

MIL-STD-1210B

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**SUPERSEDING
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MILITARY STANDARD

FOG AND ICE PREVENTIVE COMPOUNDS



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DEPARTMENT OF DEFENSE
Washington, D. C. 20301

Fog and Ice Preventive Compounds

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1. This Military Standard is mandatory for use by all departments and agencies of the Department of Defense, to assure that selection of new items is limited to essential items, for which no comparable standard item exists. This document is not intended to restrict any service in selecting new items required to support state-of-the-art changes.
2. Recommended corrections, additions or deletions should be addressed to Commanding Officer, Edgewood Arsenal, ATTN: SMUEA-DE-ES, Edgewood Arsenal, Maryland 21010.

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FOREWORD

This is the third book format standard generated on fog and ice preventive compounds. This standard is mandatory for use by all departments and agencies of the Department of Defense in the selection of items for application. It is intended to prevent the entry of unnecessary items (sizes, types, varieties) into the Department of Defense logistics system. This is not a procurement document.

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1. SCOPE

1.1 Coverage. This standard is a presentation of nomenclature, symbols, physical and chemical properties and requirements, military and typical commercial uses, directions for use, packaging data, labeling, general safety precautions, storage information, and shelf life of all military standard fog and ice preventive compounds. This standard does not necessarily include all classifications of the items presented by the title or those which are commercially available. It does contain items preferred for use in the selection of fog and ice preventive compounds for application by the Department of Defense. This standard covers the following fifteen items:

<u>NAME</u>	<u>NO. OF ITEMS</u>
ANTIFOGGING COMPOUND	1
ANTIFOGGING KIT	1
ANTIFREEZE, PERMANENT	4
ANTIFREEZE, ARCTIC-TYPE	2
ANTI-ICING AND DEICING-DEFROSTER FLUID	3
DEICING-DEFROSTER FLUID	1
INHIBITOR, ICING, FUEL SYSTEM	3

1.2 Application. Items listed herein accommodate essential requirements of the military and defense agencies and will effect continued economies in all logistics functions where properly employed in new applications.

2. REFERENCED DOCUMENTS

The issue of the following documents in effect on the date of invitation for bids form a part of this standard to the extent specified herein.

Federal Specifications

O-A-548	Antifreeze, Ethylene Glycol, Inhibited
O-C-265	Chemical, Analytical, General Specification For
O-D-190	Deicing-Defroster Fluid
O-I-490	Inhibitor, Corrosion, Liquid Cooling System
O-S-642	Sodium Phosphate, Tribasic, Technical, Anhydrous, Dodecahydrate, and Monohydrate
SS-S-535	Sodium Borate, Decahydrate, Technical (Borax)
PPP-C-96	Can, Metal, 28 Gage and Lighter
PPP-C-569	Containers, Plastic, Molded (For Liquids, Pastes and Powders); Overpacked
PPP-C-1337	Containers, Metal, with Polyethylene Liner

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Federal Specifications Cont'd

TT-T-291 Thinner Paint; Volatile Spirits, (Petroleum Spirits)

Military Specifications

MIL-A-8243 Anti-icing and Deicing-Defrosting Fluid
MIL-A-11755 Antifreeze, Arctic-Type
MIL-A-15042 Antifogging Compound, Eye Protective Equipment
MIL-D-16791 Detergent, General Purpose (Liquid, Nonionic)
MIL-A-21071 Antifogging Compound, Transparent Aircraft Enclosures
MIL-B-26701 Bottle, Screw Cap and Carboys, Polyethylene Plastic
MIL-A-27686 Inhibitor, Fuel System Icing
MIL-A-46153 Antifreeze, Ethylene Glycol, Inhibited, Heavy-Duty,
Single Package

Military Standards

MIL-STD-129 Marking for Shipment and Storage
MIL-STD-290 Packaging, Packing and Marking of Petroleum
and Related Products

3. GLOSSARY

3.1 Definitions.

Antifogging compound - A chemical compound of surface active agents used to reduce the condensation of water vapor. It causes the condensation to form a film, thereby reducing the distortion which occurs when the vapor collects as drops on glass. It is a wetting agent.

Antifreeze - A Freezing point depressant. It is often blended with water for use as a cooling medium and to prevent freezing of the cooling system of internal combustion engines during exposure to cold climates.

Boiling point - The temperature at which the vapor pressure of a liquid is equal to the external pressure. In this standard if there is no mention of the external pressure at which the boiling point was determined, it is understood to be approximately one atmosphere (760 mm mercury).

Coolant - Refers to a fluid utilized for the transfer of heat from internal combustion engines. It can be water alone or in combination with anti-freeze compounds and corrosion inhibitors.

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Corrosion inhibitor - A chemical or combination of chemicals designed to inhibit or retard corrosive chemical action.

Flash point - The temperature to which a substance must be heated under specific conditions to give off sufficient vapor to form a mixture with air that can be ignited momentarily by a specified flame.

Freezing point - The temperature at which a liquid solidifies.

Hydrolysis - The reaction of an ion with water to form either H^+ or OH^- ions and a weak acid or a weak base.

Hydroxyl - The univalent group or radical OH consisting of one atom of hydrogen and one of oxygen that is characteristic especially of hydroxides, oxygen acids, alcohols, glycols and phenols.

Hygroscopic material - A substance which readily takes up and retains moisture.

Specific gravity - The ratio of the mass of a body to the mass of an equal volume of water at $4^\circ C$ or other specified temperature. In this standard, the first temperature indicates the temperature of the substance and the second indicates the temperature of the water it is referred to. If there is no mention of the temperatures, ($20.4^\circ C$) is understood.

3.2 Abbreviations. The same abbreviation is used for the possessive case and the singular and plural forms of a given word.

C - Celsius (Centigrade)

F - Fahrenheit

g - gram

KOH - Potassium hydroxide

max - maximum

min - minimum

MIL-STD - Military Standard

mg - milligram

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4. GENERAL REQUIREMENTS

4.1 Chemical and physical requirements. All values given in tables of chemical and physical requirements are in maximum percentages unless otherwise indicated.

4.2 Nomenclature. The Department of Defense item names, as used throughout this standard are in capital letters.

4.3 Packaging data and labeling. Items included in this standard shall be packaged, packed, and marked in accordance with MIL-STD-290 in cans, pails, or drums as specified by the contract or order.

4.4 Safety. In general, the compounds detailed in this standard are not classified as detrimental to personal health or damaging to equipment when used as directed by the instructions accompanying the product. The compounds are poisonous and may be fatal if swallowed. If the compounds are taken internally, vomiting should be induced immediately and medical treatment administered as quickly as possible. Under no conditions should the containers be used for the preparation or storage of food or beverages. They are not considered fire or explosion hazards, however, care should be exercised to preclude their exposure to open flame. In all cases, the safety precautions printed on the container labels should be explicitly followed. The establishment of proper protective measures and environmental controls by the appropriate safety and medical authorities will insure adequate guidance relative to the employment of these fog and ice preventive compounds.

4.5 Shelf life. Ideal storage conditions are outlined for each item in the standard and, under these conditions, the compounds should be usable and effective for at least 24 months from date of manufacture. Periodic examinations of the material should be made frequently when storage conditions vary from the ideal. Each compound should be analyzed prior to use where quality may be critical. All fog and ice preventive compounds in this standard shall be of the most recent preparation. When annotated shelf life has expired, the compounds will be examined periodically and issued as long as they are serviceable.

4.6 Temperature. If the temperature at which property was determined is not specified, it is understood to be room temperature (20 to 25°C or 68 to 77°F).

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5. DETAIL REQUIREMENTS

5.1 Name. ANTIFOGGING COMPOUND, EYE PROTECTIVE EQUIPMENT

5.1.1 Specifications. MIL-A-15042, Antifogging Compound, Eye Protective Equipment.

5.1.2 Technical description. The antifogging kit covered by this standard consists of a small can containing a nonirritating, antifogging compound and a polishing cloth. The container is a round metal can approximately $2\frac{1}{2}$ inches long and $1\frac{3}{16}$ inches in diameter with a slip-cover closure. The antifogging compound may be in paste, stick, or liquid form supplied in a leak-proof dispenser of such size as to fit inside the container. The polishing cloth is approximately a 6 inch square of soft lint-free material.

5.1.3 Use data. The antifogging compound is intended for military use in preventing the fogging of lenses, goggles, gas masks, and eye protective equipment.

5.1.4 Packaging data and labeling. The dispenser and polishing cloth is packaged in a slip-cover container conforming to PPP-C-96. In addition to the marking required in MIL-STD-129, each unit container shall have detailed instructions for the proper application of the compound printed in clear type on the side.

5.1.5 Safety precautions. The chemical used for application on the lenses is nonpoisonous; however, general safety precautions should be followed.

5.1.6 Storage data. The antifogging kit, when properly closed and stored under normal warehouse conditions should remain usable for an indefinite period.

5.2 Name. ANTIFOGGING COMPOUND, TRANSPARENT AIRCRAFT ENCLOSURES

5.2.1 Specifications. MIL-A-21071, Antifogging Compound, Transparent Aircraft Enclosures.

5.2.2 Technical description. The antifogging compound covered by this standard is contained in a one pint can or squeeze bottle. The compound will be formulated as specified in Table I and shall not be corrosive to steel, cadmium plated steel or aluminum alloy.

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Table I - Requirements for antifogging compound,
transparent aircraft enclosures.

Ingredient	Specification	Percent (by volume)
Nonionic detergent	MIL-D-16791	0.4 ± 0.2
Polyoxyethylene (4) Sorbitan Monostearate <u>1/</u>		8.0 ± 2.0
Polyoxyethylene (20) Sorbitan Monooleate <u>2/</u>		20.0 ± 5.0
Mineral Spirits	TT-T-291 Grade 2	Quantity to make 100%

1/ Shall have a hydroxyl number that is not less than 170 nor more than 200.

2/ Shall have a hydroxyl number that is not less than 65 nor more than 80.

5.2.3 Use data. For military use, antifogging compound is intended to prevent the accumulation of fog and haze on the interior surfaces of aircraft windshields and canopies during adverse weather conditions. The compound is suitable for application on either glass or plastic surfaces.

5.2.4 Packaging data and labeling. Unless otherwise specified by the procuring activity, the compound shall be furnished in a one pint oblong can in accordance with MIL-STD-290. In addition to the marking required in MIL-STD-129, each unit container shall be marked with the following: Manufacturer's directions for use; Lot number; and CAUTION: USE WITH ADEQUATE VENTILATION. DO NOT EXPOSE THE LIQUID COMPOUND OR ITS VAPORS TO HEAT OR FLAME.

5.2.5 Safety precautions. Refer to paragraph 4.4. (Safety).

5.2.6 Storage data. This compound will remain stable indefinitely but should be inspected after two years for possible container deterioration.

5.3 ANTIFREEZE, PERMANENT, HEAVY DUTY, FORMULATION TYPE

5.3.1 Specification. MIL-S-46153, Antifreeze, Ethylene Glycol, Inhibited, Heavy Duty, Single Package.

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5.3.2 Technical description. Inhibited ethylene glycol is the major product used in the preparation of antifreeze solutions for cooling systems of liquid cooled internal combustion engines for protection against freezing in ambient temperatures as low as minus 60°F. It is readily miscible with water. Antifreeze, based on formulation, is inhibited with sodium borate (borax) and with inhibitor conforming to specification O-I-490, and shall be a blue-green color. The chemical and physical requirements of ethylene glycol are shown on Table II.

Table II - Chemical and physical requirements of ethylene glycol inhibited antifreeze

Characteristics	Requirements
Ash content % by weight (max)	2.0
Boiling point (min)	300°F
Borax, % by weight	4.00 ± 0.20
Dye requirement, gram of Alizarine Cyanine Green G Extra 100 percent per gallon antifreeze	0.3
Flash point (min)	230°F
Freezing point, by volume:	
50%	not above -30 F
30%	not above +6 F
Glycol:	
Ethylene glycol (min)	77.60
Total vicinal glycols (min)	87.60
Other glycols (min)	5.00
pH value:	
100% solution	5.8 to 6.8
30% solution	7.5 to 8.0
Reserve alkalinity (min)	20
Sodium salt of mercaptobenzothiazole solution (Normally supplied as a 50% aqueous solution by weight)	0.40 ± 0.05
Specific gravity, 60°/60°F) undiluted	1.105 to 1.135
Trisodium phosphate (calculated as dodecahydrate)	0.30 ± 0.04
Total water	5.00 ± 0.50

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5.3.3 Use data. Inhibited ethylene glycol is intended for use in the cooling systems of liquid-cooled internal combustion engines, for protection against freezing in ambient temperatures as low as minus 60°F when diluted to 60 percent by volume with water. It may also be used as a coolant in some types of automatic guns such as water-cooled machine guns. This material may be used up to 2 years, however, it should be checked quarterly during scheduled PM Service for freezing and corrosion protection and cleanliness. Check freeze protection by the refractive index freeze point tester and corrosion protection by the reserve alkalinity test kit and visual examination for cleanliness. This antifreeze is intended for use in lieu of type 1 of O-A-548. This antifreeze is essentially type 1 of O-A-548 plus inhibitor conforming to O-I-490.

5.3.4 Packaging data and labeling. Ethylene glycol antifreeze compound is packaged for military use in one quart and one gallon unit quantity plastic containers as specified in PPP-C-569 or polyethylene plastic bottle as specified in MIL-B-26701. If the bottle as specified in MIL-B-26701 is used, an additive shall be used in the polyethylene resin which will yield a bottle conforming to MIL-B-26701, no portion of which shall transmit more than 1 percent of ultraviolet light at any wavelength in the range of 310 to 325 mu when tested using a calibrated spectrophotometer with air as a reference. Packaging, packing and marking shall be in accordance with MIL-STD-129. Each container shall bear the following label:

CAUTION

Protect from freezing. This material, as packaged, will freeze at temperatures below 0°F. Freezing will not damage the contents but may damage the container. For necessary dilution for freeze protection, consult protection table on, or with container. Do not take internally.

5.3.5 Safety precautions. Ethylene glycol is poisonous and may be fatal if swallowed. If the antifreeze compound is taken internally, vomiting should be induced immediately and medical treatment administered as quickly as possible. For more specific information, the appropriate medical or safety authorities must be consulted in order to establish the proper protective measures and environmental controls. This product is not a fire or explosion hazard. However, care must be exercised to preclude its exposure to open flame. Do not use empty antifreeze containers for the preparation or storage of food or beverages.

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5.3.6 Storage data. Antifreeze compounds should not be stored in areas of excessively high humidity, or near chemicals that are corrosive to steel. (High humidity may affect the can but not the contents.) Do not store in open or unmarked containers.

5.4 Name. ANTIFREEZE, PERMANENT, PERFORMANCE TYPE

5.4.1 Specification. O-A-548, Antifreeze, Ethylene Glycol, Inhibited.

5.4.2 Technical description. As differentiated from Antifreeze, Permanent, Type I which is based on formulation, this compound, Antifreeze, Permanent, Type II is based on performance. It is typically formulated with a minimum of 92.5 percent glycol, a maximum of 5.0 percent water (exclusive of water hydration of borax) and sufficient corrosion inhibitor. It is distinctively colored as specified by the procuring activity. Type II antifreeze shall conform to the requirements of Table III. Note: Type II is not authorized for Army or Air Force use.

Table III - Physical requirements of
antifreeze, permanent, type II

Characteristics	Requirements
Boiling point (min)	300°F
Flash point (min)	230°F
Specific gravity range at 60°/60°F	1.046 to 1.052
pH value:	
undiluted	5.0 to 11.0
30% aqueous solution by volume	7.0 to 11.0
Freezing point, % by volume	
100 max	0°F
60 max	-60°F
30 max	+5°F

5.4.3 Use data. Inhibited ethylene glycol is intended for military use in liquid cooled internal combustion engines for protection against freezing in ambient temperatures as low as -60°F when diluted 60% by volume with water. This compound may also be used as a coolant in some types of automatic machine guns and other water-cooled weapons.

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5.4.4 Packaging data and labeling. This antifreeze solution is packaged for military use in one quart unit quantity cans or 1, 5 or 55 gallon unit quantity containers. The 5 gallon container shall have a pour spout. The 5 and 55 gallon drums shall be coated on the inside with an organic coating which is not affected by, nor will affect the antifreeze compound. In addition to the marking required in MIL-STD-129, each container shall be marked with the following legend.

CAUTION

Protect from freezing. The material, as packaged, will freeze at temperatures below 0°F. Freezing will not damage the contents but may damage the container. For necessary dilution for freeze protection, consult protection table on or with container. Do not take internally.

5.4.5 Safety precautions. Refer to paragraph 5.3.5 (Safety precautions).

5.4.6 Storage data. Antifreeze compounds should not be stored in areas of excessively high humidity or near chemicals that are corrosive to steel. Humidity, while not affecting the contents, may generate deterioration of the container. Do not store in open or unmarked containers. This product should be used within 24 months after packaging to avoid possible corrosion of the container. These compounds are dependable for a period of one year after being added to the cooling system.

5.5 Name. ANTIFREEZE, ARCTIC-TYPE

5.5.1 Specification. MIL-A-11755, Antifreeze, Arctic-Type

5.5.2 Technical description. The antifreeze compound shall be a single-phase homogeneous mixture of a formulation conforming to the requirements of this specification. The rust inhibiting material used in the antifreeze compound shall conform to Table IV. The compound shall be colored fluorescent yellow. The dye shall be Calco-Bromo fluorescent yellow dye or equal. The freezing point of the antifreeze compound and of the aqueous solutions of varying concentrations of the compound shall be as specified in Table V.

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Table IV - Chemical Composition of Rust Inhibitor

Component	Composition by Weight Percent of Total Antifreeze
Borax (sodium tetraborate decahydrate SS-S-535 Type II	2.50 ± 0.20
Trisodium phosphate calculated as dodecahydrate	0.37 ± 0.04
Sodium salt of mercaptobenzothiazole solution (normally supplied as a 50% aqueous solution by weight)	0.46 ± 0.05

Table V - Freezing point of aqueous solutions of the compound

Concentration, by weight of the antifreeze compound Percent	Freezing point of max
90	-63°F
60	-5°F

The formulation shall be completely miscible with water, in all proportions and compatible with the solutions in Table VI.

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Table VI - Composition, by weight, of the reference solutions

Component	Reference solution, %		
	A	B	C
Ethylene glycol <u>1/</u>	54.95	54.95	54.95
Distilled or deionized water	31.90	31.90	31.90
Methyl cellosolve (ethylene glycol monomethyl ether) O-C-265 <u>2/</u>	9.70	--	--
Cellosolve (ethylene glycol monoethyl ether) O-C-265 <u>3/</u>	--	9.70	--
Methyl carbitol (diethylene glycol monomethyl ether) <u>4/</u>	--	--	9.70
Sodium tetraborate decahydrate (Borax) <u>5/</u>	2.50	2.50	2.50
Trisodium phosphate dodecahydrate <u>6/</u>	0.40	0.40	0.40
Sodium salt of mercaptobenzothiazole solution <u>7/</u>	0.50	0.50	0.50
Antifoaming agent <u>8/</u>	0.05	0.05	0.05

- 1/ Ethylene glycol used in referenced solution shall be analyzed reagent grade.
- 2/ Ethylene glycol monomethyl ether used in the referenced solution shall conform to O-C-265, with requirements conforming to nonmonograph section, U.S.P., latest edition.
- 3/ Ethylene glycol monoethyl ether used in the referenced solution shall conform to O-C-265, with requirements conforming to nonmonograph section, U.S.P., latest edition.
- 4/ Diethylene glycol monomethyl ether shall be a reagent grade.
- 5/ Borax used in the referenced solution shall be technical grade granular sodium tetraborate, conforming to SS-S-535, Type II.
- 6/ The trisodium phosphate dodecahydrate used in the referenced solution shall conform to O-S-642.
- 7/ The sodium salt of mercaptobenzothiazole solution shall be a 50% aqueous solution by weight.
- 8/ The antifoaming agent shall be of the polyoxyalkylene glycol type such as Pluronic L-61 supplied by BASF, -Wyandotte Inc., Wyandotte, Michigan, or equal.

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Table VII - Chemical and Physical requirements of
artic-type antifreeze

Characteristics	Requirements
Ash content, % by weight	0.7 to 1.3
Boiling point (min)	230°F
Flash point (min)	155°F
Kinematic viscosity at -65°F max centistokes	1750
pH value	7.0 to 8.5
Reserve alkalinity	13.5 to 18.5

5.5.3 Use data. Arctic-type nonvolatile antifreeze compound is intended for use in the cooling system of liquid cooled internal combustion engines for protection against freezing in regions where the ambient temperature remains for extended periods of time close to minus 40°F, but may drop as low as minus 90°F, when used undiluted. This material may also be used as a heat transfer liquid for military applications where low temperatures are encountered.

5.5.4 Packaging data and labeling. The compound is packaged for military use in 1, 5 or 55 gallon unit quantity containers as specified. The packaging will conform to specifications referenced in MIL-A-11755. Marking will be in accordance with MIL-STD-129 and with any additional marking as specified by the procuring activity. Each container will be marked with the following information:

INSTRUCTIONS FOR USE

For use at temperatures of minus 40°F
to minus 90°F (-40°C to -68°C). Do
not dilute - use as packaged.

5.5.5 Safety precautions. Refer to paragraph 5.3.5 (Safety precautions).

5.5.6 Storage data. Antifreeze compounds should not be stored in areas of excessively high humidity or near chemicals that are corrosive to steel. Humidity, while not affecting the contents, may generate deterioration of the container. Do not store in open or unmarked containers. This product should be used within 24 months after packaging to avoid possible corrosion of the container. These compounds are dependable for a period of one year after being added to the cooling system.

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5.6 Name. ANTI-ICING AND DEICING-DEFROSTING FLUID

5.6.1 Specification. MIL-A-8243, Anti-icing and Deicing-Defrosting Fluid

5.6.2 Technical description. This compound is a clear, transparent homogeneous mixture of ethylene glycol, propylene glycol, corrosion inhibitor and a wetting agent. It has a minimum flash point of 215°F and a specific gravity of 1.100 to 1.106 (60°/60°F) in the undiluted form. A 50% solution at 77° ± 5°F will have a pH value of 8.5 to 9.5. Pour point of anti-icing fluid and of a 70 percent by volume aqueous solution is -65°F (-54°C). The composition of this fluid is given in Table VIII.

Table VIII - Composition of anti-icing fluid
and deicing-defrosting fluid

Component	% by weight
1, 2-glycols	88.0
Water	9.0 to 10.0
Dibasic potassium phosphate (K_2HPO_4)	0.9 to 1.1
Sodium di-(2-ethylhexyl) Sulfo succinate (100% active)	0.45 to 0.55

5.6.3 Use data. Anti-icing and deicing-defrosting fluid is intended for military use in the removal and prevention of an accumulation of frost and ice on the surface of parked aircraft. It is applied by brush or spray in the concentrated form and is generally heated to speed action during ice removal.

5.6.4 Packaging data and labeling. This compound is packaged for military use in 5 gallon unit quantity cans, 55 gallon unit quantity drums or in bulk. Packaging, packing and marking shall be in accordance with MIL-STD-129 in cans, pails or drums as specified by the contract or order. Each container shall bear the following caution label:

DO NOT TAKE INTERNALLY. AVOID BREATHING
VAPOR. AVOID CONTACT WITH EYES. KEEP
AWAY FROM FIRE, SPARKS AND POWERFUL
OXIDIZING MATERIALS. KEEP CONTAINER
CLOSED. STORE IN A COOL PLACE.

5.6.5 Safety precautions. Refer to paragraph 5.3.5 (Safety precautions).

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5.6.6 Storage data. This fluid requires no special handling or storage care. When properly packaged in closed container, its shelf life is indefinite.

5.7 Name. DEICING-DEFROSTING FLUID

5.7.1 Specification. O-D-00190, Deicing-Defrosting Fluid.

5.7.2 Technical description. This type of deicing-defrosting fluid is used for the effective removal of frost and thin ice on vehicle windshields and to reduce fogging on inside windows. It is packaged in a 14 ounce commercial type metal pressure container generally known as an aerosol container. The release valve shall be protected by a rigid cover cap which shall be removable and replaceable. The propellant shall be of sufficient force to completely discharge the contents of the can. A major portion of the fluid will travel for a distance of six feet at 0°F in a circular or elliptical pattern within the following limits when the container is held thirty inches from the target. Vertical and horizontal dimensions of spray pattern shall be as follows.

<u>Test temperature</u>	<u>Minimum (inches)</u>
25°F	1½
15°F	1
0°F	1

Table IX - Chemical and physical requirements of deicing-defrosting fluid

Characteristics	Requirements
Viscosity:	
70°F (max) cstks	5
32°F (max) cstks	11
0°F (max) cstks	29
Water content (max)	25%
Nonvolatile matter (min)	18%
Flash point (min)	90°F

5.7.3 Use data. This deicing-defroster fluid is for use on vehicles windshields and windows to melt or loosen frost and thin ice and to prevent further icing. The material may also be used for the loosening of frozen car locks. The fluid shall not be harmful to the vehicle finish.

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5.7.4 Packaging data and labeling. The container shall be a commercial type metal pressure container of such construction as to assure acceptance by the common carriers. The deicing-defrosting fluid shall be packed and labeled for Military Air Shipments with the red flammable liquid label as specified in Air Force manual 71-4. Each container shall have a lithographed or printed label, securely affixed to the container and will include the name of the material, the net contents, the manufacturer's name and address, the directions for use, precautions for use and storage, a formula in general terms and the stock number. In addition to the markings required by the procuring activity, the packages and shipping containers shall be marked in accordance with MIL-STD-129.

5.7.5 Safety precautions. Refer to paragraph 4.4 (Safety).

5.7.6 Storage data. Deicing-defroster fluid requires no special handling or storage care. When properly packaged in closed containers, the shelf life should be indefinite.

5.8 Name. INHIBITOR, ICING, FUEL SYSTEM

5.8.1 Specification. MIL-I-27686, Inhibitor, Fuel System, Icing.

5.8.2 Technical description. Fuel system icing inhibitor is ethylene glycol monomethyl ether, which is soluble in liquid hydrocarbon fuels. When added to fuels it lowers the freezing point of suspended water and prevents fuel system icing. It also controls growth of microorganisms (bacteria and fungus) in fuel storage tanks.

Table X - Chemical and physical requirements of
fuel system icing inhibitor

Property	Requirement
Acid number, mg KOH per gram (max)	0.09
Color, platinum cobalt (max)	15
Distillation:	
Initial point (min)	123.5°C (254.3°F)
Dry point (max)	125.5°C (257.9°F)
Ethylene glycol (max)	0.025 weight %
pH of 25% solution in water (25° ± 2°C)	6.0 to 7.0
Specific gravity (20°/20°C)	0.963 to 0.967
Refractive index (20°C)	1.4015 to 1.4025
Water (max)	0.15 weight %

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5.8.3 Use data. The inhibitor covered by this standard is intended for military use as an anti-icing agent to be added to jet fuels in proportions of between 0.10 and 0.15 percent by volume depending on the anti-icing qualities desired. The inhibitor is blended into some fuels before shipment from the refinery or it may be added at any point prior to actual use. This inhibitor is 30 to 100 times more soluble in fuel than its usage concentration, but nevertheless it must be proportionately and continuously blended with the fuel to obtain proper blending results. This is generally done with proportioning equipment that adds the inhibiting compound into a moving stream of the fuel. If the concentrated compound is spilled on painted or aluminum surfaces it should be washed off immediately.

5.8.4 Packaging data and labeling. Fuel system icing inhibitors are packaged for military use in 5 gallon unit quantity cans, 55 gallon unit quantity drums, and bulk. In addition to the packaging, packing, and marking required by MIL-STD-290; each container shall be marked with the following precautionary marking:

TO BE USED ONLY AS AN ANTI-ICING ADDITIVE
FOR JET TURBINE ENGINE FUELS.

5.8.5 Safety precautions. Refer to paragraph 4.4 (Safety).

5.8.6 Storage data. Fuel system icing inhibitors are flammable and hygroscopic. The compound should be handled and stored in the same manner as the fuel with which it is used. Being hygroscopic, the material will pick up moisture from the air, therefore storage tanks should be equipped with pressure-type air vents. Can and drum covers must be replaced tightly when some of the compound remains in the container. This fuel additive may be stored for extended periods of time in properly closed containers. The compound has a deteriorating effect on plastic and rubber. Unlined steel tanks must be used for storage. Asbestos-graphite packing and gaskets are recommended for use in pumping equipment. This compound should be used within 24 months after packaging.

Notice. - Copies of specifications, standards, drawings and publications required by contractors in connection with specific procurement functions should be obtained from the procurement agency or as directed by the contracting officer.

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NAVY - AS
AIR FORCE - 68

PREPARING ACTIVITY:

ARMY - MU

PROJECT NO. 6850-0270

SPECIFICATION ANALYSIS SHEET		Form Approved Budget Bureau No. 119-R004
INSTRUCTIONS		
This sheet is to be filled out by personnel either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity (as indicated on reverse hereof).		
SPECIFICATION		
ORGANIZATION (Of submitter)		CITY AND STATE
CONTRACT NO.	QUANTITY OF ITEMS PROCURED	DOLLAR AMOUNT \$
MATERIAL PROCURED UNDER A		
<input type="checkbox"/> DIRECT GOVERNMENT CONTRACT <input type="checkbox"/> SUBCONTRACT		
1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?		
A. GIVE PARAGRAPH NUMBER AND WORDING.		
B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES.		
2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID		
3. IS THE SPECIFICATION RESTRICTIVE?		
<input type="checkbox"/> YES <input type="checkbox"/> NO IF "YES", IN WHAT WAY?		
4. REMARKS (Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity)		
SUBMITTED BY (Printed or typed name and activity)		DATE

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