7 At the option of the user, a field spray test shall be performed to demonstrate and evaluate fluid application characteristics. The field spray test should be performed according to ARP6207, Section 4.
- 1.3.8 Deicing/anti-icing fluids should be compatible with carbon brake material. The industry standard test method for compatibility is AIR5567.

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 any hazards that 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 processes and to take necessary precautionary measures to ensure the health and safety of all personnel involved.

1.5 Fluid Qualification

- 1.5.1 For fluids qualified under previous versions of this specification, only tests for which the technical requirements have changed in subsequent versions from the original qualification need to be performed in order for the fluid to meet the requirements of the current version of this specification.

2. APPLICABLE DOCUMENTS

The issue of the following documents in effect on the date of the purchase order forms a part of this specification to the extent specified herein. The supplier may work to a subsequent revision of a document unless a specific document issue is specified. When the referenced document has been cancelled and no superseding document has been specified, the last published issue of that document shall apply.

2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

AMS1424/1	Deicing/Anti-Icing Fluid, Aircraft, SAE Type I Glycol (Conventional and Nonconventional) Based
AMS1424/2	Deicing/Anti-Icing Fluid, Aircraft, SAE Type I Non-Glycol Based
AMS1428	Fluid, Aircraft Deicing/Anti-Icing, Non-Newtonian (Pseudoplastic), SAE Types II, III, and IV
AMS2470	Anodic Treatment of Aluminum Alloys, Chromic Acid Process
AMS2475	Protective Treatments, Magnesium Alloys
AMS4037	Aluminum Alloy, Sheet and Plate, 4.4Cu - 1.5Mg - 0.60Mn (2024; -T3 Flat Sheet, -T351 Plate), Solution Heat Treated
AMS4041	Aluminum Alloy, Sheet and Plate, Alclad, 4.4Cu - 1.5Mg - 0.60Mn (2024, -T3 Sheet/-T351 Plate with 1-1/2% Alclad), Solution Heat Treated, Cold Worked, and Naturally Aged
AMS4049	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
AMS4376	Plate, Magnesium Alloy, 3.0Al - 1.0Zn - 0.20Mn (AZ31B-H26), Cold Rolled and Partially Annealed

AMS4911	Titanium Alloy, Sheet, Strip, and Plate, 6Al - 4V, Annealed
AMS5045	Steel, Sheet and Strip, 0.25 Carbon, Maximum (SAE 1020), Hard Temper
AMS5886	Alloy, Corrosion and Heat-Resistant, Bars, Forgings, and Rings, 50Ni - 20Cr - 20Co - 5.8Mo - 2.2Ti - 0.45Al, Consumable Electrode or Vacuum Induction Melted, 2100 °F (1149 °C) Solution Heat Treated
AMS-P-83310	Plastic Sheet, Polycarbonate, Transparent
AIR5567	Test Method for Catalytic Carbon Brake Disk Oxidation
ARP6207	Qualifications Required for SAE Type I Aircraft Deicing/Anti-Icing Fluids
AS5900	Standard Test Method for Aerodynamic Acceptance of AMS1424 and AMS1428 Aircraft Deicing/Anti-Icing Fluids
AS5901	Water Spray and High Humidity Endurance Test Methods for AMS1424 and AMS1428 Aircraft Deicing/Anti-Icing Fluids
AS6285	Aircraft Ground Deicing/Anti-Icing Processes

2.2 ANSI Accredited Publications

Copies of these documents are available online at <https://webstore.ansi.org/>.

ANSI Z400.1/Z129.1-2010 Hazardous Workplace Chemicals - Hazard Evaluation and Safety Data Sheet and Precautionary Labeling Preparation

2.3 APHA Publications

Available from American Public Health Association, 800 I Street, NW, Washington, DC 20001, 202-777-2742 or www.apha.org.

Standard Methods for the Examination of Water and Wastewater

2.4 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM C672	Scaling Resistance of Concrete Surfaces Exposed to Deicing Chemicals
ASTM D93	Flash Point by Pensky-Martens Closed Tester
ASTM D445	Kinematic Viscosity of Transparent and Opaque Liquids (and the Calculation of Dynamic Viscosity)
ASTM D1177	Freezing Point of Aqueous Engine Coolants
ASTM D1193	Reagent Water
ASTM D1218	Refractive Index and Refractive Dispersion of Hydrocarbon Liquids
ASTM D1568	Sampling and Chemical Analysis of Alkylbenzene Sulfonates
ASTM D3278	Flash Point of Liquids by Small Scale Closed-Cup Apparatus
ASTM D4177	Automatic Sampling of Petroleum and Petroleum Products

ASTM E70	pH of Aqueous Solutions with the Glass Electrode
ASTM F483	Total Immersion Corrosion Test for Aircraft Maintenance Chemicals
ASTM F484	Stress Cracking of Acrylic Plastics in Contact with Liquid or Semi-Liquid Compounds
ASTM F485	Effects of Cleaners on Unpainted Aircraft Surfaces
ASTM F502	Effects of Cleaning and Chemical Maintenance Materials on Painted Aircraft Surfaces
ASTM F519	Mechanical Hydrogen Embrittlement Testing of Plating Processes and Aircraft Maintenance Chemicals
ASTM F945	Stress-Corrosion of Titanium Alloys by Aircraft Engine Cleaning Materials
ASTM F1105	Preparing Aircraft Cleaning Compounds, Liquid Type, Solvent Based for Storage Stability Testing
ASTM F1110	Sandwich Corrosion Test
ASTM F1111	Corrosion of Low-Embrittling Cadmium Plate by Aircraft Maintenance Chemicals

2.5 Organization for Economic Cooperation and Development (OECD) Publications

Available from OECD, 2, rue André Pascal, Cedex 16, 75016 Paris, France, Tel: +33 1.45.24.82.00 or www.oecd.org.

OECD Environmental Data; Guidelines for Testing of Chemicals (Methods 202 and 203)

2.6 U.S. Government Publications

Copies of these documents are available online at <https://www.epa.gov/>.

EPA 40 CFR 136.3 Identification of Test Procedures

EPA 40 CFR 797.1300 Daphnid Acute Toxicity Test

EPA 40 CFR 797.1400 Fish Acute Toxicity Test

Copies of these documents are available online at <https://quicksearch.dla.mil>.

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

MIL-STD-870 Cadmium Plating, Low Embrittlement, Electrodeposited

3. TECHNICAL REQUIREMENTS

3.1 Material

Fluid composition shall be optional with the manufacturer; however, the product shall be based on freezing point depressants, with additives, such that the finished product shall meet all requirements of this specification. The fluid shall neither be thickened nor shall it contribute to mold creation or growth.

3.1.1 Definition of Glycol (Conventional and Non-Conventional) and Non-Glycol

For the purpose of classification for AMS1424 aircraft deicing/anti-icing fluid, freezing point depressants used to formulate AMS1424T Type I deicing/anti-icing fluids are classified as “glycol (conventional and non-conventional)” and “non-glycol.”

- 3.1.1.1 Glycol (conventional) is defined as ethylene glycol, diethylene glycol, or propylene glycol.
- 3.1.1.2 Glycol (non-conventional) is defined as organic non-ionic diols and triols, e.g., 1,3-propanediol, glycerin, and mixtures thereof, and mixtures with glycol (conventional).
- 3.1.1.3 Non-glycol is defined as all that is not glycol (conventional and non-conventional), such as organic salts, e.g., sodium formate, sodium acetate, potassium formate, potassium acetate, and any mixtures thereof. Mixtures of glycol (conventional and non-conventional) and non-glycol are defined as non-glycol.

3.1.2 Requirements

- 3.1.2.1 Glycol (conventional and non-conventional) based fluids shall meet all the technical requirements of this specification, except 3.1.3.
- 3.1.2.2 Non-glycol based fluids shall meet all the technical requirements of this specification, including 3.1.3.

3.1.3 Non-Glycol Based Fluids

A fluid based on non-glycol freezing point depressants shall be tested as follows: Two pieces of AMS5886 bar, 35-mm diameter and 15-mm long, shall have one end of each machined flat. An 8.5-mm drill shall then be used to drill a centered hole 6.5-mm deep in one end to allow the milling of a cup-shaped depression. A 12.5-mm bull-nosed end mill shall be used to open up the drilled hole to produce a 7-mm deep depression. The cup shall then be finished by improving the surface with 600- μ m, 180- μ m, and 6- μ m diamond paste. The cups shall be cleaned and degreased using a suitable solvent and allowed to dry. One cup shall be filled with the candidate test fluid, the other with water conforming to ASTM D1193 Type IV. Both test pieces shall then be placed in an oven at $221^{\circ}\text{F} \pm 5^{\circ}\text{F}$ ($105^{\circ}\text{C} \pm 2^{\circ}\text{C}$). The fluid shall then be allowed to evaporate by progressive increase in oven temperature at the rate of 18°F (10°C) per minute to a final temperature of $482^{\circ}\text{F} \pm 10^{\circ}\text{F}$ ($250^{\circ}\text{C} \pm 5^{\circ}\text{C}$), where they shall be held at this temperature for 15 minutes $\pm$ 1 minute. Test pieces shall then be transferred to an air furnace set at $1904^{\circ}\text{F} \pm 25^{\circ}\text{F}$ ($1040^{\circ}\text{C} \pm 10^{\circ}\text{C}$) and held at this temperature for 2 hours $\pm$ 5 minutes.

Test pieces shall be removed and allowed to cool to ambient temperature. Microscopic examination of the polished cups at 500X magnification shall be undertaken; no corrosion worse than control shall be evident in the candidate test fluid cup.

The report shall include photographs of both cups after testing, and the candidate test fluid cup shall be identified.

3.1.4 Appearance

The fluid, as received by the purchaser, shall be homogeneous, uniform in color, and free from skins, lumps, and foreign materials detrimental to usage of the product.

3.1.4.1 Color

The fluid color shall be orange.

3.1.5 Environmental Information

The user shall ensure that the fluid meets all local, state, and federal toxicity regulations. The information to satisfy the federal, state, and provincial requirements shall be provided by the manufacturer; for local requirements, upon request from the user.

Formulated fluid shall be tested in accordance with APHA "Standard Methods for the Examination of Water and Wastewater," unless otherwise specified in Appendix A. The manufacturer shall supply not less than the following:

- 3.1.5.1 Biochemical oxygen demand (BOD) of the fluid shall be determined at both 41°F (5°C) and 68°F (20°C). The test solutions shall be incubated at the designated temperatures for 5 days and 28 days. The results shall be reported in terms of kilograms of oxygen per kilogram of concentrate and kilograms of oxygen per kilogram of mixture of fluid and water to formulate a freezing point of -15°F (-26°C).

3.1.5.2 The chemical oxygen demand (COD) of the fluid is expressed in kilograms of oxygen per kilogram of fluid and kilograms of oxygen per kilogram of mixture of fluid and water to formulate a freezing point of -15 °F (-26 °C).

3.1.5.3 Biodegradability

This characteristic can be approximated by determining the ratio of the BOD and COD. The percent of fluid biodegraded can be calculated by dividing BOD by COD and shall be reported for all incubation time periods.

3.1.5.4 Aquatic Toxicity

Formulated fluid shall be tested in accordance with EPA (refer to 40 CFR 797.1300 and 797.1400, revised July 1, 1989, and 40 CFR 136.3) or OECD (refer to Guidelines for Testing of Chemicals, Methods 202 and 203) procedures using test species required by regulatory agencies for permitted discharges. Examples include: fathead minnows (96-hour LC₅₀), *Ceriodaphnia dubia* (48-hour EC₅₀), *Daphnia magna* (48-hour EC₅₀), and rainbow trout (96-hour LC₅₀). The LC₅₀ (for fish) or EC₅₀ (for invertebrates) concentration (the highest concentration at which 50% of the organisms do not survive the test period) shall be given in milligrams per liter (see Appendix A).

3.1.6 Trace Contaminants

Report the presence, in percentage by weight or ppm by weight, of sulfur, halogens, total phosphorus, nitrate, total Kjeldahl nitrogen, and metals (lead, chromium, cadmium, and mercury). Report the test method used and detection limits.

3.2 Physical Properties

The fluid supplied by the vendor, unless otherwise specified, shall conform to the following requirements:

3.2.1 Flash Point

Shall be not lower than 212 °F (100 °C), determined in accordance with ASTM D93 or ASTM D3278. In case of dispute, the flash point in accordance with ASTM D93 shall apply.

3.2.2 Repealed

3.2.3 pH

Shall be within ±0.5 units of the initial qualification value, determined in accordance with ASTM E70.

3.2.4 Refractive Index

Shall be within ±0.0015 units of the initial qualification value, determined in accordance with ASTM D1218, with the following acceptable variations:

- The cleaning procedures and materials shall be sufficient to ensure the prism face is completely clean of previously measured fluids. For AMS1424 fluids, deionized water and/or ethanol is normally sufficient for this purpose.
- The sample volume shall be sufficient to allow an accurate measurement with the instrument used.
- The functionality of the instrument shall be verified with water every day as a daily check and shall be calibrated according to the instrument manufacturer's instructions or annually if no recommendation is given.

NOTE: The measurement of refractive index is critically dependent on the temperature. Sufficient time should be allowed for the ambient conditions, instrument, and fluid sample to equilibrate to 68 °F (20 °C) (refer to ASTM D1218, Notes 8 and 9).

3.2.5 Freezing Point

Shall be within ± 5 °F (± 3 °C) of the initial qualification value, determined in accordance with ASTM D1177.

NOTE: If the fluid supplied by the vendor is a concentrate intended to be diluted prior to use, the freezing point shall be determined after dilution 1:1 by volume with ASTM D1193, Type IV, water. The refractive index of the diluted fluid that is tested shall also be reported.

3.2.6 Repealed

3.2.7 Viscosity

Shall be within $\pm 5\%$ of the initial qualification value at 68 °F, 32 °F, 14 °F, and -4 °F (+20 °C, 0 °C, -10 °C, and -20 °C) when determined in accordance with ASTM D445.

3.3 Fluid Stability

The fluid, as supplied by the vendor, shall conform to the following requirements:

3.3.1 Storage Stability

Prior to the start of this test, determine the viscosity at 68 °F (20 °C) in accordance with ASTM D445. The fluid shall then be subjected to one complete cycle as outlined in ASTM F1105. On completion of the cycle, the fluid shall be retested for viscosity as before and the result compared to the original values. These results shall not vary by more than +10% or -20%. The pH of the aged fluid, determined as in 3.2.3, shall be within ± 0.5 units of the unaged sample. A portion of the fluid shall then be diluted 1:1 with ASTM D1193, Type IV, water. There shall be no evidence of separation, precipitation, or insoluble deposits in the fluid or the 1:1 dilution.

3.3.2 Thermal Stability - Accelerated Aging for Concentrate and Ready-to-Use Fluids (to Simulate Long-Term Heated Storage Without Water Loss)

Age sample as in 3.3.2.1 and examine as in 3.3.2.2.

3.3.2.1 Transfer 800 mL $\pm$ 10 mL of fluid to a 1-L borosilicate bottle (e.g., Pyrex® brand or equivalent) fitted with a tight, heat-resistant plastic seal and tightly close. For the reference sample, also keep 800 mL $\pm$ 10 mL of the fluid in an identical bottle and store at room temperature until the completion of 3.3.2.2. Transfer the other closed bottle containing the test fluid to a circulating-air oven or heated oil or water bath. Elevate the temperature to 176 °F $\pm$ 4 °F (80 °C $\pm$ 2 °C) and maintain the sample in this environment for 30 days.

3.3.2.2 After 30 days, remove the test sample from the heated environment and examine the contents for evidence of separation, precipitation, or insoluble deposits. Report any evidence of these factors. Allow the test sample to cool to 68 °F $\pm$ 4 °F (20 °C $\pm$ 2 °C). Turn the test sample bottle upside down and then right side up. Repeat this rotation procedure three additional times and then examine the contents for evidence of separation, precipitation, or insoluble deposits versus the unheated reference sample. Report findings. Determine the refractive index of the test and reference samples as in 3.2.4. If the test and reference samples have a refractive index difference of greater than 0.0020, the test is invalid. If the test is valid and the fluid tested is a concentrate fluid, dilute both the test and reference fluids 50/50 by volume with ASTM D1193, Type IV, water and measure the pH as in 3.2.3. If the test fluid is a ready-to-use fluid, no further dilution is necessary, and the pH should be measured as in 3.2.3. The pH difference between the heat-aged test sample and the unheated reference sample shall not be greater than 1.0 unit. The heat-aged test sample shall be tested according to AS5901 (WSET only) using one set of three plates and shall have a minimum time of 3 minutes.

3.3.3 Hard Water Stability

Fluid supplied as concentrate shall be diluted 1:1 by volume with standard hard water made up as in 3.3.3.1. Determine the refractive index of the diluted fluid as in 3.2.4 and the pH as in 3.2.3. Age the diluted fluid as in 3.3.2.1 but at a storage temperature of $203^{\circ}\text{F} \pm 4^{\circ}\text{F}$ ($95^{\circ}\text{C} \pm 2^{\circ}\text{C}$). After 30 days, remove the bottle from the heated environment and examine the contents for evidence of separation or insoluble deposits. Report any evidence of these factors. Allow the sample to cool to $68^{\circ}\text{F} \pm 4^{\circ}\text{F}$ ($20^{\circ}\text{C} \pm 2^{\circ}\text{C}$). Turn the test sample bottle upside down and then right side up. Repeat this rotation procedure three additional times. Reexamine and report any evidence of separation or insoluble deposits. Retest for refractive index as before and record the result. If the refractive index of the aged fluid has increased by more than 0.0020, the test is invalid. If the refractive index is within limits, the pH of the aged fluid shall be determined as before and shall not vary by more than 1.0 unit from the unaged value. The aged sample shall be tested according to AS5901 (WSET only) using one set of three plates and shall have a minimum time of 3 minutes.

NOTE: Additional testing to demonstrate fluid stability with softer water (as designated by the user) may be required as agreed to by the user and the fluid manufacturer.

3.3.3.1 Composition of Hard Water

Dissolve $400\text{ mg} \pm 5\text{ mg}$ calcium acetate dihydrate ($\text{Ca}(\text{C}_2\text{H}_3\text{O}_2)_2 \cdot 2\text{H}_2\text{O}$) or $363\text{ mg} \pm 5\text{ mg}$ calcium acetate monohydrate ($\text{Ca}(\text{C}_2\text{H}_3\text{O}_2)_2 \cdot \text{H}_2\text{O}$) and $280\text{ mg} \pm 5\text{ mg}$ magnesium sulfate heptahydrate ($\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$), both of analytical reagent quality, in 1 L of ASTM D1193, Type IV, water.

3.3.4 Shear Stability

The anti-icing performance tests as in 3.5.2 shall start within 2 hours after the product has been sheared, but not within the first 20 minutes after shearing, using the laboratory method as in 3.3.4.1.

3.3.4.1 Run a laboratory blender (Waring model number 7012G, or equivalent) with the 1-L glass mixing container removed for a 5-minute warming period at $3000\text{ rpm} \pm 100\text{ rpm}$. Pour $500\text{ mL} \pm 5\text{ mL}$ of fluid at $68^{\circ}\text{F} \pm 4^{\circ}\text{F}$ ($20^{\circ}\text{C} \pm 2^{\circ}\text{C}$) into the 1-L mixing container. Mix for $10\text{ minutes} \pm 10\text{ seconds}$ at $3400\text{ rpm} \pm 100\text{ rpm}$. The blender shall be calibrated using a noncontact optical tachometer to provide a mix speed of $3400\text{ rpm} \pm 100\text{ rpm}$ using 500 mL of water. This noncontact calibration can be performed by placing the blender on a stand and elongating the rotating shaft at the base to measure the rotation speed with the mixing container in place.

3.3.5 Foam Stability

3.3.5.1 The foaming tendency of the fluid is determined using a cold plate foam test, which is conducted using a precooled chiller unit (frosticator) inside a cold chamber. The cold chamber and the frosticator are described in detail in AS5901. Prior to application, the fluid is heated, and foam is generated by subjecting the fluid to vigorous agitation using a high-shear mixing device.

3.3.5.2 Fluid supplied as concentrate shall be diluted 1:1 by volume with standard hard water made up as in 3.3.3.1 before testing. Ready-to-use fluid shall be tested as received.

3.3.5.3 Tests shall be conducted at two temperatures: $14^{\circ}\text{F} \pm 0.9^{\circ}\text{F}$ ($-10^{\circ}\text{C} \pm 0.5^{\circ}\text{C}$) and $32^{\circ}\text{F} \pm 0.9^{\circ}\text{F}$ ($0^{\circ}\text{C} \pm 0.5^{\circ}\text{C}$). The cold chamber shall be maintained at the desired test temperature throughout the evaluation. The frosticator coolant temperature shall be adjusted such that the test surface (refer to AS5901, 4.3, for test surface options) is at the desired test temperature at the start of the test. Allow sufficient time for the frosticator to equilibrate to the desired test temperature before beginning the test. The slope of the frosticator test surfaces (slots) shall be $10\text{ degrees} \pm 0.2\text{ degree}$ above the horizontal. Test surfaces shall be free of all visible contamination, smears, or stains. Between test runs using the same fluid, the frosticator test slots shall be thoroughly rinsed with water and dried. Between test runs using different fluids, test slots shall be thoroughly rinsed with water followed by an ethanol rinse and drying.

3.3.5.4 Heat 800 mL $\pm$ 5 mL of the test fluid to 140 °F $\pm$ 2 °F (60 °C $\pm$ 1 °C) in a 1000-mL glass beaker with sufficient agitation to prevent fluid bumping. Alternate heating containers may also be employed. When the fluid has reached 140 °F $\pm$ 2 °F (60 °C $\pm$ 1 °C), transfer to a 1-L Waring blender glass mixing container and shear as in 3.3.4.1 for 15 seconds $\pm$ 1 second. Immediately after shearing, pour the hot fluid evenly across the six frosticator slots. This should be done in a uniform back-and-forth motion to distribute the foam and liquid as evenly as possible on the test surfaces. Allow the fluid to remain on the frosticator for 15 minutes while maintaining the cold chamber at the desired test temperature. At the end of the 15-minute test period, estimate and report the percent of the total test area covered by foam. Photographs should be taken at the end of the 15-minute test period and should be included with the test report. Optionally, photos also taken at intervals during the test may be useful. Comments on foam behavior and coverage estimates at intervals during the test may also prove to be useful. A foam evaluation percentage chart may also provide an acceptable means of estimating the percent foam coverage. Average temperatures of the cold chamber and the test surface shall also be included in the test report.

3.4 Effect on Aircraft Materials

The fluid shall conform to the following requirements in the form supplied by the vendor and, if a concentrate intended to be diluted prior to use, diluted 1:1 by volume with ASTM D1193, Type IV, water, except as noted:

3.4.1 Sandwich Corrosion

Specimens, after testing in accordance with ASTM F1110, shall not have a rating greater (worse) than one.

3.4.2 Total Immersion Corrosion

The fluid, tested in accordance with ASTM F483, shall neither show evidence of corrosion of panels nor cause a weight change of any test panel greater than as shown in Table 1.

Table 1 - Total immersion corrosion

Test Panel		Weight Change mg/cm ² per 24 hours
AMS4037	Aluminum Alloy, anodized as in AMS2470	0.3
AMS4041	Aluminum Alloy	0.3
AMS4049	Aluminum Alloy	0.3
AMS4376	Magnesium Alloy, dichromate treated as in AMS2475	0.2
AMS4911	Titanium Alloy	0.1
AMS5045	Carbon Steel	0.8

3.4.3 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 F1111.

3.4.4 Stress-Corrosion Resistance

The fluid shall not cause cracks in AMS4911 titanium alloy specimens, determined in accordance with ASTM F945, Method A.

3.4.5 Hydrogen Embrittlement

The fluid shall be non-embrittling, determined in accordance with ASTM F519, utilizing Type 1a, 1c, or 2a specimens cadmium plated in accordance with MIL-STD-870, Class 1, Type 1. In case of dispute, the 1c bar shall be used. Type 1a and Type 1c specimens shall be loaded to 45% of the predetermined notch fracture strength, and Type 2a specimens shall be loaded to 80% of the yield strength. The entire Type 2a stressed specimen, or just the notched area of the Type 1a and Type 1c stressed specimens, shall be immersed continuously in the fluid under test for 150 hours at a temperature of 77 °F $\pm$ 9 °F (25 °C $\pm$ 5 °C). The test specimens shall be galvanically isolated. Galvanic reactions can be prevented by confining the test sample to the test specimen using a chemically inert cup.

3.4.6 Effect on Transparent Plastics

- 3.4.6.1 Fluid shall be diluted with ASTM D1193, Type IV, water to the maximum intended fluid/water concentration recommended for use by the manufacturer. The diluted fluid, heated to and applied at $149^{\circ}\text{F} \pm 4^{\circ}\text{F}$ ($65^{\circ}\text{C} \pm 2^{\circ}\text{C}$) and then allowed to cool naturally to the test temperature specified in ASTM F484, shall not craze, stain, or discolor MIL-PRF-25690 stretched acrylic plastic, determined in accordance with ASTM F484.
- 3.4.6.2 Fluid supplied as concentrate shall be diluted to the maximum intended fluid/water concentration with standard hard water made up as in 3.3.3.1. The diluted fluid or the ready-to-use fluid, heated to and applied at $149^{\circ}\text{F} \pm 4^{\circ}\text{F}$ ($65^{\circ}\text{C} \pm 2^{\circ}\text{C}$) and then allowed to cool naturally to the test temperature specified in ASTM F484, shall not craze, stain, or discolor AMS-P-83310 polycarbonate plastic, determined in accordance with ASTM F484, except that the specimens shall be stressed for 30 minutes $\pm$ 2 minutes to an outer fiber stress level of 13.8 MPa (2000 psi).

3.4.7 Effect on Painted Surfaces

Fluid, heated to $149^{\circ}\text{F} \pm 4^{\circ}\text{F}$ ($65^{\circ}\text{C} \pm 2^{\circ}\text{C}$) and applied to a painted surface having an initial surface temperature of $72^{\circ}\text{F} \pm 2^{\circ}\text{F}$ ($22^{\circ}\text{C} \pm 1^{\circ}\text{C}$), shall not produce any streaking, discoloration, or blistering of the paint film and shall not decrease paint film hardness by more than two pencil hardness numbers, determined in accordance with ASTM F502.

3.4.8 Effect on Unpainted Surfaces

Fluid, tested in accordance with ASTM F485, shall neither produce streaking nor leave stains that require polishing to remove.

3.4.9 Runway Concrete Scaling Resistance

The condition of the runway concrete surface shall have a rating not greater than one for 50 freeze-thaw cycles, determined in accordance with ASTM C672, except that the concrete shall be air-entrained with an air content as specified in ASTM C672, have a minimum cement content of $510 \text{ lb/yd}^3 \pm 10 \text{ lb/yd}^3$ ($302 \text{ kg/m}^3 \pm 6 \text{ kg/m}^3$), and have a slump of 1.5 inches $\pm$ 0.5 inch (38 mm $\pm$ 13 mm). A 25% $\pm$ 1% volume solution of the fluid prepared using tap water shall be substituted for the specified calcium chloride solution. Performing more than one freeze-thaw cycle per day is acceptable.

3.5 Performance Properties

The fluid shall conform to the following requirements:

3.5.1 Freezing Point

Fluid supplied as concentrate shall, after dilution 1:1 by volume with ASTM D1193, Type IV, water, have a freezing point not higher than -4°F (-20°C), determined in accordance with ASTM D1177. Freezing point shall be expressed as a function of volume dilution with water and shall be reported from 100:0 to 0:100, with each increment of 10% expressed.

- 3.5.1.1 For fluid supplied as ready-to-use, the freezing point shall be determined on the fluid in the as-supplied form in accordance with ASTM D1177. The refractive index of the ready-to-use fluid shall also be reported.

3.5.2 Anti-Icing Performance

Ready-to-use fluid shall be tested in the form supplied by the vendor. Concentrate fluid shall be tested in two diluted forms. The diluted forms shall be made with hard water as defined in 3.3.3.1. The two diluted forms shall be:

1. A 50/50 by-volume ratio of fluid concentrate and hard water (50 parts fluid concentrate/50 parts hard water).
2. A volume ratio of the highest concentration of fluid concentrate recommended for use by the manufacturer and the balance being hard water to make up 100 parts (e.g., 75 parts fluid concentrate/25 parts hard water).

The fluid or fluids as tested shall protect against formation of frozen deposits within the failure zone depicted in Figure 1 of AS5901 for not less than 3 minutes in the water spray endurance test (WSET) procedure and for not less than 20 minutes in the high humidity endurance test (HHET) procedure. The confirmation shall be obtained from each of six panels, three panels from two successive test runs for each type of test. Testing shall be done in a facility meeting the requirements set forth in 4.2 of AS5901. Prior to the anti-icing performance test, the fluid, or the diluted fluid, shall first be sheared in accordance with 3.3.4.1.

3.5.3 Aerodynamic Acceptance Test

The fluid shall demonstrate acceptable aerodynamic performance when tested in accordance with the AS5900 high-speed ramp test, middle-speed ramp test, and/or low-speed ramp test.

The high-speed ramp test is the approved aerodynamic test for fluids used on large transport-type jet aircraft, defined as aircraft with takeoff rotation speeds exceeding 100 kts, with time from brake release to rotation speed greater than 20 seconds and time to liftoff greater than approximately 25 seconds.

The middle-speed ramp test was developed to provide additional operational capability for aircraft such as regional turboprops with lower rotational speed than large transport-type jet aircraft, defined as aircraft with takeoff rotation speeds between 80 and 100 kts, with time from brake release to rotation speed between 16 to 20 seconds.

The low-speed ramp test is the approved aerodynamic test for fluids used on lower takeoff rotation speed commuter aircraft, defined as aircraft with takeoff rotation speeds between 60 to 100 kts, with time from brake release to rotation speed between 15 to 20 seconds.

A fluid is acceptable for use on large transport-type jet aircraft, larger turboprop aircraft, or on lower takeoff rotation speed commuter aircraft if it meets the criteria defined in 7.3 of AS5900 (see 1.2.1). Consult the aircraft manufacturer for guidance on which ramp applies to a particular aircraft, if not already specified in the aircraft manufacturer's manuals.

3.5.3.1 Final fluid thickness shall be measured and averaged in accordance with AS5900 and shall be based on an initial thickness of 2 mm (2000 µm) on the test duct floor. The final fluid thickness shall not be greater than 400 µm for the high-speed ramp test, 500 µm for the middle-speed ramp test, and 600 µm for the low-speed ramp test at all tested temperatures.

3.5.3.2 Tests will be performed depending on the forms in which the fluid is supplied by the vendor.

Case 1: The fluid is supplied only in concentrated form (intended for use diluted). The fluid concentrate shall be tested in two diluted forms in accordance with AS5900 and AS5901. The diluted forms shall be made with ASTM D1193, Type IV, water. The two diluted forms shall be:

1. A 50/50 by-volume ratio of fluid concentrate and water (50 parts fluid concentrate/50 parts water).
2. A volume ratio of the highest concentration of fluid concentrate recommended for use by the manufacturer and the balance being water to make up 100 parts (e.g., 75 parts fluid concentrate/25 parts water).

Case 2: The fluid is only supplied ready-to-use. The fluid shall be tested in accordance with AS5900 and AS5901.

Case 3: The fluid is supplied in both forms, concentrate and ready-to-use. The concentrate shall be tested according to Case 1 requirements. Ready-to-use dilutions falling below the tested dilution range (e.g., a volume ratio less than 50/50) require no additional testing.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The vendor shall supply all samples for testing and shall be responsible for obtaining independent laboratory confirmation of conformance to the requirements of this specification (contained in 3.2 through 3.5.3). Each fluid sample container shall be clearly identified with the vendor's name, the fluid name, the lot number, the fluid dilution if the fluid is supplied concentrate and ready-to-use, and the manufacturing site. The purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the fluid conforms.

4.2 Classification of Tests

4.2.1 Lot Acceptance Tests

Refractive index (see 3.2.4) or freezing point (see 3.2.5) and pH (see 3.2.3) are acceptance tests and shall be performed on each lot. The certificate of analysis shall include the results of the lot acceptance tests.

4.2.2 Initial Qualification Tests

Tests for all technical requirements are initial qualification tests and shall be performed prior to or on the initial shipment of fluid to a purchaser, when a change in ingredients and/or processing requires reapproval as in 4.4.2, and when the purchaser deems confirmatory testing to be required.

Expiration dates of anti-icing performance (see 3.5.2) and aerodynamic acceptance (see 3.5.3) initial qualification tests will be as follows:

- Tests performed between January 1st and May 31st: June 1st two calendar years after the performance of the test (e.g., test performed March 15, 2019, will expire on June 1, 2021).
- Test performed between June 1st and December 31st: two calendar years after the performance of the test (e.g., test performed August 15, 2019, will expire August 15, 2021).

These dates have been chosen to facilitate timely publication of holdover time guidelines and to avoid a backlog at the test lab. Manufacturers are encouraged to submit samples early in the year to assist the test lab and regulators meet these objectives.

4.2.3 Periodic Requalification Tests

Anti-icing performance (see 3.5.2) and aerodynamic acceptance (see 3.5.3) are periodic requalification tests and shall be performed prior to the expiration of the previous anti-icing performance and aerodynamic acceptance tests (approximately 2 years after initial qualification and approximately every 4 years thereafter). Fluids submitted for requalification testing more than 12 months after expiration shall require all testing as if the fluid were initially being qualified.

Expiration dates of anti-icing performance (see 3.5.2) and aerodynamic acceptance (see 3.5.3) periodic requalification tests will be as follows:

- Tests performed between January 1st and May 31st: June 1st four calendar years after the performance of the test (e.g., test performed March 15, 2019, will expire on June 1, 2023).
- Tests performed between June 1st and December 31st: four calendar years after the performance of the test (e.g., test performed August 15, 2019, will expire on August 15, 2023).

These dates have been chosen to facilitate timely publication of holdover time guidelines and to avoid a backlog at the test lab. Manufacturers are encouraged to submit samples early in the year to assist the test lab and regulators meet these objectives.

An approved and autonomous test facility shall perform 3.5.3 testing, and 3.5.2 testing shall be performed by a user-approved and preferably independent facility.

4.3 Sampling and Testing

Shall be in accordance with 4.3.1 or 4.3.2; a lot shall be all fluid produced in one continuous manufacturing process from the same batches of raw materials and presented for the vendor's inspection at one time.

4.3.1 Bulk Shipments

Shall be in accordance with ASTM D4177.

4.3.2 Drum and Tote Shipments

Shall be in accordance with ASTM D1568. The information contained in Section 6 of this test method will ensure that a representative sample for testing will be removed from the drum.

4.3.3 Acceptance Tests

Sufficient fluid from a single lot shall be taken at random to perform all required tests.

4.3.4 Initial Qualification and Periodic Requalification Tests

Sufficient fluid from a single production lot shall be taken at random to perform all required tests.

4.3.5 When a statistical sampling plan has been agreed upon by the purchaser and vendor, sampling shall be in accordance with such plan, in lieu of sampling as in 4.3.1 and 4.3.2, and the report of 4.5 shall state such plan was used.

4.4 Approval

4.4.1 Sample fluid shall be approved by the purchaser before fluid for use is supplied.

4.4.2 The vendor shall use ingredients, manufacturing processes, and methods of inspection for production of fluid that are essentially the same as those used to produce the fluid that is presented for initial qualification. If necessary to make any change in ingredients or manufacturing procedures, the vendor shall notify the customer of the proposed changes and, if requested, shall supply a sample of the fluid produced under the changed conditions. Production fluid made by the revised procedure shall not be shipped to the user until approved by that user.

4.4.2.1 Since glycol is such a high component of Type I fluids, special attention shall be paid when new glycol sources, including recycled glycol, are used. The manufacturer shall ensure that adequate quality assurances and analyses are used to enable compliance with 4.4.2. New glycol sources shall not cause adverse effects that may interfere with the fluid's performance, such as reduced WSET (see 3.5.1) or excessive foaming (see 1.3.7 and ARP6207, Section 4).

4.4.2.2 The sales specification of fluid manufactured with different sources of glycol shall be identical.

4.4.3 Whenever a fluid is to be produced at multiple locations or is to be produced by a licensee or subcontractor, testing shall be required on fluid produced by each production unit, at each site, prior to initial shipment, as detailed in 4.4.3.1 or 4.4.3.2.

4.4.3.1 If the production method, materials, and handling are not the same as the originally qualified vendor's production method, materials, and handling, all testing shall be required on fluid produced by each production unit as if the fluid were being initially qualified (see 4.2.2).

4.4.3.2 If the production method, materials, and handling are the same as the originally qualified vendor's production method, materials, and handling, the fluid shall be reconfirmed by the same aerodynamic acceptance test(s) (see 3.5.3) undertaken during initial fluid qualification and a single WSET (three panels only). Ready-to-use fluids shall be tested in the as-supplied form only. Concentrates shall be tested in the 50/50 dilution form only (see 3.5.2).

- 4.4.3.3 Once the production unit at the multiple locations has been confirmed as in 4.4.3.1 or 4.4.3.2, no additional testing is required unless the production method, materials, or handling changes, in which case testing as in 4.4.3.1 is required.

4.5 Reports

The vendor of the fluid shall furnish, before the initial shipment, a report showing the results of tests to determine conformance to all technical requirements. These tests shall be carried out by independent testing facilities. The facility performing the aerodynamic acceptance test (see 3.5.3) shall determine the viscosity (see 3.2.7), refractive index (see 3.2.4), and surface tension (see 3.2.6) from the sample of fluid submitted for testing. The report shall clearly indicate the fluid dilution ratio specified by the vendor, if different than 1:1 by volume with water, and all concentrations tested for anti-icing performance (see 3.5.2) and aerodynamic performance (see 3.5.3). The report shall include the purchase order number, lot number, AMS1424T, the manufacturer's product identification, quantity, and name of location.

- 4.5.1 Subsequent reports of the results of periodic tests shall be compared to the manufacturer's initial qualification results to check for product consistency as required by users.

- 4.5.2 A safety data sheet (SDS) conforming to ANSI Z400.1/Z129.1-2010, or equivalent for the countries in which the product will be sold, shall be supplied to each purchaser prior to, or concurrent with, the report of preproduction test results or - if the preproduction tests are waived by the purchaser - concurrent with the first shipment of fluid for use. Modification of fluid formulation or change in the reportable status of any of the raw materials used shall be accompanied by a revised material SDS.

4.6 Resampling and Retesting

If any sample used in the above tests fails to meet the specified requirements, disposition of the fluid may be based on the results of testing three additional samples for each original nonconforming sample. In the case of WSET or HHET, the number of additional tests for a failed test should be restricted to two. Failure of any retest sample to meet the specified requirements shall be cause for rejection of the fluid lot represented. Results of all tests shall be reported.

5. PREPARATION FOR DELIVERY

5.1 Packaging and Identification

- 5.1.1 The fluid shall be packaged in containers of a size and type acceptable to the purchaser or shall be delivered in bulk.
- 5.1.2 A lot of fluid may be packaged in small quantities and delivered under the basic lot approval, provided lot identification is maintained.
- 5.1.3 Each container of fluid, except for bulk shipments, shall be legibly marked with not less than the manufacturer's identification (name or reference code), lot number, quantity, AMS1424/1 Type I aircraft deicing/anti-icing fluid for glycol (conventional and non-conventional) based fluids or AMS1424/2 Type I aircraft deicing/anti-icing fluid for non-glycol based fluids, and, if requested, purchase order number.
- 5.1.4 Labeling requirements shall meet federal, state, and local laws. In the United States, there are states whose right-to-know regulations relate to labeling. Product that is to be manufactured, stored, or used in those states is subject to those regulations.
- 5.1.5 Containers of fluid shall be prepared for shipment in accordance with commercial practice and in compliance with applicable rules and regulations pertaining to the handling, packaging, labeling, and transportation of the fluid to ensure carrier acceptance and safe delivery.

6. ACKNOWLEDGMENT

A vendor shall mention this specification number and its revision number in all quotations and when acknowledging purchase orders.

7. REJECTIONS

Fluid not conforming to this specification, or to modifications authorized by the purchaser, shall be subject to rejection.

8. NOTES

NOTICE

This document references a part which contains cadmium as a plating material. Consult local officials if you have questions concerning cadmium's use.

Cadmium is carcinogenic to humans (International Agency for Research on Cancer (IARC), Group 1) and is hazardous to ecosystems and human health. Suggest use of alternative materials, when possible.

NOTICE

This specification may reference the use of substances, products, or processes that are restricted or banned by local (regional) chemical substance regulations. Users of this specification should consider the implications of local legislation on the products, substances, and processes referred to within the document.

8.1 Revision Indicator

A change bar (I) located in the left margin is for the convenience of the user in locating areas where technical revisions, not editorial changes, have been made to the previous issue of this document. An (R) symbol to the left of the document title indicates a complete revision of the document, including technical revisions. Change bars and (R) are not used in original publications, nor in documents that contain editorial changes only.

8.2 Dimensions and properties in inch/pound units and the Fahrenheit temperatures are primary; dimensions and properties in SI units and the Celsius temperatures are shown as the approximate equivalents of the primary units and are presented only for information.

8.3 Purchase documents should specify not less than the following:

AMS1424T

Size and type of containers desired

Quantity desired

Packaging requirements (see 5.1.4)

PREPARED BY SAE G-12ADF AIRCRAFT DEICING FLUIDS

APPENDIX A - ENVIRONMENTAL REQUIREMENTS AND TEST METHODS

- A.1 For Type I aircraft deicing fluids intended for sale and use in North America, the following sections further particularize specified sections of AMS1424 or otherwise augment AMS1424.
- A.1.1 The requirements in this section further particularize those of 3.1.4 and shall be tested in accordance with APHA "Standard Methods for the Examination of Water and Wastewater." The most concentrated form of each Type I fluid formulation offered for sale shall be analyzed, provided that any fluid that is derived from a concentrated fluid simply by the addition of water need not be separately analyzed. The manufacturer shall supply not less than the following:
- A.1.2 The requirements in this section further particularize those of 3.1.4.4 and shall be tested in accordance with EPA (refer to 40 CFR 797.1300 and 797.1400, revised July 1, 1989, and 40 CFR 136.3) procedures using test species required by regulatory agencies for permitted discharges. Species to be tested include: fathead minnows (96-hour LC₅₀), *Ceriodaphnia dubia* (48-hour LC₅₀), *Daphnia magna* (48-hour LC₅₀), and rainbow trout (96-hour LC₅₀). The LC₅₀ (for fish) or EC₅₀ (for invertebrates) concentration (the highest concentration at which 50% of the organisms do not survive the test period) shall be given in milligrams per liter. A valid test shall contain at least one exposure concentration in which there is greater than 50% mortality/effect to the test organisms and one concentration in which there is less than 50% mortality/effect to the test organisms. For tests conducted utilizing *Ceriodaphnia dubia*, the tests shall follow the procedures provided in 40 CFR 136.3.
- A.1.3 LC₅₀ values shall be expressed in terms of the formulated fluid, a fluid containing 85% glycol by volume, and a dilution that has a freezing point of -15 °F (-26 °C). Furthermore, the percent water and percent glycol in the formulated fluid concentrate shall be reported. Aquatic toxicity data on formulations shall be reported at the time of product certification.
- A.1.4 Aquatic Toxicity Standard

Any Type I deicing fluid shall exhibit the following performance:

A fluid aquatic toxicity greater than or equal to 4000 mg/L. It is the intent of the G-12 Committee to review this standard and revise it upward to 10000 mg/L or another appropriate value as data become available that such a value is technically feasible. Any such revised standard shall be scheduled to take reasonable account of research and development interests.

- A.1.5 For the purposes of this specification, "aquatic toxicity" shall mean the concentration of a sample that is lethal to 50% of the test population (the LC₅₀ or EC₅₀). "Fluid aquatic toxicity" shall be the aquatic toxicity to the most sensitive of those organisms required to be tested pursuant to 3.1.4.4. Conformance with this standard shall be based on the fluid aquatic toxicity of a fluid containing 85% glycol by volume. Where more than one LC₅₀ or EC₅₀ is developed consistent with the provisions of 3.1.4.4 for a test organism, the aquatic toxicity to that organism shall be the average of all LC₅₀/EC₅₀s available to the manufacturer at the time of submission. It is the intent of this section that any Type I aircraft deicing fluid formulation that is in use prior to the implementation of the 4000-mg/L standard may, subject to any applicable law or regulation, continue to be sold and used after the implementation of that standard.

NOTE: The aquatic toxicity standard established herein applies only to Type I aircraft deicing fluids. It would be technically unsupportable and otherwise inappropriate to employ that standard in connection with any Type II, Type III, or Type IV aircraft deicing fluid or with any runway deicing product.