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MILITARY STANDARD

CLEANING COMPOUNDS

FSC 6850

DEPARTMENT OF DEFENSE
Washington, D.C. 20301

Cleaning Compounds

MIL-STD-1428

1. This Military Standard is approved for use by all Departments and Agencies of the Department of Defense.

2. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, US Army Armament Research and Development Command, Attn: DRDAR-TSC-D, Aberdeen Proving Ground, MD 21010, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

FOREWORD

This book format standard, covering cleaning compounds, concentrates, solutions and solvents, (except for aircraft surfaces) under FSC 6850, 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 document is not intended to restrict any service in selecting new items resulting from state-of-the-art changes. This standard is divided into five parts.

Part 1 - Alkaline Cleaners
Part 2 - Acidic Cleaners
Part 3 - Neutral Water-Soluble Cleaners
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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, shelf life, and waste disposal instructions for military standard cleaning compounds (except for aircraft surfaces). This standard does not necessarily include all classifications of the items represented by the title or those which are commercially available. It does contain items preferred for use in the selection of cleaning compounds, concentrates, solutions and solvents; cleaning and descaling compounds, and cleaning and lubricating compounds. This standard is divided into five parts.

Part 1 - Alkaline Cleaners
Part 2 - Acidic Cleaners
Part 3 - Neutral Water-Soluble Cleaners
Part 4 - Non-Aqueous Solvent Cleaners
Part 5 - Emulsifiable Solvent Cleaners

1.2 Application. Items listed herein accommodate essential requirements for the military and defense agencies, and will effect continued economics in all logistic functions where properly employed in new applications.

2. REFERENCED DOCUMENTS

2.1 Issues of documents. The following documents of the issue in effect on date of invitation for bids or request for proposal, form a part of this standard to the extent specified herein.

SPECIFICATIONS

FEDERAL

PPP-B-585 - Box, Wood, Wirebound
PPP-B-591 - Box, Fiberboard, Wood-Cleated
PPP-B-601 - Box, Wood, Cleated Plywood
PPP-B-621 - Box, Wood, Nailed and Lock Corner
PPP-B-636 - Box, Shipping, Fiberboard
PPP-C-96 - Can, Metal, 28 Gage and Lighter
PPP-C-186 - Containers, Packaging and Packing for Drugs, Chemicals and Pharmaceuticals
PPP-C-300 - Chemicals, Liquid; Packaging and Packing of
PPP-C-301 - Chemicals, Dry and Paste, Packaging and Packing of
PPP-P-1892 - Paint, Varnish, Lacquer, and Related Materials, Packaging, Packing and Marking of

STANDARDS

FEDERAL

FED-STD-123 - Marking for Shipment (Civil Agencies)

MILITARY

MIL-STD-129 - Marking for Shipment and Storage

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

MANUALS

MILITARY

DOD4140.34-M - Defense Utilization Manual
DOD4160.21-M - Defense Disposal Manual

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

2.2 Other publications. The following documents form a part of this standard to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI 2129.1 - American National Standard for the Precautionary Labeling of Hazardous Chemicals.

(Application for copies should be addressed to the American National Standards Institute, Incorporated, 1430 Broadway, New York, NY 10018.)

DEPARTMENT OF TRANSPORTATION REGULATIONS

49 CFR, Parts 100 to 199 Regulations of the Transportation of Explosive and Other Dangerous Articles by Land and Water.

ENVIRONMENTAL PROTECTION AGENCY REGULATIONS

40 CFR, Parts 261 to 265 Hazardous Waste Management System

(Application for copies should be addressed to the Superintendent of Documents, Government Printing Office, Washington, DC 20402.)

UNIFORM CLASSIFICATION COMMITTEE, AGENT

Uniform Freight Classification Rules

(Application for copies should be addressed to the Uniform Classification Committee, 222 South Riverside Plaza, Chicago, IL 60606.)

3. GLOSSARY

3.1 Definitions.

Acid or Acidic - A general term for compounds which give hydrogen ions (H^+) in aqueous solution.

Alkali - A base, which gives a high concentration of hydroxyl ions (OH^-) in aqueous solution.

Anhydrous - Free from water including water of crystallization.

Base - A general term for compounds which give hydroxyl ions (OH^-) in aqueous solution.

Biodegradable - Capable of being decomposed or oxidized into innocuous products by the action of microorganisms.

Boiling point - The temperature at which the vapor pressure of a liquid is equal to the external pressure. If the external pressure is not given it is understood to be 760 mm of mercury.

Caustic - A strong base which has a corrosive and distintegrating action on the skin and the destruction of living tissue, and causes a burning sensation.

Centipoise - A unit of viscosity equal to one-hundreth (1/100) of a poise.

Centistoke - A unit of viscosity equal to one-hundreth (1/100) of a stoke.

Chelating Agent - A compound forming a metal ion complex in a ring structure by means of coordination bonds.

Density - The concentration of matter expressed as a ratio of its mass per unit volume (e.g. grams/cm^3, pounds per gallon).

Detergent - A surface active agent which has the property of wetting soil particles, deflocculating soil clumps, and keeping them in suspension.

Emulsifiable - Capable of being emulsified.

Emulsifier - A surface active agent promoting the formation and stabilization of an emulsion.

Emulsion - A system consisting of a liquid (disperse phase) dispersed in an immiscible liquid (continuous phase), usually in droplets of larger than colloidal size (e.g. an oil in water emulsion).

Hydrate - A compound formed by the bonding of water molecules with the molecules of some other substance.

Hydrophilic - Relating to or having a strong affinity for water.

Hygroscopic - The property of taking up and retaining moisture from the atmosphere under some conditions of humidity and temperature.

Mil - A unit of length equal to one-thousandth (1/1000) of an inch.

Miscible - The property of liquids being mutually soluble in all proportions.

Oxidizing Agent - A chemical reagent which produces an increase in the proportion of oxygen or acid forming elements or radicals in a compound.

pH - A numerical measure of the hydrogen ion concentration, indicating degree of acidity or alkalinity of a solution. Expressed as pH = $-\log_{10}[H^+]$. At the neutral point, pH = 7. At a pH lower than 7, a solution is acidic. At a pH higher than 7, a solution is basic.

Poise - The unit of absolute viscosity expressed as one dyne x second per square centimeter or gram per centimeter x second.

Reducing Agent - A substance which causes a decrease in the oxidation state of another substance, thus lowering the net positive valence of the metallic or metal equivalent element in the reduced compound.

Specific Gravity - The ratio of the mass of a body to the mass of an equal volume of water at 4°C or other specified temperature. The first temperature indicates the temperature of the substance, and if there is no mention of temperature ($20^{\circ}/4^{\circ}$C) is understood.

Stoke - The unit of kinematic viscosity, expressed as cm^2/second, is derived from poise/density, where density is grams/cm^3.

Surface Active Agent or Surfactant - An organic molecule containing hydrophilic and lipophilic groups and demonstrating surface active properties by being capable of lowering the surface tension of its aqueous solution, thereby decreasing the interfacial tension between the aqueous phase and an oily liquid phase.

Surface Tension - The tension existing at the free surface of a liquid by the attractive effect of intermolecular forces on the individual surface molecules tending to adjust the surface to a minimum area. It is expressed as dynes per centimeter or ergs per square centimeter with both values numerically equal.

Technical Grade - Denotes a quality of chemicals and solvents which are generally used for industrial and manufacturing applications.

Threshold Limit Value (TLV®) - Time Weighted Average (TLV-TWA) - the time weighted average concentration for a normal 8 hour workday or 40 hour workweek to which most workers may be repeatedly exposed, day after day without adverse effect. Units are parts per million by volume unless stated otherwise.

Viscosity - The property of a fluid or semi-fluid that enables it to develop and maintain an amount of shearing stress dependent upon the velocity gradient under laminar flow conditions, and then to offer continued resistance to flow. It is determined as the ratio of the tangential frictional force per unit area (shear stress) to the velocity gradient perpendicular to the direction of flow of a liquid (shear rate).

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

cm - centimeter

cp - centipoise

cs - centistoke

g - gram

gal - gallon

kg - kilogram

l - liter

lb - pound

max - maximum

mg - milligram

MIL-STD- Military Standard

min - minimum

ml - milliliter

mm - millimeter

oz - ounce

ppm - parts per million

secs - seconds

Sp Gr - Specific Gravity

sq - square

SSU - Seconds Saybolt Universal

vol - volume

wt - weight

4. GENERAL REQUIREMENTS

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

4.2 Nomenclature. The Department of Defense basic names, as used throughout this standard, are in capital letters. Other names that are sometimes used commercially are in small letters immediately beneath. The DOD item name is the basic name.

4.3 Packaging data and labeling. In addition to being unit packed and packed in accordance with Federal Specification PPP-C-186, all liquid chemicals should be unit packed and packed in accordance with Federal

Specification PPP-C-300 and all dry and paste chemicals in accordance with Federal Specification PPP-C-301 and applicable documents mentioned in these specifications. All items included in this standard shall be marked for shipment and storage in accordance with FED-STD-123, MIL-STD-129, or MIL-STD-290 as applicable.

4.4 Safety. General laboratory and plant safety precautions and measures should be exercised in the handling and use of any of these items. Only general safety precautions are outlined in each part of this standard. For more specific information the responsible safety and medical authorities must be consulted to determine safe operating procedures, personnel protective measures and environmental controls.

4.5 Shelf life. Factors such as moisture, temperature, type and condition of container, exposure to sunlight and the atmosphere cause variations in shelf life. Ideal storage conditions are outlined for each item. An approximate period of time after which this material will no longer be suitable for its intended use is also presented where applicable. The term "cool" denotes temperatures from above freezing up to 110°F (43.3°C), but not consistently over 100°F (37.8°C) when stored out of direct sunlight. The term "dry" is usually used to denote an area where condensation does not come in contact with the package or contents (for example, storing on pallets away from walls in an enclosure or building). Periodic examination of the container or material should be made more frequently when storage conditions vary from the ideal. For applications where quality may be critical, each compound should be tested or analyzed prior to use. Shelf life is dated from the date of manufacture.

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

4.7 Pollution potential. All items described in this MIL-STD should be assumed to have a pollution potential. However, to minimize the potential, use, storage and disposal instructions must be strictly observed.

4.8 Disposal data. To minimize disposal problems, it is recommended that no more than a one-year's supply of each item listed in this MIL-STD be stocked. Should excess or unserviceable material occur, dispose of the material as outlined in the Defense Utilization Manual, DOD 4140.34M or the Defense Disposal Manual, DOD 4160.21M. Prior to initiating disposal procedures as outlined in each part of this MIL-STD, the items should be reported to the local Property Disposal Office (PDO) as outlined in DOD 4160.21M. The local PDO will not accept physical custody of these stocks; however, the PDO will accept forms which are required to initiate property disposal action. The reporting activity will be responsible for providing physical custody and security of an excess chemical. Disposal of non-hazardous unserviceable material shall be accomplished as outlined in the Defense Disposal Manual DOD 4160.21M. Disposal and storage of items classified as hazardous wastes, as defined by the Resources Conservation and Recovery Act (RCRA) of 1976 (Public Law 94-580), shall be accomplished as described below. The US Environmental Protection Agency (EPA) has identified items as meeting the classification (i.e., ignitable, corrosive, reactive or EP toxic) or are listed (i.e., toxic or acute hazardous) according to Identification and Listing of Hazardous Waste, Part 261, 40

CFR, Vol. 45 Federal Register 33119, 19 May 1980. Items can also be determined to be hazardous wastes by declaration of the Installation Environmental Coordinator in accordance with section 262.11, Part 262 of this reference. Disposal of such items must be coordinated with the Installation Environmental Coordinator to insure proper reporting of disposal and/or treatment actions to the US EPA and/or State; and must be managed in accordance with Federal, State and local laws. The three main disposal methods include acceptance and utilization by Defense Property Disposal Office (DPDO), on-post disposal by installation personnel, or disposal by commercial contract. Hazardous wastes that cannot be used, or subjected to ultimate disposal, must be stored under environmentally safe conditions until suitable methods of disposal are determined. Short-term storage (less than 90 days) requires proper containerization and appropriate labeling, marking and placarding in accordance with section 262.34, part 262 of the above reference. Long-term storage (greater than 90 days) requires permitting by the EPA or by the State under Public Law 94-580 of 1976 (RCRA), subject to the requirements of 40 CFR Parts 264 and 265. In all cases where the wastes are to be collected, stored, transported and disposed of at a State or local permitted disposal facility, the identity and description of the waste must be maintained and recorded in accordance with Part 262 of the above reference. Transportation of the waste must be in accordance with Part 263 of the above reference, Standards Applicable to Transporters of Hazardous Waste. Ultimate disposal shall be accomplished at a permitted hazardous waste disposal facility designated by the Installation Environmental Coordinator. Solid compound spills should be salvaged if not contaminated for their use. Contaminated solid compound spills shall be packaged and labeled for transportation to a permitted disposal facility as described above. Large liquid spills or leaks should be diked around the item with an inert, dry absorbent (e.g. clay, sawdust or vermiculite) to prevent spreading and contamination of the area, and to preclude additional problems. Salvageable materials should be segregated away from the spill area and waste cleanup initiated immediately. Small spills and residues of large spills should be covered with dry absorbent and let stand until contaminated absorbent and containers can be safely handled and transported to a permitted disposal site. Packaging, labeling, transportation and record-keeping requirements shall be in accordance with the appropriate Federal and State regulations. Cleanup and disposal operations for large spills shall be conducted under the supervision of the Installation Environmental Coordinator by the procedures described above. Used cleaning solutions, containing soil or products of reaction with soil, shall be handled for disposal in accordance with the procedures described above. Separated sludges shall be packaged so that the waste item can be transported to a permitted disposal facility in accordance with procedures described above. Storm drain disposal of hazardous liquid wastes, solutions or effluent, which are discharged into rivers, lakes or other inland bodies of water, is forbidden. For assistance on large scale spills that can grossly contaminate the environment, call the Chemical Transportation Emergency Center (CHEMTREC-Toll free telephone number: 800-424-9300).

4.9 DISCLAIMER. RECOMMENDED DISPOSAL INSTRUCTIONS IN SECTION 5 ARE FORMULATED FOR USE BY ELEMENTS OF THE DEPARTMENT OF DEFENSE. THE UNITED

STATES OF AMERICA IN NO MANNER WHATSOEVER EITHER EXPLICITLY OR IMPLICITLY WARRANTS, STATES, OR INTENDS SAID INSTRUCTION TO HAVE ANY APPLICATION, USE OR VIABILITY BY OR TO ANY PERSON OR PERSONS OUTSIDE THE DEPARTMENT OF DEFENSE OR ANY PERSON OR PERSONS CONTRACTING WITH ANY INSTRUMENTALITY OF THE UNITED STATES OF AMERICA AND DISCLAIMS ALL LIABILITY FOR SUCH USE. ANY PERSON USING THESE INSTRUCTIONS WHO IS NOT A MILITARY OR CIVILIAN EMPLOYEE OF THE UNITED STATES OF AMERICA SHOULD SEEK COMPETENT PROFESSIONAL ADVICE TO VERIFY AND ASSUME RESPONSIBILITY FOR THE SUITABILITY OF THESE INSTRUCTIONS TO THEIR PARTICULAR SITUATION REGARDLESS OF SIMILARITY TO A CORRESPONDING DEPARTMENT OF DEFENSE OR OTHER GOVERNMENT SITUATION.

Part 1 of 5 Parts

ALKALINE CLEANERS

1. SCOPE

1.1 Coverage. Refer to introductory paragraph 1.1. This part of the standard covers eight items preferred for use in the selection of alkaline cleaners by the Department of Defense.

1.2 Application. Refer to introductory paragraph 1.2.

2. REFERENCED DOCUMENTS

2.1 Issues of documents. The following documents, of the issue in effect on date of invitation for bids or request for proposal, form a part of this standard to the extent specified herein.

SPECIFICATIONS

FEDERAL

O-C-430 - Cleaning Compound, Paint Brush
O-S-571 - Sodium Carbonate, Anhydrous, Technical
O-S-598 - Sodium Hydroxide, Technical
O-S-604 - Sodium Metasilicate, Technical
O-S-642 - Sodium Phosphate, Tribasic, Technical
P-C-433 - Cleaning Compound, Alkali, Pipeline
P-C-436 - Cleaning Compound, Alkali, Boiling Vat (Soak) or Hydrosteam
P-C-437 - Cleaning Compound, High Pressure (Steam) Cleaner
P-C-535 - Cleaning Compound, Plater's, Electrocleaning for Steel
VV-K-211 - Kerosene

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MIL-C-22542 - Cleaning Compound, High Pressure Cleaner, Liquid
MIL-C-51052 - Cleaning Compound for Water-Wash Paint Spray Booth
MIL-D-16791 - Detergents, General Purpose (Liquid Nonionic)
MIL-D-26549 - Descaling Compound, Alkaline, Hot Section Jet Engine Parts

3. GLOSSARY

3.1 Definitions. Refer to introductory paragraph 3.1.

3.2 Abbreviations. Refer to introductory paragraph 3.2.

4. GENERAL REQUIREMENTS

4.1 Chemical and physical requirements. Refer to introductory paragraph 4.1.

4.2 Nomenclature. Refer to introductory paragraph 4.2.

4.3 Packaging data and labeling. Refer to introductory paragraph 4.3.

4.4 Safety. Dry solid forms of alkaline substances can produce dusts if the particle size is very fine. Granular forms of large particle size minimize dust formation. The TLV for sodium and potassium hydroxide is 2 mg/m^3, but values for alkaline salts, such as sodium carbonate, silicates and phosphates are not available. Alkaline dusts are irritating to the skin, and especially to the mucous membranes of the respiratory tract and also the eyes. Solution forms of alkaline cleaners can vary from mildly alkaline (pH from 7.1 to 9.0) to highly alkaline and caustic solutions (pH above 10). Highly alkaline solutions are corrosive to body tissues and can cause severe damage to the eyes. Personnel working with alkaline powders and solutions shall be provided with and required to use respiratory, skin and eye protection determined by the type of exposure. For more specific instructions, the responsible local safety authority must be consulted to determine safe operating procedures, personnel protective measures and environmental controls. For emergency treatment in case of skin contact, the exposed area shall be flushed with water. In case of eye contact, flush with water for at least 15 minutes, and obtain medical attention.

4.5 Shelf life. Refer to introductory paragraph 4.5.

4.6 Temperature. Refer to introductory paragraph 4.6.

4.7 Pollution potential. Refer to introductory paragraph 4.7.

4.8 Disposal data. Alkaline dry powder spills shall be salvaged for use if not contaminated for their application. Contaminated solid compound spills shall be handled for disposal as described in introductory paragraph 4.8. Caustic and highly alkaline solution spills should be neutralized with sodium bisulfate to render them innocuous, before handling for disposal. Mildly alkaline solutions can be handled for disposal without neutralization. Disposal of the neutralized or mildly alkaline solution spills shall be handled in accordance with appropriate regulations as described in introductory paragraph 4.8. Used alkaline cleaning solutions, containing soil or products of reaction with soil, shall be handled for disposal in accordance with appropriate regulations. The presence of heavy metal contaminants in large quantity, such as chromium compounds, in waste solutions will require special treatment involving chemical reduction, precipitation and separation of the contaminated sludge, before disposal of the effluent in accordance with appropriate regulations. The contaminated sludge shall be packaged in such a manner that the waste item can be safely handled and transported to a permitted disposal facility.

4.9 DISCLAIMER. Refer to introductory paragraph 4.9.

5. DETAIL REQUIREMENTS

5.1 Name. CLEANING COMPOUND, PAINT BRUSH

5.1.1 Specification. O-C-430, Cleaning Compound, Paint Brush.

5.1.2 Technical description.

5.1.2.1 Physical. The compound is a homogeneous, free-flowing powdered mixture of uniform particle size to minimize segregation of the ingredients, with not less than 85% passing through a US No. 10 (2.00 mm) sieve.

5.1.2.2 Chemical. The compound shall be completely soluble in water, with a 1% solution having a pH in the range of 7.0 to 12.0. Caustic alkali agents are excluded from the finished product. Composition of the mixture is not specified.

5.1.2.3 Cleaning efficiency. A 10.0% solution of the compound in water shall effectively loosen hard (oil base) paint, varnish, shellac and enamel within 48 hours to permit easy removal, without deleterious action on the brush.

5.1.2.4 Stability. The compound shall be stable for a period of not less than one year, without tendency to cake under normal shipping and storage conditions.

5.1.3 Use data. The compound is intended for use in the cleaning of brushes hardened with (oil base) paint, varnish, shellac and enamel.

5.1.4 Packaging data and labeling.

5.1.4.1 Packaging data. The compound shall be unit packed and packed for shipment as specified in the contract or order.

5.1.4.2 Labeling. Unit packs and shipping containers shall be marked in accordance with MIL-STD-129. The manufacturer shall mark each unit container with instructions for use and preservation of the brush after the use of the compound. Warning or precautionary labeling required by applicable federal laws shall be included based on the manufacturer's formulation.

5.1.5 Safety precautions. The compound is alkaline and the safety instructions of paragraph 4.4 are applicable to the material and its solutions. Exposure to dust while handling shall be prevented because it is irritating to the skin, eyes and respiratory tract. Exposure of the skin and eyes to solutions of the compound must be prevented. In case of exposure of the skin, prompt flushing with water should be adequate. In case of eye contact, flushing with water for at least 15 minutes shall be the emergency treatment. Medical attention should then be obtained.

5.1.6 Storage data. Alkaline salts, containing water of crystallization, tend to agglomerate and cake if heated and then cooled while stored in sealed containers. The compound should be stored in a cool, dry place in order to assure indefinite storage life. Alternate heating and cooling of containers must be avoided to prevent breathing by the containers which could cause absorption of carbon dioxide and moisture by the contents.

5.1.7 Disposal data. Dry powder spills shall be salvaged for use, but if contaminated should be placed in sealed containers for disposal.

Clean solution spills should be neutralized with sodium bisulfate if highly alkaline and absorbed, or if only mildly alkaline can be absorbed and placed in sealed containers for disposal. Soiled solutions containing heavy metal contaminants, derived from paint pigments, should be absorbed and placed in sealed containers for disposal. Disposal of dry powder, absorbed solutions and soiled solvent residues shall be done by the procedures described in disposal data of paragraph 4.8.

5.2 Name. CLEANING COMPOUND, ALKALI, PIPELINE

5.2.1 Specification. P-C-433, Cleaning Compound, Alkali, Pipeline.

5.2.2 Technical description.

5.2.2.1 Physical. The compound shall be a uniform, free-flowing, granular type mixture of material completely passing a US No. 3 1/2 (5.6 mm) sieve.

5.2.2.2 Chemical.

TABLE I. - Material composition

Ingredients	Percent by Weight
Sodium hydroxide, flake	54 ± 5
Sodium nitrate	30 ± 3
Sodium chloride	11 ± 1
Aluminum cuttings	4.2 ± 0.4

5.2.2.2.1 Chemical requirement. The reaction resulting from the addition of 30g of the compound to 100 ml of water will cause a temperature rise of not less than 78°C (172°F), and the resulting solution will be free of alkali cake or aluminum cuttings within ten minutes.

5.2.3 Use data. The compound is intended for opening clogged drain lines and as a regular maintenance compound for keeping drain lines sanitary and trouble-free. It is not intended for use with garbage disposal or dishwasher appliances.

5.2.4 Packaging data and labeling.

5.2.4.1 Packaging data. The compound shall be unit packed and packed for shipment as specified in the contract or order. Unit containers shall have a reclosable feature in accordance with the Poison Prevention Packaging Act.

5.2.4.2 Labeling. Unit and shipping containers shall be marked in accordance with MIL-STD-129. Exterior shipping containers shall be marked in accordance with Department of Transportation requirements. Labels for unit containers shall conform to Federal Hazardous Substance Act (FHS). Labels shall be bold-type securely affixed to the container and reading as follows:

DANGER! CORROSIVE; POISON

Contains sodium hydroxide (caustic soda; lye).
Causes severe eye and skin damage.
Keep material and solutions of material away from eyes, skin and clothing.
Keep out of reach of children.
In case of contact with eyes, immediately flush with water for at least 15 minutes, and obtain medical attention. For skin, flood with water.

5.2.5 Safety precautions. The compound is strongly alkaline (caustic) and corrosive, and the safety instructions of paragraph 4.4 are applicable to the material and its solutions. Personnel handling this material must prevent skin or eye contact. Reaction with water and deposits in drain pipes could produce spattering and noxious fumes which personnel must avoid contacting or inhaling. In case of exposure, flush skin with water followed by dilute acetic acid (vinegar). Eyes shall be flushed with water and medical attention obtained.

5.2.6 Storage data. Sodium hydroxide will absorb carbon dioxide and moisture from the atmosphere if exposed, thereby resulting in caking. Containers of this material must, therefore, be kept tightly sealed, and stored in a cool, dry place in order to insure indefinite storage life.

5.2.7 Disposal data. Dry material spills shall be salvaged for use, but if contaminated shall be placed in sealed containers for disposal. Spattered reaction products shall be absorbed and placed in sealed containers for disposal. Disposal of dry material and absorbed reaction products shall be done by the procedures described in disposal data of paragraph 4.8.

5.3 Name. CLEANING COMPOUND, ALKALI, BOILING VAT (SOAK) OR HYDROSTEAM.

5.3.1 Specification. P-C-436, Cleaning Compound, Alkali, Boiling Vat (Soak) or Hydrosteam.

5.3.2 Technical description.

5.3.2.1 Physical. The compound shall be a uniform, free-flowing granular type material showing no evidence of segregation or caking during handling or storage. The dust forming property requires dust settling within 5 seconds.

5.3.2.2 Chemical.

5.3.2.2.1 Composition. The cleaning compound consists of sodium metasilicate, monobasic sodium phosphate, trisodium phosphate, nonionic surfactant and anionic surfactant in the proportions necessary to meet the stated requirements of the specification but not necessarily in the proportions shown in Table II.

5.3.2.2.1.1 Composition limitations.

Silicate as SiO_2 - Not less than 15.1% by wt
Total phosphates as P_2O_5 - Between 17.7% and 22% by wt
Total alkalinity as Na_2O - Not to exceed 28.0% by wt
Alcohol soluble matter - Between 17.3% and 18.4% by wt
All nonionic and anionic surfactants - At least 80% biodegradable.

TABLE II. Comparison formula composition

Ingredient	Material Specification	Percent by Weight
Sodium metasilicate, anhydrous	O-S-604, Type II	31.3
Primary sodium phosphate, monabasic, anhydrous	Technical Grade NaH_2PO_4	12.3
Trisodium phosphate, anhydrous	O-S-642, Type I	24.8
Nonionic surfactant	Ethoxylated straight chain primary alcohol. Ethoxylated straight chain secondary alcohol. Ethoxylated straight chain alkyl phenol	7.9
Anionic surfactant	Straight chain sodium alkyl benzene sulphonate - C_{12} to C_{18} alkyl (40% active)	23.7

5.3.2.2.2 Solutions. The pH value of a 4.75% wt/vol solution of the compound in distilled water shall be not more than 12.2 at 25°C (77°F). Surface tension of a 0.0317% wt/vol solution of the compound in distilled water shall be not more than 36 dynes/cm at 25°C (77°F).

5.3.2.3 Cleaning efficiency. The compound shall be capable of completely removing mineral oil and asphalt soils from steel panels, when tested at a concentration of 4.75% wt/vol in water, as indicated by freedom from "water-break" and "residue-pattern" stains. The 4.75% wt/vol solution, after boiling for 40 hours, shall retain its cleaning efficiency.

5.3.2.4 Corrosiveness. The compound solution shall not attack aluminum, even when coupled galvanically to steel. The aluminum shall remain bright, unstained and unetched.

5.3.3 Use data. The compound is intended for use in the hot soak tank cleaning of ferrous and non-ferrous alloy parts, including aluminum-magnesium assemblies. For soak cleaning the compound is used at a concentration of 7 oz/gal (52 g/l) of water at a rolling boil. The compound may also be used in injection hydrosteam units, using existing plant steam supplies, for steam cleaning ferrous and non-ferrous alloys. For hydrosteam cleaning the compound is completely dissolved in hot water at a concentration of 7 oz/gal (52 g/l), and this concentrate solution is metered to obtain desired results. The compound must not be used in steam cleaning machines of the high pressure continuous tubular coil, vapor generator type. The cleaning solutions prepared from this cleaning compound are useful for removal of mineral oil, grease and asphalt soils from metal surfaces. The poor detergent efficiency of aqueous cleaning solutions, for removal of asphalt soil can be improved by increasing the anionic surfactant content of the surfactant mixture to 50% for good detergency, and to 67% for excellent detergency. The effectiveness of the cleaner can be increased by conversion of the aqueous solution of the cleaner into a stable, single phase, alkaline water-base organic solvent solution which is operated at a boil when used as a soak detergent, or may be used as a conventional hydrosteam cleaner. The improvement is accomplished by adding 1 gal (3.8 l) of hexylene glycol to 9 gal (34 l) of a 7 oz/gal (52 g/l) water solution of the cleaning compound. The hexylene glycol content is maintained during use.

5.3.4 Packaging data and labeling.

5.3.4.1 Packaging data. The compound shall be unit packed and packed for shipment as specified in the contract or order.

5.3.4.2 Labeling. Containers shall be marked in accordance with MIL-STD-129. Labeling shall comply with the requirements of the Federal Hazardous Substance Act. The following markings shall be included on each unit container:

Directions for use - Use compound at a concentration of 7 oz/gal (52 g/l) of water at a rolling boil for soak cleaning. For hydrosteam cleaning, dissolve compound completely in hot water to obtain a concentration of 7 oz/gal of water, and adjust concentrate solution on metering device to obtain desired results. Hot water should be used for dissolving, and solution of the compound must be complete before using. There must be no undissolved material in concentrate tank.

In addition, each unit container shall bear the following precautionary label.

WARNING! CAUSES IRRITATION

Avoid contact with eyes, skin and clothing.
Avoid breathing dust.
Wash thoroughly after handling.
In case of contact, flush skin with water. For eyes, wash with water for at least 15 minutes, and obtain medical attention.

5.3.5 Safety precautions. The compound is alkaline and the safety instructions of paragraph 4.4 are applicable to the material and its solutions. Exposure to dust while handling must be prevented because it is irritating to the skin, eyes and respiratory tract. Exposure of the skin and eyes to solutions of the compound must be prevented. In case of exposure of the skin, prompt flushing with water should be adequate. In case of eye contact, flush with water for at least 15 minutes and obtain medical attention.

5.3.6 Storage data. Anhydrous alkaline salts will absorb carbon dioxide and moisture on exposure to air which will cause agglomeration and caking. Containers of the compound must be promptly resealed after partial use to prevent exposure to moisture. The compound should be stored in a cool, dry place to assure indefinite storage life.

5.3.7 Disposal data. Dry material spills shall be salvaged for use, but if contaminated shall be placed in sealed containers for disposal. Solution spills should be neutralized with sodium bisulfate before disposal. Soiled solutions shall be treated to separate the contaminants as oil and sludge before disposal of the effluent. Oil and sludge shall be packaged in sealed containers for disposal. Disposal of contaminated dry material, solutions, effluent, and separated oil and sludge shall be by procedures described in disposal data of paragraph 4.8.

5.4 Name. CLEANING COMPOUND, HIGH PRESSURE (STEAM) CLEANER

5.4.1 Specification. P-C-437, Cleaning Compound, High Pressure (Steam) Cleaner.

5.4.2 Technical description.

5.4.2.1 Physical. Type I and Type II compounds shall be nonhygroscopic, nonsegregating, granular, free-flowing mixtures which will show no evidence of caking (lumping or agglomerating) in the as-received condition or during storage. The fineness of the compounds requires that the particle size be such that 100% shall pass a US No. 6 sieve and not more than 3.0% shall pass a US No. 100 sieve. When tested for caking in storage, the compounds shall remain free flowing and of such a texture and granulation that 100% shall pass a US No. 6 sieve. The dust forming property requires settling of dust within a period of 5 secs. Segregation of any ingredient within containers shall not differ more than 2% from the average percentage of that ingredient in the compound.

5.4.2.2 Chemical.

5.4.2.2.1 Solutions. The insoluble matter in a 10% wt/vol distilled water solution of the compound shall not exceed 0.25%. The pH of a 0.50% wt/vol solution of type I or a 0.30% wt/vol solution in distilled water shall be between 10.5 and 11.4. The surface tension of a 0.25% wt/vol solution of the type I compound or a 0.15% solution of the type II compound shall be not more than 42 dynes/cm.

5.4.2.2.2 Composition. The type I compound contains phosphates and the type II compound contains no phosphates. The compounds are not required to conform to definite chemical composition requirements, but they shall be free from fatty acid, rosin, soaps, starch, abrasives, gritty material, inert fillers, carbonates, bicarbonates, and free sodium hydroxide. The synthetic detergents in the compounds shall be 90% (minimum) biodegradable.

5.4.2.3 Water softening. The water softening or stability of the compounds, when tested at a temperature of 126.5°C to 129.5°C for a 0.25% wt/vol solution of type I or a 0.15% solution of type II in water of 20 grain hardness, shall give no evidence of precipitation or curd formation nor shall there be an opalescence greater than that produced in a solution of the comparison compound of the same type compound shown in Table III.

TABLE III. Standard comparison compounds

TYPE I

Component	Percent by Weight
Sodium metasilicate, pentahydrate ($Na_2SiO_3 \cdot 5H_2O$), (O-S-604)	35.0
Primary sodium phosphate ($NaH_2PO_4 \cdot H_2O$), ACS Grade	10.5
Sodium tripolyphosphate ($Na_5P_3O_{10}$), Technical Grade	52.5
Nonionic surface active agent (MIL-D-16791, Type I)	2.0

TYPE II

Component	Percent by Weight
Sodium metasilicate, anhydrous	54.2
Citric acid, monohydrate	23.6
Sodium citrate, dihydrate	20.2
Nonionic surface active agent (MIL-D-16791, Type I) (With cloud point $54^{\circ}C \pm 3^{\circ}C$)	2.0

5.4.2.4 Cleaning Efficiency. The cleaning compound shall be equal or superior to the standard comparison compound of the same type in ability to remove a standard soil when tested as specified.

5.4.2.5 Corrosion. Boiling solutions of the compounds in distilled water, at concentrations of 0.25% and 1.2% wt/vol for type I and concentrations of 0.15% and 1.2% wt/vol for type II, shall cause no visible staining, discoloration, etching or pitting of aluminum or aluminum alloy, and permitted weight loss not in excess of required limits for the metal test specimens.

5.4.3 Use data. The compounds are for use in high pressure steam cleaning machines of the continuous tubular coil vapor-generating type, for cleaning of ferrous and non-ferrous metal surfaces. Solutions of the compound shall not impede nor clog the flow by precipitation and building up of solids in the jets, coils or orifices. For use, the compounds are thoroughly dissolved at concentrations of 10 oz/gal (75 g/l) of water by adding the dry compounds to hot water. For type I compound a nozzle concentration of 0.3% (0.4 oz/gal or 3 g/l) is suitable for average cleaning. For type II compound a nozzle concentration of 0.2% (0.25 oz/gal or 1.9 g/l) is suitable for average cleaning. Nozzle concentrations may be adjusted to obtain desired results.

5.4.4 Packaging data and labeling.

5.4.4.1 Packaging. The compounds shall be unit packed and packed for shipment as specified in the contract or order. A 3-mil thick polyethylene bag liner is required regardless of the type of drum used to prevent caking due to absorption of moisture and carbon dioxide.

5.4.4.2 Labeling. Containers shall be marked in accordance with MIL-STD-129. Each unit container shall be durably and legibly marked with the directions for use of the compound as follows:

For Type I compounds - Directions for use. The compound shall be thoroughly dissolved to give a concentration of approximately 10 oz of the compound per gal (75 g/l) of water, using the soap tank of the cleaning machine, or a separate drum outside the cleaning machine and then transferring to the soap tank of the cleaning machine. The dry compound must be added to hot water in preparing the solution, and not vice versa. Adjust the concentrate solution metering device to obtain the desired results. A nozzle concentration of 0.3% (0.4 oz/gal or 3 g/l) is suitable for average cleaning. When the machine is shut down at the end of a shift, a "blow-down" is essential for retarding scale formation in the coils of the machine.

For Type II compounds - Directions for use. The compound shall be thoroughly dissolved to give a concentration of approximately 10 oz of the compound per gal (75 g/l) of water, using the soap tank of the cleaning machine, or a separate drum outside the cleaning machine and then transferring to the soap tank of the cleaning machine. The dry compound must be added to hot water in preparing the solution, and not vice versa. Adjust the concentrate solution metering device to obtain the desired results. A nozzle concentration of 0.2% (0.25 oz/gal or 1.9 g/l) is suitable for average cleaning. When the machine is shut down at the end of a shift, a "blow-down" is essential for retarding scale formation in the coils of the machine.

In addition, each unit container shall bear the following precautionary label.

WARNING! CAUSES IRRITATION

Avoid contact with eyes, skin and clothing.
Avoid breathing dust.
Wash thoroughly after handling.
In case of contact, flush skin with water. For eyes, wash with water for at least 15 minutes, and obtain medical attention.

5.4.5 Safety precautions. The compounds are alkaline and the safety instructions of paragraph 4.4 are applicable to these materials and their solutions. Exposure to dust while handling must be prevented because it is irritating to the skin, eyes, and respiratory tract. Exposure of the skin and eyes to solutions of the compound must be prevented. In case of exposure of the skin, prompt flushing with water should be adequate. In case of eye contact, flush with water for at least 15 minutes and obtain medical attention.

5.4.6 Storage data. Alkaline salts, containing water of crystallization, tend to agglomerate and cake if heated and then cooled while stored in sealed containers. The compound should be stored in a cool, dry place in order to assure indefinite storage life. It is required that 125 lbs (56.6 kg) of the compound, stored in a specified steel drum for 12 months in an unheated warehouse, retain free-flowing and granular characteristics.

5.4.7 Disposal data. Dry material spills shall be salvaged for use, but if contaminated shall be placed in sealed containers for disposal. Solution spills should be neutralized with sodium bisulfate before disposal. Soiled solutions shall be treated to separate the contaminants, as oil and sludge before disposal of the effluent. Oil and sludge shall be packaged in sealed containers for disposal. Disposal of contaminated dry material, solutions, effluent and separated oil and sludge, shall be done by procedures described in disposal data of paragraph 4.8.

5.5 Name. CLEANING COMPOUND, PLATER'S ELECTROCLEANING, FOR STEEL.

5.5.1 Specification. P-C-535, Cleaning Compound, Plater's Electrocleaning for Steel.

5.5.2 Technical description.

5.5.2.1 Physical. The compound shall be a uniform, free-flowing material with the maximum particle size of the ingredients such as to pass through a US No. 4 sieve. The dust forming property requires dust settling within 5 secs.

5.5.2.2 Chemical.

5.5.2.2.1 Composition. The compound shall be free of fatty acids, rosin, starch, soaps, lignite, inert fillers, and excessive dust-control agents. The compound shall conform to the chemical composition as specified in Table IV.

5.5.2.3 Performance.

5.5.2.3.1 Conductivity. The electrical conductivity of a 6% by wt solution of the compound shall be at least one-half that of a solution of NaOH of the same concentration at 25°C (77°F).

5.5.2.3.2 Tarnishing of steel. The minimum allowable current density for tarnishing of polished high carbon steel, with the test specimen as the anode; shall be 150 amperes/sq foot (1615 amperes/sq meter) for ten minutes in a 6% by wt solution of the compound at 83°C (180°F).

5.5.2.3.3 Foam blanket. The foam blanket produced with a steel specimen of 4 by 4 inches (10.2 by 10.2 cm) as the anode in a 6% by wt solution of the compound, with a current density of 40 amperes/sq foot (431 amperes/sq meter) of solution surface area of the tank for 10 minutes, shall be between 1/4 inch and 1 1/2 inches (0.63 and 3.8 cm) thick.

5.5.3 Use data. The compound is intended primarily for use in the anodic cleaning of steel prior to electroplating and chemical treatments. It may also be used for cathodically cleaning magnesium prior to chemical and electrochemical treatments. The compound is generally used in concentrations from 8 to 12 oz/gal (60 to 90 g/l) at a minimum solution temperature of 83°C (180°F).

5.5.4 Packaging data and labeling.

5.5.4.1 Packaging data. The compound shall be unit packed and packed for shipment as specified in the contract or order.

5.5.4.2 Labeling. Containers shall be marked in accordance with MIL-STD-129. Each container shall also be marked with directions for use of the compound as follows:

Directions for use - The compound shall be thoroughly dissolved to give a concentration of 8 to 12 oz/gal (60 to 90 g/l) of water, or other useful concentration as desired. The dry compound must be added to hot water in preparing the solution, and not vice versa, with a minimum solution temperature of 83°C (180°F) for use.

In addition, each unit container shall bear the following precautionary label.

DANGER! CORROSIVE
CAUSES SEVERE BURNS

Contains sodium hydroxide (caustic soda).
Causes severe eye and skin damage.
Keep material and solutions away from eyes, skin, and clothing.
Avoid breathing dust.
In case of contact with eyes, flush with water for at least 15 minutes and obtain medical attention. For skin, flush with water.

5.5.5 Safety precautions. The compound is strongly alkaline (caustic) and corrosive, and the safety instructions of paragraph 4.4 are applicable to the material and its solution. Personnel handling this material or its solutions must prevent skin or eye contact. In case of exposure, flush skin with water. Eyes shall be flushed with water and medical attention obtained.

5.5.6 Storage data. The compound contains caustic soda (sodium hydroxide) which will absorb carbon dioxide and moisture from the atmosphere, if exposed, thereby resulting in caking. Containers of this material must therefore, be kept tightly sealed, and stored in a cool, dry place in order to insure indefinite storage life.

5.5.7 Disposal data. Dry material spills shall be salvaged for use, but if contaminated shall be placed in sealed containers for disposal. Solution spills should be neutralized with sodium bisulfate before disposal. Soiled solutions shall be treated to separate the contaminants as sludge before disposal of the effluent. Sludge shall be packaged in sealed containers for disposal. Disposal of contaminated dry material, solutions, effluent, and separated sludge shall be done by procedures described in disposal data of paragraph 4.8.

5.6 Name. CLEANING COMPOUND FOR WATER-WASH PAINT SPRAY BOOTH.

5.6.1 Specification. MIL-C-51052, Cleaning Compound for Water-Wash Paint Spray Booth.

5.6.2 Technical description.

5.6.2.1 Physical. The compound shall be an intimate, uniform mixture of materials showing no evidence of segregation or caking during handling or storage and meeting specified granulation and dusting requirements.

5.6.2.2 Chemical.

5.6.2.2.1 Composition. The compound shall be an intimate mixture of anhydrous alkaline salts, detergents, and/or alkalies, including sodium metasilicate or sodium orthosilicate possessing colloidal properties in solution, and kerosene. The compound may also contain a defoaming agent, solvent and a soluble inert inorganic salt. A compound illustrating the type of formulation covered, but not necessarily represented as meeting all the requirements of the applicable specification, is shown in Table V below.

TABLE V. Illustrative composition

Component	Percent by Weight
Sodium orthosilicate - Technical grade	23.0
Sodium carbonate (O-S-571)	20.0
Sodium hydroxide (O-S-598)	30.0
Sodium chloride - C. P. grade	6.0
Bentonite - Technical grade	12.0
Kerosene (VV-K-211)	9.0

5.6.2.3 Requirements. The compound shall conform to the requirements shown in Table VI.

5.6.3 Use data. The compound is intended for use either as a float type or digestant type water wash paint spray booth product depending on the use concentration. In use, the float type concentration is approximately 0.2 oz/gal (1.5 g/l), and the digestant type concentration is approximately 0.5 oz/gal (3.7 g/l). Best use concentration depends on type of paint overspray, ranging from 0.13 oz/gal (0.97 g/l) for flotation to 1 oz/gal (7.5 g/l) for digestant type. The water wash solution is prepared by dissolving the required quantity in a small container, and the solution (with insoluble matter) transferred to the water curtain tank. Solution strength is maintained by daily additions based on alkalinity titrations. Foaming is controlled by addition of 1 or 2 gal (3.8 or 7.6 l) of kerosene per 200 gal (757 l) of solution.

TABLE VI. Quantitative requirements

Characteristics	Requirements
pH, 0.5% solution, at 25°C (77°F)	12.4 - 12.7
Surface tension, 0.5% solution, at 25°C, min	53 dynes/cm
Foaming, 0.5% solution, at 25°C, initial foam height	None allowed
Inorganic water insolubles, % by wt of compound	5.0 - 15.0
Alkalinity to methyl orange, as % Na_2O, min	40.0 Alkalinity
Alkalinity to phenolpthalein, as % Na_2O	35.0 - 40.0
Silicates, as % SiO_2, min	5.0
Granulation, passing No. 8 Mesh Sieve, min	100%
Granulation, retained on No. 100 Mesh Sieve, min	90%
Suspendibility	Solids remain partially dispersed after 1 hour settling
Dusting	Dust shall settle in 5 secs
Penetration, average, min	30.0

5.6.4 Packaging data and labeling.

5.6.4.1 Packaging data. The compound shall be unit packed and packed for shipment as specified in the contract or order.

5.6.4.2 Labeling. Marking of containers shall be in accordance with MIL-STD-129. In addition, each container shall be marked as follows:

Directions for use.

1. Float type concentration is approximately 0.2 oz/gal (1.5 g/l).
2. Digestant type concentration is approximately 0.5 oz/gal (3.7 g/l).
3. Best use concentration depends on type of paint overspray, ranging from 0.13 oz/gal (0.97 g/l) for flotation to 1 oz/gal (7.5 g/l) for digestant type.
4. To prepare the water wash solution, the required quantity of compound should be dissolved in hot water in a small container outside the spray booth system, and the resultant solution (with insoluble matter) transferred to the water curtain tank.
5. Solution strength should be maintained by small daily additions based on alkalinity titrations.
6. Foaming caused by some paints may be controlled by addition of 1 to 2 gal (3.8 or 7.6 l) of kerosene/200 gal (757 l) of water wash solution.

5.6.4.1 Precautionary marking. Each unit container shall bear the following precautionary marking:

DANGER! CORROSIVE
CAUSES BURNS

Avoid contact with skin, eyes and clothing.
Avoid breathing dust.
Wash thoroughly after handling.
In case of contact, flush skin with water. For eyes, flush with water for at least 15 minutes and obtain medical attention.

5.6.5 Safety precautions. The compound is strongly alkaline (caustic) and corrosive, and the safety instructions of paragraph 4.4 are applicable to the material and its solution. Personnel handling this material or its solutions must prevent skin or eye contact by wearing long sleeve coveralls, rubber gloves and aprons, and eye protection. In case of exposure, flush skin with water. Eyes shall be flushed with water for at least 15 minutes and medical attention obtained.

5.6.6 Storage data. The compound contains anhydrous alkaline salts, and could contain alkalies such as sodium and potassium hydroxide which will absorb carbon dioxide and moisture from the atmosphere, if exposed, thereby resulting in caking. Containers of this material, therefore, must be kept tightly sealed and stored in a cool, dry place in order to insure indefinite storage life.

5.6.7 Disposal data. Dry material spills shall be salvaged for use, but if contaminated shall be placed in sealed containers for disposal. Solution spills should be neutralized with sodium bisulfate before disposal. Soiled solutions in flotation tanks shall be skimmed to reclaim the paint and the solution reused after adjusting the alkalinity. Soiled solutions, from both flotation and digestant type systems, when no longer reuseable, shall be treated to separate the contaminants as oil and sludge before disposal of the effluent. Contaminants could include heavy metals such as chromium, lead and titanium compounds. Disposal of contaminated dry material, solutions, effluent, and separated oil and sludge, shall be done by procedures described in disposal data of paragraph 4.8.

5.7 Name. CLEANING COMPOUND, ALKALI, FERROUS SURFACE
Descaling Compound, Alkaline, Hot Section Jet Engine Parts

5.7.1 Specification. MIL-D-26549, Descaling Compound, Alkaline, Hot Section Jet Engine Parts.

5.7.2 Technical description.

5.7.2.1 Physical. The compound shall be a homogeneous liquid at 25°C (77°F) containing not more than 1.0% by vol of sediment. Viscosity of the undiluted compound shall be not greater than 120 cp at 25°C (77°F). The specific gravity shall be between 1.255 and 1.495 at 25°C (77°F). The pour point shall not be above -1°C (30.2°F); and after being exposed to a temperature of -26°C (-14.8°F) for one hour the compound shall return to its original condition as shown by lack of precipitation or layering. The boiling point shall be in the temperature range 115.6°C to 135°C (240°F to 275°F), and upon distillation there shall be no distillate other than water when the vapor temperature is at 100°C (212°F) and the temperature of the material is in the specified boiling range. The compound shall be completely miscible in cold distilled water at a vol concentration between 10 and 50%, and be completely rinsable by hot tap water, from a steel panel wetted by the compound.

5.7.2.2 Chemical. The compound shall be nonflammable. The alkalinity of the compound shall be equivalent to about between 12.5 and 15% of sodium hydroxide solution, and the pH of a 0.5% solution shall be greater than 12.0 at 25°C (77°F). The compound shall cause no permanent turbidity with cobaltous or nickel cations when tested as specified.

5.7.2.2.1 Composition. The composition of the compound is optional, but the compound shall contain no cresols, phenols (or their salts), chlorides, fluorides, sulfides or cyanides. There shall be no strong oxidizing substances such as chlorates, perchlorates, chromates, peroxides and nitrates present. The presence of free caustic soda is not permitted.

5.7.2.3 Performance. The compound shall be equal or superior to in performance to a comparison process employing fused caustic potash, with a descaling percentage of 80 to 95%. The operational stability of the compound, tested after heating within 5°C (9°F) of its boiling point for 7 days (168 hours) shall be within 5% of the fresh compound in descaling effectiveness. Corrosion dimensional changes of representative hot section alloy samples shall not exceed 0.05 mil when processed in the compound within 5°C (9°F) of its boiling point for one hour.

5.7.3 Use data. The compound, together with auxiliary solutions, is intended to be used for descaling hot section jet engine parts by removal of carbon deposits, complex metallic oxides and heat scale. In the practical laboratory descaling test, heavily scaled engine parts are immersed in a bath of the compound at a temperature 5°C below its boiling point for one hour. After removal, the parts are pressure rinsed with steam or hot water air gun. The parts are then immersed in an alkaline permanganate bath, composed of 20 oz (567 g) sodium hydroxide, 20 oz (567 g) sodium carbonate, and 10 oz (283.5 g) of potassium permanganate per gal (3.8 l) of solution, at a temperature of 88°C (190°F) for one hour. After removal, the parts are again pressure rinsed as before. The parts are then immersed in a nitric acid bath, composed of a 25% by volume of (70%) nitric acid solution, at a temperature of 25°C (77°F) for one hour. After removal the parts are pressure rinsed as before. The compound should not be used on aluminum alloys. In addition, it should not be used on any other alloy whose dimensional losses will be greater than 0.05 mils; or on any alloy where dimensional losses in auxiliary baths, such as alkaline permanganate and nitric acid, exceed 0.05 mils.

5.7.4 Packaging data and labeling.

5.7.4.1 Packaging data. The compound shall be unit packed and packed for shipment as specified in the contract or order.

5.7.4.2 Labeling. Containers shall be marked in accordance with MIL-STD-129, with marking nomenclature:

DESCALING COMPOUND, ALKALINE, HOT SECTION, JET ENGINE PARTS

Additional information shall be durably marked so it will not be damaged when the container is opened:

SPECIFICATION NO.
MFR'S CODE NO.
DATE OF MANUFACTURE

DANGER! CORROSIVE LIQUID
CAUSES BURNS

The ingredients used in the manufacture of this compound are toxic and caustic, and proper precautions should be taken to prevent contact with skin and clothing and to avoid inhalation of the vapors. In case of skin contact, remove clothing and wash with copious amounts of water. For eyes, wash well with water for at least 15 minutes and obtain medical attention.

5.7.5 Safety precautions. The compound is a strongly alkaline and corrosive liquid, and the safety instructions of paragraph 4.4 are applicable. Personnel handling this liquid must prevent skin or eye contact by wearing long sleeve coveralls, rubber gloves and aprons, and eye protection. Inhalation of vapors from hot solutions must be prevented by exhaust ventilation, or respiratory protection equipment. In case of exposure, flush skin with water. Eyes shall be flushed with water for at least 15 minutes and medical attention obtained.

5.7.6 Storage data. The compound is a very alkaline liquid and will absorb carbon dioxide from the air if exposed, thereby resulting in the lowering of alkalinity and possibly in deterioration of performance. Containers of this compound must, therefore, be kept tightly sealed in order to insure indefinite storage life. Storage of containers should be in a cool, dry place. Alternate heating and cooling of containers should be avoided to prevent breathing by the containers.

5.7.7 Disposal data. Liquid compound spills shall be salvaged for use, but if contaminated should be neutralized with sodium bisulfate before disposal. Soiled solutions shall be treated to separate the contaminants as sludge before disposal of the effluent. Contaminants could include products of reaction with carbon deposits, complex metallic oxides and heat scale. Sludge shall be packaged for disposal in sealed containers. Disposal of solutions, effluent, and separated sludge, shall be done by procedures described in disposal data of paragraph 4.8.

5.8 Name. CLEANING COMPOUND, HIGH PRESSURE CLEANER, LIQUID

5.8.1 Specification. MIL-C-22542, Cleaning Compound, High Pressure Cleaner, Liquid.

5.8.2 Technical description.

5.8.2.1 Physical. The compound shall be a clear liquid, showing no separated solids or phase separation, that is completely soluble in water. After a dried film is rinsed, there shall be no visible film left on aluminum clad aluminum alloy, magnesium alloy or anodized aluminum alloy panel surfaces. The compound shall not separate into layers and shall retain its homogeneity after exposure to heat at 140° ± 3°F (60° ± 2°C) for six hours and exposure to cold at 0° ± 9°F (-18° ± 5°C) for one hour.

5.8.2.2 Chemical. The compound shall be nonflammable by not continuing to burn after removal of an applied flame. The pH of a 0.5% by wt solution of the compound in distilled water shall be between 10.3 and 11.4 at 77°F (25°C). A solution of the compound shall cause no precipitation nor curd formation when mixed with hard water as specified.

5.8.2.2.1 Composition. The composition of the compound is optional, but the water content shall be less than 60% by wt and the alcohol insoluble content shall be not less than 22% by wt.

5.8.2.3 Performance. A 6% by wt aqueous solution of the compound shall effect the removal of 80% of soil on the surface of an aluminum clad aluminum alloy panel, when tested as specified with the composition of the standard soil being asphaltum 5.0 parts, anhydrous lanolin 15.0 parts, lubricating oil 20.0 parts, turpentine 25.0 parts, powdered activated carbon 20.0 parts by wt. The compound shall not cause a loss of more than 15% of surface hardness nor shall it cause discoloration or dulling of painted surfaces when tested as specified. A 6% by wt aqueous solution of the compound, at a temperature of 205° to 212°F (96° to 100°C) shall cause no visible staining, discoloration, or attack on aluminum clad aluminum alloy, anodized aluminum alloy, polished steel, cadmium plated steel, and chrome pickled magnesium alloy.

5.8.3 Use data. A 10% by vol aqueous solution of the liquid compound is used to neutralize surfaces that were previously treated with acid type cleaners or paint strippers, and it is desirable that the compound solution be rinsed off before drying.

5.8.4 Packaging data and labeling.

5.8.4.1 Packaging data. The compound shall be unit packed and packed for shipment as specified in the contract or order.

5.8.4.2 Labeling. Shipping containers and palletized unit loads shall be marked in accordance with MIL-STD-129. Individual containers shall be marked with the following information:

MIXING RATIO

When used to neutralize acids in the paint removal operation, 1 quart (0.95 l) of the cleaning compound should be mixed with 9 quarts (8.5 l) of water (a mixing ratio of 10% by vol).

When used in the heavy duty cleaning operation, 1 1/2 quarts (1.4 l) of the cleaning compound should be mixed with 50 gal (189 l) of water (a mixing ratio of 0.75% by vol). Adjust the concentrate solution metering device to obtain the desired results.

In addition, each unit container shall bear the following precautionary label.

WARNING! IRRITATING LIQUID

Avoid contact with eyes, skin and clothing.
Wash thoroughly after handling.
In case of contact, flush skin with water. For eyes, flush with water for at least 15 minutes and obtain medical attention.

5.8.5 Safety precautions. The compound is a moderately alkaline liquid, and the safety instructions of paragraph 4.4 are applicable. Personnel handling this liquid must prevent skin or eye contact by wearing long sleeve coveralls, rubber gloves and aprons, and eye protection. In case of exposure, flush skin with water. Eyes shall be flushed with water for at least 15 minutes and medical attention obtained.

5.8.6 Storage data. The compound is a moderately alkaline liquid and will absorb carbon dioxide from the air, if exposed, thereby resulting in lowering of alkalinity and possibly in deterioration of performance. Containers of this compound must, therefore, be kept tightly sealed in order to insure indefinite storage life. Storage of containers should be in a cool, dry place.

5.8.7 Disposal data. Liquid compound spills shall be salvaged for use, but if contaminated should be neutralized with sodium bisulfate before disposal. Soiled solutions should be treated to separate the contaminants, as oil and sludge, before disposal of the effluent. Oil and sludge should be packaged for disposal in sealed containers. Disposal of solutions, effluent, and separated oil and sludge shall be done by procedures described in disposal data of paragraph 4.8.

Part 2 of 5 Parts

ACIDIC CLEANERS

1. SCOPE

1.1 Coverage. Refer to introductory paragraph 1.1. This part of the standard covers two items preferred for use in the selection of acidic cleaners by the Department of Defense.

1.2 Application. Refer to introductory paragraph 1.2.

2. REFERENCED DOCUMENTS

2.1 Issues of documents. The following documents, of the issue in effect on date of invitation for bids or request for proposal, form a part of this standard to the extend specified herein.

SPECIFICATIONS

FEDERAL

0-C-00432	- Cleaning Compound, Engine Cooling System
0-I-490	- Inhibitor, Corrosion, Liquid Cooling Systems
0-0-690	- Oxalic Acid, Dihydrate, Technical
0-S-605	- Sodium Silicate Solution

MILITARY

MIL-C-10597	-Cleaning Compound with Conditioner and Inhibitor for Engine Cooling Systems

3. GLOSSARY

3.1 Definitions. Refer to introductory paragraph 3.1.

3.2 Abbreviations. Refer to introductory paragraph 3.2.

4. GENERAL REQUIREMENTS

4.1 Chemical and physical requirements. Refer to introductory paragraph 4.1.

4.2 Nomenclature. Refer to introductory paragraph 4.2.

4.3 Packaging data and labeling. Refer to introductory paragraph 4.3.

4.4 Safety. Dry solid forms of acidic substances such as oxalic acid, aluminum chloride, sodium bisulfate, sodium acid phosphate and chromic acid can produce dusts if the particle size is very fine. Granular forms of large particle size minimize dust formation. The TLV for oxalic acid is 1 mg/m^3, and for chromic acid is 0.05 mg/m^3 (as Cr). TLVs for other dry physical forms are not available. Acidic dusts are irritating to the skin, and especially to the mucous membrane of the respiratory tract and also the eyes. Solution forms of acid cleaners can vary from mildly acidic to highly acidic solutions (pH lower than 4). Some acid solutions, such as hydrochloric or nitric, can release acid fumes. Some have oxidizing capability such as nitric acid or acid chromate solutions. Highly acidic solutions are corrosive and can cause severe skin burns and eye damage. Personnel working with acidic powders and solutions shall be provided with and be required to use respiratory, skin and eye protection as determined by the type of exposure. For more specific instructions, the responsible local safety authority must be consulted to determine safe operating procedures, personnel protective measures and environmental controls. For emergency treatment in case of skin contact, the exposed areas shall be flushed with water followed by dilute sodium bicarbonate solution. In case of eye contact, flush with water for at least 15 minutes and obtain medical attention.

4.5 Shelf life. Refer to introductory paragraph 4.5.

4.6 Temperature. Refer to introductory paragraph 4.6.

4.7 Pollution potential. Refer to introductory paragraph 4.7.

4.8 Disposal data. Acid dry powder spills should be salvaged for use if not contaminated for their application. Contaminated solid compound spills shall be handled for disposal as described in introductory paragraph 4.8. Highly acidic solution spills should be neutralized with sodium carbonate (soda ash) or calcium oxide (lime) to render them innocuous before handling for disposal. Weakly acid solutions should be neutralized with sodium bicarbonate, and solutions containing oxidizing agents should be reduced with sodium sulfite or ferrous sulfate. Disposal of the neutralized and reduced solution spills shall be handled in accordance with appropriate regulations as described in introductory paragraph 4.8. Used acid cleaning solutions, containing soil or products of reaction with soil, shall be handled for disposal in accordance with appropriate regulations. The presence of heavy metal contaminants in large quantity, such as chromium compounds, in waste solutions will require special treatment involving chemical reduction, precipitation and separation of the contaminated sludge, before disposal of the effluent in accordance with appropriate regulations. The contaminated sludge shall be packaged in such a manner that the waste item can be safely handled and transported to a permitted disposal facility.

4.9 DISCLAIMER. Refer to introductory paragraph 4.9.

5. DETAIL REQUIREMENTS

5.1 Name. CLEANING COMPOUND, ENGINE COOLING SYSTEM

5.1.1 Specification. O-C-00432, Cleaning Compound, Engine Cooling System.

5.1.2 Technical description. The compound is a two component item, consisting of an acid cleaner and alkaline neutralizer.

5.1.2.1 Physical. Both major and minor components shall be free-flowing, and free of dirt and foreign material. Solutions of the major and minor components shall show a surface tension of not more than 37 dynes/cm a 25°C (77°F).

5.1.2.2 Chemical. The major component shall consist of not less than 93% oxalic acid dihydrate and a wetting agent. The minor component shall consist of not less than 93% anhydrous sodium carbonate and a wetting agent.

5.1.3 Use data. The compound is a two-step cleaner. In the first step, a solution of the major component, oxalic acid, when circulated through an engine cooling system at a temperature between 160° and 190°F (71.1° and 87.8°C) dissolves and removes rust and dirt. In the second step, a solution of the minor component, sodium carbonate, when circulated through the engine cooling system, neutralizes the residual oxalic acid remaining in the system after draining the acidic solution.

5.1.4 Packaging data and labeling.

5.1.4.1 Packaging data. The containers of the compound components, consisting of a standard commercial type two compartment paperboard can with slip-on lids and metal ends holding a minimum of 16 oz (454 g) of the major component and 2 oz (57 g) of the minor component, shall be packed in a snug fitting, fiberboard shipping container conforming to V3c or V3s of PPP-B-636, waterproofed and reinforced.

5.1.4.2 Labeling. Interior containers and shipping containers shall be marked in accordance with MIL-STD-129. Each container shall have imprinted on the label in waterproof ink the following instructions:

Directions for use - Drain the cooling system completely, then close drain cocks. Pour entire contents of upper compartment into the radiator. (Use two cans for systems holding more than 22 quarts). Fill system with water and replace radiator cap. Avoid overfilling and spillage of solution on car finish. Run engine at fast idle and warm up to 160° to 190°F (71.1° - 87.8°C). Continue to run for thirty minutes to one hour, maintaining this temperature. If necessary, partly cover radiator to avoid boiling. (Very dirty systems may require up to two hours running or an extra cleaning operation.) Stop engine and drain solution completely from radiator, engine block, and heater. Close drain opening and refill with water. Pour neutralizer from bottom compartment of the container into the radiator, circulate, and drain. Close all cocks and fill system for running.

The container label shall be marked to show where container is to be opened for both cleaner and neutralizer. In addition to complying with the requirements of the Federal Hazardous Substances Labeling Act, each can shall have imprinted a warning statement as follows:

DANGER! CORROSIVE
POISON; MAY BE FATAL IF SWALLOWED

Contains oxalic acid - avoid contact with eyes or prolonged contact with skin.
Avoid breathing dust.

Wash thoroughly after use.
In case of contact with eyes, flush thoroughly with water for at least 15 minutes and obtain medical attention.
If swallowed, give large quantities of milk or chalk and induce vomiting (tablespoon of salt in glass of warm water).
Keep out of reach of children.

5.1.5 Safety precautions. The major component is a strong acid and the safety instructions of paragraph 4.4 are applicable. Oxalic acid is corrosive and contact of the powder or solutions with skin and eyes must be prevented. The dust is irritating to the respiratory tract. Personnel handling this material should wear rubber gloves and eye protection. In case of exposure, flush skin with water followed by soap solution or sodium bicarbonate solution. Eyes should be flushed with water for at least 15 minutes and medical attention obtained. The minor component is alkaline, and the safety instructions of Part 1 paragraph 4.4 are applicable.

5.1.6 Storage data. Oxalic acid dihydrate, contains water of crystallization, and will tend to agglomerate and cake if heated and then cooled in a closed container. The compound should be kept tightly sealed and stored in a cool, dry place to insure indefinite storage life.

5.1.7 Disposal data. Dry oxalic acid and sodium carbonate spills shall be salvaged for use, but if contaminated shall be placed in sealed containers for disposal. The acid solutions should be neutralized with sodium carbonate before disposal. Disposal of dry material, solutions or effluent shall be done by procedures described in paragraphs 4.8 of Parts 1 and 2.

5.2 Name. CLEANING COMPOUND WITH CONDITIONER AND INHIBITOR FOR ENGINE COOLING SYSTEM; Cleaning Compound, Engine Cooling System

5.2.1 Specification. MIL-C-10597, Cleaning Compound with Conditioner and Inhibitor for Engine Cooling Systems.

5.2.2 Technical description. The compound is a three component item kit; consisting of an acid cleaner, an alkaline conditioner, and an alkaline inhibitor.

5.2.2.1 Physical. The dry components shall be free-flowing granulated material.

5.2.2.2 Chemical.

5.2.2.2.1 Composition.

TABLE I. Composition of acid components

Component	Requirement	
	Min	Max
Major Component (granular powder)		
Oxalic acid (O-O-690, Type I), calculated as anhydrous, g	287.5	295.0
Cornstarch, % by wt of major component	1.0	2.0
Minor Component (liquid)		
Aluminum chloride solution,		
calculated as anhydrous, $AlCl_3$, g	49.0	53.0
calculated as anhydrous, % by wt	22.5	28.0
Chlorine, calculated as % by wt of $AlCl_3$	75.0	80.0
pH of 1% $AlCl_3$ solution	3.15	3.35

TABLE II. Composition of alkaline conditioner components

Component	Requirement	
	Min	Max
Alkaline conditioner component		
Trisodium phosphate, anhydrous, g	139.00	150.00
Borax, anhydrous, g	115.00	125.00
Sodium carbonate, anhydrous, g	50.00	60.00
Free alkali, millimole	......	0.10
Sodium silicate component (O-S-605, Class 1)		
Sodium silicate solution, total wt, g	325.00	400.00
Na_2O, % by wt of solution	8.70	9.40
Parts SiO_2 to 1 part Na_2O, by wt	3.17	3.27

TABLE III. Composition of inhibitor component

Composition	Percent by Weight	
	Min	Max
Mercaptobenzothiazole (O-I-490)	3.5	4.5
Sodium tetraborate, decahydrate	95.5	96.5
Inhibitor weight, g	282.0	295.0

5.2.3 Use data. The component mixtures are utilized in a three step system for cleaning, conditioning and inhibiting corrosion in an engine cooling system. In the first step, a solution of the acid cleaner, oxalic acid and aluminum chloride solution is circulated through the cooling system at a temperature of 160° to 180°F (71.1° to 82.2°C) for 20 to 25 minutes; then drained and flushed continuously with water. The second step conditioning process, involving silicate protecting and alkaline conditioning, is carried out by first circulating the silicate solution through the cooling system for 15 minutes at 160° to 180°F, and draining; then circulating the alkaline conditioner through the cooling system for 1 hour at a temperature of 160° to 180°F, and draining; then refilling with water, circulating for 15 minutes and draining. In the third step, for inhibiting corrosion in the cooling system, 10 oz (283.5 g) of inhibitor are added for each 5 gal (18.9 l) of water or antifreeze solution.

5.2.4 Packaging data and labeling.

5.2.4.1 Packaging data. The dry compound components in heat-sealable waterproof bags, the liquid components in semi-rigid round polyethylene plastic bottles, and the instruction sheet shall be placed into a fiberboard box conforming to PPP-B-636, class weather resistant, grade W6c. The unit packs shall be packed into a nailed wood box, wood-cleated plywood box, wirebound wood box, wood-cleated fiberboard box, or solid or corrugated fiberboard box conforming to PPP-B-621, class 2; PPP-B-601, overseas type; PPP-B-585, class 3; PPP-B-591, class II or PPP-B-636, class weather resistant, grade V3c. Unless otherwise specified, gross weight shall not exceed 200 lbs for wood boxes and 70 lbs for fiberboard boxes.

5.2.4.2 Labeling. Shipping containers and unit packs shall be marked in accordance with MIL-STD-129. Each component of the kit shall be marked as indicated in figure 3 of the specification with precautionary labeling as shown.

5.2.5 Safety precautions. The safety precautions of paragraph 4.4 are applicable to the components of the acid cleaner. Oxalic acid is corrosive and contact of the powder or solutions with skin and eyes must be avoided. The dust is irritating to the respiratory tract. Aluminum chloride solutions are also acidic and contact with skin and eyes must be avoided. Personnel handling these materials should wear rubber gloves and aprons, and eye protection. In case of acid exposure, flush skin with water, followed by soap solution. Eyes should be flushed with water. Safety precautions for handling the alkaline conditioner and inhibitor components and the alkaline solutions, including sodium silicate, shall be followed as stated in paragraph 4.4 of Part 1 of this standard.

5.2.6 Storage data. Oxalic acid dihydrate contains water of crystallization, and will tend to agglomerate and cake if heated and then cooled in a closed container. The anhydrous alkaline conditioner component could agglomerate after absorption of moisture. The solid compound components should be kept tightly sealed and stored in a cool, dry place to insure indefinite storage life. The aluminum chloride solution and sodium silicate solution should be kept from freezing.

5.2.7 Disposal data. Dry material spills shall be salvaged for use, but if contaminated shall be placed in sealed containers for disposal. Solutions of oxalic acid or aluminum chloride shall be neutralized with sodium carbonate before disposal. Solutions of alkaline conditioner shall be neutralized with sodium bisulfate before disposal. Disposal of dry material, solutions or effluent shall be done by procedures described in paragraphs 4.8 of Parts 1 and 2.

Part 3 of 5 Parts

NEUTRAL WATER-SOLUBLE CLEANERS

1. SCOPE

1.1 Coverage. Refer to introductory paragraph 1.1. This part of the standard covers three items preferred for use in the selection of neutral water-soluble cleaners by the Department of Defense.

1.2 Applications. Refer to introductory paragraph 1.2.

2. REFERENCED DOCUMENTS

2.1 Issues of documents. The following documents, of the issue in effect on date of invitation for bids or request for proposal, form a part of this standard to the extent specified herein.

SPECIFICATIONS

FEDERAL

O-C-1901	- Cleaning Compound, Windshield (Solvent and Anti-Freeze, Concentrated)
P-C-438	- Cleaning Compound, Optical Lens

MILITARY

MIL-C-43454	- Cleaning Compound, Optical Lens (Ready to Use)
MIL-D-16791	- Detergent, General Purpose (Liquid Nonionic)

2.2 Other publications. The following documents form a part of this standard to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D1193 - Reagent Water

DEPARTMENT OF THE TREASURY, INTERNAL REVENUE SERVICE REGULATIONS

27 CFR, 212.19, Formula No. 3A

3. GLOSSARY

3.1 Definitions. Refer to introductory paragraph 3.1.

3.2 Abbreviations. Refer to introductory paragraph 3.2.

4. GENERAL REQUIREMENTS

4.1 Chemical and physical requirements. Refer to introductory paragraph 4.1.

4.2 Nomenclature. Refer to introductory paragraph 4.2.

4.3 Packaging data and labeling. Refer to introductory paragraph 4.3.

4.4 Safety. Neutral water soluble cleaners, containing surface tension depressants such as alcohol or nonionic surface active agents, are hazardous to the eyes, and may also be irritating to the skin. In the case of solvents such as alcohols, precautions for flammable liquids and vapors are applicable. Personnel working with neutral water soluble cleaning solutions shall be provided with and required to wear skin and eye protection as determined by the type of exposure. For more specific instructions, the responsible safety and medical authorities must be consulted to determine safe operating procedures, personnel protective measures and environmental controls. For emergency treatment in case of skin contact, the exposed areas shall be flushed with water. In case of eye contact flush with water for at least 15 minutes and obtain medical attention.

4.5 Shelf life. Refer to introductory paragraph 4.5.

4.6 Temperature. Refer to introductory paragraph 4.6.

4.7 Pollution potential. Refer to introductory paragraph 4.7. Some neutral water-soluble cleaners can be classified as ignitable hazardous waste depending on their flash points.

4.8 Disposal data. In case of spills, the liquid compounds or solutions shall be absorbed with dry absorbent (clay, vermiculite, sawdust). The contaminated absorbent shall be packaged in such a manner that the waste item can be safely handled for disposal as described in introductory paragraph 4.8. Used neutral cleaning solutions containing soil shall be handled for disposal in accordance with appropriate regulations as described in introductory paragraph 4.8.

4.9 DISCLAIMER. Refer to introductory paragraph 4.9.

5. DETAIL REQUIREMENTS

5.1 Name. CLEANING COMPOUND, WINDSHIELD

5.1.1 Specification. O-C-1901, Cleaning Compound, Windshield (Solvent and Anti-Freeze, Concentrated).

5.1.2 Technical description.

5.1.2.1 Physical. A solution of one part compound and two parts by vol of distilled water shall remain liquid at $0^{\circ}F$ ($-17.8^{\circ}C$). A solution of one part compound and sixteen parts by vol of distilled water shall have a surface tension between 30 and 37 dynes/cm.

5.1.2.2 Chemical. The compound shall be a colorless or tinted transparent solution, free from foreign matter and miscible with water in all concentrations. Insoluble matter shall not exceed 0.005% by wt determined as ignited residue. A solution of one part cleaning compound and four parts distilled water by vol shall not cause spotting, pitting or discoloration of painted steel test panels, after drying, rinsing with water and wiping dry.

5.1.3 Use data. The compound is intended to be sprayed on the windshield of a moving vehicle, and to remove road dirt with the help of the windshield wipers. A concentration of 2 oz (0.059 l) of compound per washer jar is used in warm weather; and for cold weather use, with protection at 0°F (-17.8°C), a concentration of one part of compound in two parts by vol of water is specified.

5.1.4 Packaging data and labeling.

5.1.4.1 Packaging data. The compound shall be unit packed and packed for shipment as specified in the contract or order.

5.1.4.2 Labeling. Each shipping container shall be marked in accordance with FED-STD-123 and MIL-STD-129 as applicable. Each unit container shall be marked with the National Stock Number, and also in accordance with the Federal Hazardous Substances Labeling Act. Each unit container shall have the following instructions printed thereon:

"During warm weather months, use 2 oz (0.059 l) per washer jar. For winter use - For 0°F (-17.8°C) protection dilute contents of this can with two cans of water."

In addition, each unit container shall bear the following precautionary label.

WARNING! CAUSES IRRITATION

Avoid contact with eyes.
Wash thoroughly after handling.
In case of contact, wash eyes for at least 15 minutes
and obtain medical attention.

5.1.5 Safety precautions. The safety precautions of paragraph 4.4 are applicable. The liquid compound should contain oxygenated organic solvents, such as alcohols, and some nonionic surface active agents. The vapors may be flammable, and the cleaner should not be used near a source of ignition. The compound and its vapors may be irritating to the skin and dangerous to the eyes. In case of exposure, skin should be flushed off with water. Eyes should be flushed with water for at least 15 minutes and medical attention obtained.

5.1.6 Storage data. Since the oxygenated solvents may be volatile, the compound should be stored in a cool place to avoid excessive pressure from developing in the containers. Containers must be kept tightly sealed to insure indefinite storage life.

5.1.7 Disposal data. Solvent spills shall be absorbed and packaged for disposal. Disposal of absorbed spills should be done by procedures described in paragraph 4.8.

5.2 Name. CLEANING COMPOUND, OPTICAL LENS

5.2.1 Specification. P-C-438, Cleaning Compound, Optical Lens.

5.2.2 Technical Description.

5.2.2.1 Physical. The cleaning compound shall be a water-white to light straw liquid without an objectionable odor.

5.2.2.2 Chemical. The compound shall consist of a 99 to 100% active water-soluble nonionic synthetic detergent. No cloudiness, precipitation or sediment shall be formed when the detergent is mixed with anionic and cationic wetting agents. The compound shall conform to the requirements of Table I.

TABLE I. Chemical and physical properties

Requirements	Min	Max
Water content, % by wt	.....	1.0 Ash
Ash content, % by wt	.....	0.25
Saponification, mg KOH/g sample	.....	5.0
Hydroxyl number, mg KOH/g sample	.....	100.0
Cloud point	120°F (48.9°C)	160°F (71°C)
pH at 25°C, 1% solution	6.0	8.0
Surface tension at 25°C, dynes/cm (for 0.01% solution)	.....	35.0
Sp gr at 25°/25°C (77°/77°F)	1.0	1.10
Biodegradability, %	80.0	......

5.2.3 Use data. The compound is intended for use in cleaning plastic and glass lenses, coated or uncoated, and other optical elements. Its principal use being in optical repair and maintenance shops. A concentration of 1 oz of compound per gal of water (or 7.8 ml/1) is suitable for use as a prepared solution. After application of the prepared solution to a prerinsed lens surface, the lens is rinsed with distilled water.

5.2.4 Packaging data and labeling.

5.2.4.1 Packaging data. The compound shall be unit packed and packed for shipment as specified in the contract or order.

5.2.4.2 Labeling. Interior packs and shipping containers shall be marked in accordance with MIL-STD-129. Each unit container of cleaning compound shall be durably and legibly marked with the following information:

CLEANING COMPOUND, OPTICAL LENS

Instructions for Use:

Preparation of Cleaning Solution.

A solution suitable for cleaning glass and plastic optical lens and other optical elements not affected by water shall be prepared by dissolving 1 oz of this cleaning compound in a small amount of warm water and making up to 1 gal (or 7.8 ml/l) with distilled or clear fresh water. Best results will be obtained by adding the cleaning compound in small amounts to the water with vigorous stirring.

Cleaning Procedure.

1. Rinse the lens in clean running water to wet surface and remove particles that might scratch the polished surface.
2. Apply the prepared solution to the surface to be cleaned using a wad of absorbent cotton or a soft clean cloth, free from sizing.
3. Rinse the surfaces in distilled water.
4. Repeat steps 2 and 3 to remove stubborn soils.

In addition, each unit container shall bear the following precautionary label.

WARNING! CAUSES IRRITATION

Avoid contact with skin and eyes.
Wash thoroughly after handling.
In case of contact, wash eyes with water for at least 15 minutes and obtain medical attention.

5.2.5 Safety precautions. The safety precautions of paragraph 4.4 are applicable. The undiluted detergent can be irritating to the skin and dangerous to the eyes. Rubber gloves and eye protection should be worn. The diluted prepared detergent should be harmless to the skin, but may be irritating to the eyes. In case of exposure, the skin should be flushed with water. Eyes should be flushed with water and medical attention obtained.

5.2.6 Storage data. The sealed containers should be stored in a cool, dry place to avoid deterioration of the detergent by heat. Containers should be kept tightly sealed to insure indefinite storage life.

5.2.7 Disposal data. Spills of undiluted detergent shall be absorbed and placed in containers for disposal. Disposal of absorbed detergent and diluted detergent solutions shall be done by procedures described in paragraph 4.8.

5.3 Name. CLEANING COMPOUND, OPTICAL LENS, (READY TO USE)

5.3.1 Specification. MIL-C-43454, Cleaning Compound, Optical Lens (Ready to Use).

5.3.2 Technical description. The cleaning compounds, types I and II, are mixtures of alcohol, nonionic detergent, and distilled or deionized water as shown in Table II.

TABLE II. Composition

Component	Type I	Type II
	Percent by weight	
Ethyl alcohol, denatured (3A)*	20.0 ± 1.0	57.0 ± 1.0
Detergent, nonionic (Type I-MIL-D-16791)	0.15 ± 0.01	0.15 ± 0.01
Water ASTM reagent water)	79.9 ± 1.0	42.9 ± 1.0

*Formula 3A (US Treasury Department) - Denatured with methyl alcohol

5.3.2.1

5.3.2.1 Physical. The compounds shall be clean, clear, homogeneous liquids free from foreign matter. The color of the compounds shall be no darker than Saybolt color +25 when tested as specified.

5.3.3 Use data. The compounds are ready-to-use solutions for use on exposed optical surfaces of optical equipment in the field. It is not intended for cleaning of internal optical components during assembly. The Type I solution is safe to use on optical components which are not adversely affected by the solvent action of a 20% alcohol solution and the abrasive action of lens tissue. Type I compound is not intended for use at temperatures below 20°F (-7°C). The Type II solution is safe to use on optical components which are not adversely affected by the solvent action of a 57% alcohol solution and the abrasive action of lens tissue. Type II compound can be used at temperatures as low as -40°F (-40°C). In practice, loose soil is removed from the lens or mirror with a clean, dry soft brush or stream of air. A folded lens tissue or cotton swab, moistened sparingly with compound is stroked once on the surface and then discarded. The process is repeated, each time with freshly moistened tissue or cotton, until the surface is clean.

5.3.4 Packaging data and labeling.

5.3.4.1 Packaging data. The compounds shall be unit packed and packed for shipment as specified in the contract or order.

5.3.4.2 Labeling. Intermediate packs, shipping containers and palletized unit loads shall be marked in accordance with MIL-STD-129. The following information shall be imprinted on the unit container or printed on a paper label and applied to the main panel of the body of the unit container:

CLEANING COMPOUND, OPTICAL LENS
NATIONAL STOCK NUMBER
Military Specification MIL-C-43454B
Manufacturer
POISONOUS IF TAKEN INTERNALLY.

Directions for use on exposed optical surfaces:

1. Remove loose soil from lens or mirror with a clean, dry, soft brush or stream of air. Wiping with a dry lens tissue may scratch the delicate surface.

2. Lightly wipe the lens or mirror with a folded lens tissue or an absorbent cotton swab slightly dampened with cleaning

compound. Use the cleaning compound sparingly. After one stroke, discard the tissue or cotton. Repeat the process, each time use a freshly dampened tissue or cotton, until the surface is clean.

Additional marking, type I: "The cleaning compound should not be used at temperatures below 20°F (-7°C)."

Additional marking, type II: "The cleaning compound can be used at temperatures as low as -40°F (-40°C)."

In addition, each unit container shall bear the following precautionary label.

WARNING! CAUSES IRRITATION

Avoid contact with skin and eyes.
Wash thoroughly after handling.
In case of contact, wash eyes with water for at least 15 minutes, and obtain medical attention.

5.3.5 Safety precautions. The safety precautions of paragraph 4.4 are applicable. The compounds should not be used near an ignition source because of the flammability of alcohol vapors. The liquid compounds, because of their alcohol and detergent content, can be irritating to the skin and dangerous to the eyes. Therefore, direct contact of the liquid with the eyes must be avoided. Eyes should be flushed with water for at least 15 minutes in case of exposure to the liquid. It is required that the compound shall not be irritating to the nose or eyes after cleaning spectacles, goggles or faceshields, and allowing to dry for five minutes and then wearing for five minutes.

5.3.6 Storage data. The sealed containers should be stored in a cool, dry place to avoid deterioration of the detergent, by heating, and possibly evaporating some alcohol by vapor leakage through the closure. Containers should be kept tightly sealed to assure indefinite storage life.

5.3.7 Disposal data. Liquid compound spills shall be absorbed and packaged for disposal. Disposal of absorbed liquid compound shall be done by procedures described in paragraph 4.8.

Part 4 of 5 Parts

NON-AQUEOUS SOLVENT CLEANERS

1. SCOPE

1.1 Coverage. Refer to introductory paragraph 1.1. This part of the standard covers nine items preferred for use in the selection of non-aqueous solvent cleaners by the Department of Defense.

1.2 Application. Refer to introductory paragraph 1.2.

2. REFERENCED DOCUMENTS

2.1 Issues of documents. The following documents, of the issue in effect on date of invitation for bids or request for proposal, form a part of this standard to the extent specified herein.

SPECIFICATIONS

FEDERAL

O-C-1889 - Cleaning Compound, Solvent
O-T-236 - Tetrachloroethylene (Perchloroethylene) Technical Grade
O-T-620 - Trichloroethane-1,1,1, Technical, Inhibited
P-D-680 - Dry Cleaning Solvent
BB-F-1421 - Fluorocarbon, Refrigerants
TT-E-751 - Ethyl Acetate, Technical
TT-I-735 - Isopropyl Alcohol
TT-M-261 - Methyl Ethyl Ketone, Technical
TT-N-97 - Naphtha, Aromatic
VV-D-1078 - Damping Fluid, Silicone Base (Dimethyl Polysiloxane)

MILITARY

MIL-C-372 - Cleaning Compound, Solvent (For Bore of Small Arms and Automatic Aircraft Weapons)
MIL-C-15348 - Cleaning Oil, Turbine (Compounded)
MIL-C-38736 - Compound Solvent, For Use in Integral Fuel Tanks
MIL-C-81302 - Cleaning Compound, Solvent, Trichlorotrifluoroethane
MIL-C-81964 - Cleaning Compound, Avionic Components
MIL-C-83360 - Cleaning and Lubricating Compound, Electrical Contact
MIL-D-6998 - Dichloromethane, Technical
MIL-S-10561 - Solvent, Cleaning, High Temperature Pressure Spray

3. GLOSSARY

3.1 Definitions. Refer to introductory paragraph 3.1.

3.2 Abbreviations. Refer to introductory paragraph 3.2.

4. GENERAL REQUIREMENTS

4.1 Chemical and physical requirements. Refer to introductory paragraph 4.1.

4.2 Nomenclature. Refer to introductory paragraph 4.2.

4.3 Packaging data and labeling. Refer to introductory paragraph 4.3.

4.4 Safety.

4.4.1 Hydrocarbon solvents. Hydrocarbon solvents are flammable combustible or burnable liquids, the vapors of which form explosive mixtures in air. Relative ignitability is indicated by the flash point temperatures of the solvents. Susceptibility to vapor-in-air explosions are determined by lower and upper explosive limits of the vapor concentrations in air. Incomplete combustion produces carbon monoxide and other substances. Aromatic compound vapors are generally more toxic than the other types. All hydrocarbon solvents are irritating to the eyes. Because of flammability and vapor-in-air explosion hazards, as well as vapor toxicity hazards, hydrocarbon solvents shall only be used in properly ventilated areas. Sources of ignition, such as hot surfaces, exposed flame, and sparking electrical equipment, must be absent if explosive vapor concentrations are produced. Personnel working with hydrocarbon solvents shall be provided with and be required to use respiratory, skin and eye protection as determined by the type of exposure. For more specific instructions, the responsible safety authority must be consulted to determine safe operating procedures, personnel protective measures and environmental controls. For emergency treatment in case of skin contact, the exposed area shall be washed with soap and water. In case of eye contact, flush with water for at least 15 minutes and obtain medical attention.

4.4.2 Polar solvents. Polar oxygenated solvents, such as alcohols, ketones, ethers, esters and cresols, are flammable combustible or burnable liquids, the vapors of which form explosive mixtures in air. Relative ignitability is indicated by flash point temperatures of the solvents. Susceptibility to vapor-in-air explosions is determined by lower and upper explosive limits of the vapor concentrations in air. Incomplete combustion produces carbon monoxide and other substances. The solvent vapors vary widely in toxicity, with cresols and ethanolamine being among the more toxic. Cresols are very corrosive to all tissues. All polar solvents are irritating to the eyes, and cresols are the most damaging. Because of flammability and vapor-in-air explosion hazards, as well as toxicity hazards, polar solvents shall only be used in properly ventilated areas. Sources of ignition must be absent if explosive vapor concentrations are produced. Personnel working with polar solvents shall be provided with and be required to use respiratory, skin and eye protection as determined by the type of exposure. For more specific instructions, the responsible safety or medical authorities must be consulted to determine safe operating procedures, personnel protective measures and environmental controls. For emergency treatment in case of skin contact, the exposed area shall be flushed with water. In case of eye contact, flush with water for at least 15 minutes and obtain medical attention.

4.4.3 Halogenated solvents.

4.4.3.1 Chlorinated hydrocarbons. Chlorinated hydrocarbons can vary from flammable to nonflammable liquids and also from explosive to non-explosive vapor-in-air mixtures, depending upon the degree of chlorination or replacement of hydrogen atoms by chlorine atoms. Completely chlorinated compounds are, therefore, nonflammable and their vapors are nonexplosive. Partially chlorinated compounds may be nonflammable liquids, but some can form explosive vapor-in-air mixtures. Partially chlorinated compounds that are flammable, combustible or burnable will form explosive vapor-in-air mixtures. The decomposition and combustion products from chlorinated hydrocarbons can contain major amounts of hydrogen chloride and some chlorine and phosgene. The chlorinated hydrocarbons have various degrees of toxicity. These solvents are irritating to the eyes. Chlorinated hydrocarbon solvents should only be used in properly ventilated areas. Their vapors can cause asphyxiation by displacement of air and reduction of oxygen content. Personnel working with these solvents shall be provided with and required to use respiratory, skin and eye protection as determined by the type of exposure. For more specific instructions, the responsible safety or medical authorities must be consulted to determine safe operating procedures, personnel protective measures and environmental controls.

4.4.3.2 Chlorofluorocarbons. Chlorofluorocarbon solvents are all nonflammable and their vapors do not form explosive mixtures in air. Their decomposition products at high temperatures are hydrogen fluoride and hydrogen chloride, and in the presence of water oxygen will produce some phosgene. The chlorofluorocarbon solvents are generally much less toxic than the chlorinated hydrocarbons. Chlorofluorocarbon solvents shall only be used in properly ventilated areas. Personnel working with these solvents shall be provided with and be required to use respiratory, skin and eye protection as determined by the type of exposure. For more specific instructions, the responsible safety or medical authorities must be consulted to determine safe operating procedures, personnel protective measures and environmental controls.

4.4.4 Solvent Mixtures. Solvent mixtures can be composed of any miscible combination of hydrocarbon, polar, and halogenated solvents. Their hazards and toxicity will depend on their composition. The precautions taken must be applicable to the hazards. When two or more hazardous substances are present, the TLVs for mixtures should be considered as shown by American Conference of Governmental Industrial Hygienists (ACGIH).

4.4.4.1 The effects of the different hazards should be considered as additive when the mixture components have similar toxicological effects.

4.4.4.2 The effects of the different hazards are independent because of local effects on different body organs produced by the various components of the mixture.

4.5 Shelf life. Refer to introductory paragraph 4.5.

4.6 Temperature. Refer to introductory paragraph 4.6.

4.7 Pollution potential. Refer to introductory paragraph 4.7.

4.8 Disposal data. Non-aqueous solvents and solvent mixtures are handled for disposal dependent on their composition. The mandatory procedures for handling solvent spills and soiled solvent residues that are not recoverable or reclaimable are described in introductory paragraph 4.8.

4.8.1 Hydrocarbon solvents. Some hydrocarbon solvents can be classified as ignitable hazardous wastes depending on their flash points. Since hydrocarbon solvents are not water soluble and only very slowly biodegradable, they must not be discharged into storm drains or sewage systems for disposal. Solvent spills and soiled solvent residues that are not recoverable or reclaimable, must be handled for disposal as described in paragraph 4.8 of this part.

4.8.2 Polar solvents. Some oxygenated solvents can be classified as ignitable hazardous wastes depending on their flash points. Oxygenated solvents that are water soluble usually form neutral solutions, with the exception of alkanolamine type compounds which are organic bases. Basic or alkaline solutions shall be handled for disposal as described in Part 1 - paragraph 4.8. The neutral solvents shall be handled for disposal as described in Part 3 - paragraph 4.8. Solvents such as cresols, which are not readily water soluble or biodegradable must be handled for disposal as described in paragraphs 4.8 and 4.8.1 of this part.

4.8.3 Halogenated solvents.

4.8.3.1 Some chlorinated hydrocarbon solvents can be classified as ignitable hazardous wastes depending on their flash points. Since these solvents are not water soluble or biodegradable they must not be discharged into storm drains or sewage systems for disposal. Solvent spills and soiled solvent residues, that are not recoverable or reclaimable, must be handled for disposal as described in paragraph 4.8 of this part.

4.8.3.2 Chlorofluorocarbons. Since these solvents are not water soluble or biodegradable, they must not be discharged into storm drains or sewage systems for disposal. Solvent spills and soiled solvent residues, that are not recoverable or reclaimable, must be handled for disposal as described in paragraph 4.8 of this part.

4.8.4 Solvent mixtures. The disposal methods employed should be applicable to the composition of the solvent mixture, and after use applicable to the composition of soiled solvent mixture.

4.9 DISCLAIMER. Refer to introductory paragraph 4.9.

5. DETAIL REQUIREMENTS

5.1 Name. CLEANING COMPOUND, SOLVENT, TRICHLOROTRIFLUOROETHANE

5.1.1 Specification. MIL-C-81302, Cleaning Compound, Solvent, Trichlorotrifluoroethane.

5.1.2 Technical description. The compound solvents, types I and II are 1,1,2-trichloro-1,2,2-trifluoroethane. Type I solvent is classified as ultra-clean, and type II solvent is classified as standard. Type IIA is type II solvent in a container pressurized with a propellant consisting of type 12 fluorocarbon refrigerant (dichlorodifluoromethane). The chemical and physical requirements of trichlorotrifluoroethane are shown in Table I.

TABLE I. Chemical and physical requirements of trichlorotrifluoroethane

Property	Requirement Type I	 Type II
Boiling point (at standard barometric pressure)	47.6 ± 0.2°C (117.6 ± 0.4°F)	47.6 ± 0.2°C (117.6 ± 0.4°F)
Chemical purity, trichlorotrifluoroethane; % by wt, min	99.9	99.8
Chloride ion, ppm by wt, max	0.1	0.1
Acid number, milligrams KOH/g of sample, max	0.003	0.003
Residue, ppm by wt, max	1	2
Particulate matter, max number of particles per 100 ml of solvent		
Particle size of:		
25 - 100 micrometers	100	
greater than 100 micrometers	10	
Balance of product	Other halogenated solvents	Other halogenated solvents

5.1.3 Use data. Type I solvent is intended for use in the cleaning of space vehicle components, precision assemblies, oxygen systems and electronic equipment, by the processes of spraying, flushing, vapor degreasing and ultrasonics. The solvent is especially applicable to cleaning precision parts and assemblies in clean rooms and for use as a medium in testing the cleanliness of components that are assumed to be clean. Prefiltering of the solvent may be required in cleaning applications that require a very low particulate matter count or to remove particles that are larger than the limits specified for the part, assembly or system being cleaned, flushed or tested. It may be desirable in critical operations to test the solvent before use, because contamination may result from improper storage or from a defective drum interior. Type II solvent is used when the requirements for purity and cleanliness are less stringent than those of a cleaning process using type I solvent. Since solvent vapors are purer than the liquid from which they evolve, type II solvent is particularly suitable for vapor degreasing processes. Samples of materials to be cleaned should be tested with the solvent, to determine compatibility, before initiation of the cleaning process.

5.1.4 Packaging data and labeling.

5.1.4.1 Packaging data. Type I and II solvents shall be unit packed and packed for shipment as specified in the contract or order. Type IIA solvent, unit packed in 16 oz (0.47 l) pressurized cans conforming to type IX of PPP-C-96, shall be packed in accordance with PPP-C-96.

5.1.4.2 Labeling. Marking shall be in accordance with MIL-STD-129. In addition, unit containers shall bear the following precautionary labels.

For unpressurized containers:

CAUTION! VAPOR REDUCES OXYGEN
AVAILABLE FOR BREATHING

Keep away from heat and open flame.
Keep container closed.
Use with adequate ventilation.
Avoid prolonged or repeated breathing of vapors.
Avoid contact of liquid with skin and eyes.
Emits toxic fumes if heated to decomposition.

For pressurized containers:

WARNING! LIQUID AND GAS CONTENTS
UNDER PRESSURE

Keep away from direct sunlight, radiators, stoves, hot water, open flame, and other sources of heat.
Do not puncture or incinerate.
Use with adequate ventilation.
Avoid breathing of vapors.
Avoid contact with skin and eyes.
Emits toxic fumes if heated to decomposition.

5.1.5 Safety precautions. The safety precautions for chlorofluorocarbons in paragraph 4.4.3.2 are applicable. Trichlorotrifluoroethane is a nonflammable solvent. The ACGIH TLV is 1000 ppm, which indicates it is a safe solvent for cleaning. Adequate ventilation must be provided because the solvent vapors can displace air and cause asphyxiation. Also, the solvent and its vapors should not be used near heat sources or open flame, because the products of decomposition are toxic and very irritating. Since the solvent dissolves natural oils, skin contact should be avoided by use of impervious rubber gloves, sleeves, and aprons as necessary. Contact of the compound with finely divided aluminum and magnesium could cause an explosion, especially at higher temperatures. The compound could also react violently with other highly reactive materials such as alkali and alkaline earth metals in their free metallic state, e.g., sodium, potassium and barium. The pressurized container for type IIA solvent should be kept away from all sources of heat, and should not be punctured or incinerated.

5.1.6 Storage data. The compound is inherently stable. Storage should be in a cool, dry place to assure indefinite storage life, and to avoid pressure effects due to excessive heat. Alternate heating and cooling should be avoided in order to prevent breathing by the containers and contamination of the contents by air borne impurities. Storage of the propellant pressurized containers should be limited to a maximum temperature of 120°F (48.9°C) to assure indefinite storage life.

5.1.7 Disposal data. Type I and type II compound solvents are recoverable for reuse after purification. Type IIA solvent is not recoverable after use because of its method of application from pressurized containers. Spills of this compound must be handled by the procedures stated in disposal data of paragraph 4.8. Disposal of empty pressurized containers shall be done in accordance with local safety regulations.

5.2 Name. CLEANING COMPOUND, AVIONIC COMPONENTS

5.2.1 Specification. MIL-C-81964, Cleaning Compound, Avionic Components.

5.2.2 Technical description. Type I compound is a solvent and lubricant in a container pressurized with a propellant. Type II compound is a solvent and lubricant in standard containers. The compound shall be free of suspended matter, sediment, grit or other foreign material. The composition of the compound is shown in Table II.

TABLE II. Composition of cleaner

Component	Percent by Weight of Total Mixture	
	Type I	Type II
Trichlorotrifluoroethane (Type II, MIL-C-81302)	74.7 ± 0.7	99.6 ± 0.04
Silicone Fluid (VV-D-1078) [Dimethyl Polysiloxane. Viscosity = 0.65 cs at 25°C (77°F)]	0.30 ± 0.03	0.4 ± 0.04
Propellant (Type 12, BB-F-1421) (Dichlorodifluoromethane)	25.0 ± 0.3	....

5.2.3 Use data. The compound is intended for cleaning electrical and electronic components, and is particularly effective for cleaning electrical contacts. In use, the compound is sprayed into and on equipment until the surface is wet, in order to remove moisture, condensation, oil, grease and dirt.

5.2.4 Packaging data and labeling.

5.2.4.1 Packaging data. Type I compound shall be packaged in pressurized containers. Type II compound shall be unit packed and packed for shipment as specified in the contract or order.

5.2.4.2 Labeling. Marking shall be in accordance with MIL-STD-129. In addition, Type I pressurized unit containers shall bear the following precautionary label:

WARNING! LIQUID AND GAS
CONTENTS UNDER PRESSURE

Keep away from direct sunlight, radiators, stoves, hot water, open flame, and other sources of heat.
Do not puncture or incinerate.
Use with adequate ventilation.
Avoid prolonged or repeated breathing of vapors.

Avoid contact of liquid with skin and eyes.
Emits toxic fumes if heated to decomposition.

Each pressurized container shall also show the following instructions:

For use on all electrical and electronic components and equipment. Spray into and on equipment until the surface is wet. This will remove moisture, condensation, oil, grease and dirt.

Type II standard unit containers shall bear the following precautionary label:

CAUTION! VAPOR REDUCES OXYGEN
AVAILABLE FOR BREATHING

Keep away from heat and open flame.
Keep container closed.
Use with adequate ventilation.
Avoid prolonged or repeated breathing of vapor.
Avoid contact of liquid with skin and eyes.
Emits toxic fumes if heated to decomposition.

5.2.5 Safety precautions. The safety precautions for chlorofluorocarbons in paragraph 4.4.3.2 are applicable. Trichlorotrifluoroethane and dichlorodifluoroethane are nonflammable solvents. The ACGIH TLV is 1000 ppm which indicates they are relatively safe for handling. Adequate ventilation must be provided because the vapors can displace air and cause asphyxiation. Also, the solvent and its vapors should not be used near heat sources or open flame because the products of decomposition are toxic and very irritating. Since the solvent dissolves natural oils, skin contact should be avoided by use of impervious rubber gloves, sleeves and aprons as necessary.

5.2.6 Storage data. The compound is inherently stable, but storage should be in a cool, dry place to avoid pressure effects due to excessive heat. Storage of the pressurized containers should be limited to a maximum temperature of 120°F (48.9°C) to assure indefinite storage life.

5.2.7 Disposal data. Type I compound is not recoverable after use because of the method of application from a pressurized container. Empty pressurized containers should be disposed of in accordance with local safety regulations. Type II compound solvent should be recoverable for reuse after purification, but small volumes will be lost in use depending on the method of application. Spills of this solvent must be handled by the procedures stated in disposal data of paragraph 4.8.

5.3 Name. CLEANING AND LUBRICATING COMPOUND, ELECTRICAL CONTACT
Cleaning Compound, Electrical Contact

5.3.2 Technical description. Two types of cleaner-lubricant compounds and one type of cleaner-non-lubricant compound are in containers pressurized with propellant. The compounds shall be homogeneous and free of suspended matter, sediment, grit, or other foreign material. The composition of the compounds are shown in Table III.

TABLE III. Composition of compounds

Components	Type I	Type II	Type III
Trichlorotrifluoroethane (Type II, MIL-C-81302)	60 to 65% by wt of total mixture	....	70 to 75% by wt of total mixture
1,1,1-Trichloroethane, Technical Inhibited (Type I, O-T-620)	....	65 to 70% by wt of total mixture	....
Silicone Fluid, Dimethylpolysiloxane (VV-D-1078) [Viscosity = 100 to 500 cs at 25^{o}C (77^{o}F)]	3 to 5% by vol of useable product	3 to 5% by vol of useable product	....
Propellant (Type 12, BB-F-1421), Dichlorodifluoromethane	35 to 40% by wt of total mixture	30 to 35% by wt of total mixture	25 to 30% by wt of total mixture

The compounds shall not cause any visible pitting, etching, dark discoloration and no weight change (mg/cm^2) greater than 0.5 for magnesium, cadmium and zinc, or greater than 0.2 for aluminum, copper, and brass when tested as specified. Type I cleaner-lubricant compound shall have no deleterious effect on potting compounds, rubber materials, plastics, insulation, and paint coatings. Type II cleaner-lubricant compound may have deleterious effects, to some degree, on certain potting compounds, rubber materials and insulating materials. Type III cleaning compound shall have no deleterious effect on potting compounds, rubber materials, plastics, insulation, and paint coatings.

5.3.3 Use data. The contact cleaner-lubricant or cleaner material is used in cleaning and lubricating electrical contacts. Care should be exercised in using Type II compound on synthetic materials which may be affected under some conditions. Also, the Type II compound solvent, trichloroethane, contains stabilizers and inhibitors which may produce residue deposits. Electrical contacts, after being treated with Types I, II or III compounds shall function properly in environmental temperatures as low as -54^{o}C (-65^{o}F).

5.3.4 Packaging data and labeling.

5.3.4.1 Packaging data. The dispenser cans, containing 4 oz (113 g), 6 oz (170 g) and 16 oz (454 g) of the compound and conforming to class 2, type IX of PPP-C-96, shall be packed twelve cans in a box in boxes conforming to PPP-B-636, class weather resistant, grade V3s, style RSC.

5.3.4.2 Labeling. Marking shall be in accordance with MIL-STD-129. Also each container and unit pack shall bear warning information marked directly on the exterior surface with marking material which is not affected by the cleaning compound. The precautionary label shall be as follows:

WARNING! LIQUID AND GAS
CONTENTS UNDER PRESSURE

Do not puncture or incinerate.
Keep away from direct sunlight, radiators, hot water, open flame and other heat sources.
Use with adequate ventilation.
Avoid prolonged or repeated breathing of vapors.
Avoid contact with skin and eyes.
Emits toxic fumes if heated to decomposition.

5.3.5 Safety precautions. The safety precautions of paragraph 4.4.3.1 are applicable to Type II, and of paragraph 4.4.3.2 are applicable to Types I and III compounds. Trichlorotrifluoroethane and dichlorodifluoroethane are nonflammable solvents and vapors. Trichloroethane is a nonflammable liquid but a flammable vapor, so care must be taken to avoid spraying this solvent in the vicinity of an ignition source. The vapors of trichloroethane are moderately toxic and their inhalation should be avoided, when using the Type II compound, by wearing approved respiratory protective equipment in confined areas and in the absence of adequate ventilation. The spraying of all three types of compounds near open flames must be avoided to prevent the formation of toxic decomposition products.

5.3.6 Storage data. The compounds are inherently stable, but storage should be in a cool, dry place to avoid pressure effects due to excessive heat. Storage of the pressurized containers should be limited to a maximum temperature of 120°F (48.9°C) to assure indefinite storage life.

5.3.7 Disposal data. The compounds are not recoverable after use because of their method of application from pressurized containers. Empty containers should be disposed of in accordance with local safety regulations.

5.4 Name. CLEANING COMPOUND, SOLVENT

5.4.1 Specification. O-C-1889, Cleaning Compound, Solvent.

5.4.2 Technical description. The compound consists of Stoddard solvent, dichloromethane and tetrachloroethylene with the approximate composition shown in Table IV, and also meeting the physical requirements described.

TABLE IV. Composition of solvent

Component	Percent by Volume
Stoddard Solvent (P-D-680, Type 1)	70
Dichloromethane (MIL-D-6998, Grade B)	25
Tetrachloroethylene (O-T-236)	5

5.4.2.1 Physical. Specific gravity of the compound at 20°/20°C shall be between 0.900 and 0.980. Specific gravity of the first 20 ml of distillate shall be between 1.270 and 1.330. Distillation range shall be as shown in Table V.

TABLE V. Distillation range of solvent

Distillation range	Minimum	Maximum
Initial boiling point	100°F (37.8°C)	....
Percent recovered at 350°F (177°C)	65	....
End point	....	410°F (210°C)

The closed cup flash point of the compound shall be not less than 200°F (93.3°C). After evaporating 35% (by vol) the closed cup flash point shall be not less than 100°F (37.8°C).

5.4.3 Use data. The compound is a safety solvent intended to be used to remove grease, fungus and ground-in dirt from items such as photographic processing equipment, electrical and electronic equipment, engine components, small arms and armament.

5.4.4 Packaging data and labeling.

5.4.4.1 Packaging data. The compound shall be unit packed and packed for shipment as specified in the contract or order.

5.4.4.2 Labeling. Marking shall be in accordance with MIL-STD-129. In addition, unit containers shall be marked with the following information and precautions in conformance with the Federal Hazardous Substances Act.

CAUTION! BURNABLE LIQUID;
COMBUSTIBLE AFTER EVAPORATION

This cleaning compound shall not be used in confined areas where there are open flames, arcing equipment, hot surfaces or where smoking is permitted.
Use only with adequate ventilation.
Avoid prolonged or repeated breathing of vapor.
Do not get in eyes, on skin, or clothing.
In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes; for eyes, get medical attention.

In addition, the following warning should appear on each container:

CONTAINS TETRACHLOROETHYLENE -
A POTENTIAL HUMAN CARCINOGEN

5.4.5 Safety precautions. The safety precautions of paragraphs 4.4.1 and 4.4.3.1 are applicable to this solvent. The compound contains tetrachloroethylene, which is a potential human carcinogen, and exposure to the compound by inhalation of vapors and skin contact must be prevented. All containers of the compound must be kept tightly closed to avoid toxic fumes in the workspace, and to eliminate the fire hazard from combustible vapors.

5.4.6 Storage data. The compound is inherently stable. Storage should be in a cool, dry place to assure indefinite storage life, and to avoid pressure effects due to excessive heat. Alternate heating and cooling should be avoided in order to prevent breathing by the containers and loss of the volatile components, thereby causing a change in composition of the solvent, and also to prevent condensation of moisture in the containers.

5.4.7 Disposal data. Large volumes of the compound are reclaimable for reuse after purification. Small volumes of the compound will be lost in use depending on the method of application. Spills of the compound and soiled solvent residues must be handled by the procedures described in disposal data of paragraph 4.8.

5.5 Name. CLEANING OIL, TURBINE (COMPOUNDED)
Cleaning Compound, Solvent

5.5.1 Specification. MIL-C-15348, Cleaning Oil, Turbine (Compounded).

5.5.2 Technical description. The composition is optional but the oil shall conform to the following physical requirements.

TABLE VI. Physical Requirements

Property	Requirement
Viscosity at 100°F (37.8°C) (SSU)	125 - 150 secs.
Viscosity at 210°F (98.9°C) (SSU), min	38 secs
Pour point, max	-15°F (-26°C)
Flash point, min	250°F (121°C)
Neutrality	Neutral
Rusting action	Passing
Corroding action	Passing

The cleaning oil shall be completely miscible with turbine lubricating oils and shall show no visible precipitation or stratification. One percent by vol of the cleaning oil shall show no significant reduction in the stability of the turbine lubricating oil, and show no significant increase in the foaming tendency of turbine lubricating oil. The cleaning oil shall not affect the emulsibility of the turbine lubricating oil as indicated by comparison with a mixture of distilled water and the lubricating oil. The cleaning oil shall readily and effectively remove rust preventive compound, and be capable of removing moisture films from the metallic surfaces of the lubricating oil and gear systems.

5.5.3 Use data. The compounded turbine cleaning oil is intended for use in flushing of propulsion machinery lubricating oil systems to remove rust preventive preservative contamination and moisture films.

5.5.4 Packaging data and labeling.

5.5.4.1 Packaging data. The cleaning oil shall be unit packed and packed for shipment as specified in the contract or order in accordance with MIL-STD-290.

5.5.4.2 Labeling. Marking of containers shall be in accordance with MIL-STD-129. In addition, each unit container must bear the following precautionary label.

CAUTION! BURNABLE LIQUID

Keep away from heat and open flame.
Emits irritating fumes if heated to decomposition.
Avoid contact with eyes, skin and clothing.
In case of contact, flush eyes or skin with water for
at least 15 minutes; for eyes, get medical attention.

5.5.5 Safety precautions. The safety precautions of paragraph 4.4.1 are applicable to this hydrocarbon-type solvent. The cleaning oil shall not generate toxic and otherwise hazardous vapors when used or handled, as evidenced by tests conducted with laboratory animals to determine toxic effects of skin contact under conditions simulative of use and handling. Since the actual toxicity of this item is not known and will vary with different sources, the general safety precautions of 4.5 shall be followed by personnel using this compound. The normal precautions for use of a burnable solvent shall be followed.

5.5.6 Storage data. The cleaning oil is inherently stable. Storage should be in a cool, dry place to avoid pressure effects due to excessive heat, and to assure indefinite storage life. Alternate heating and cooling of containers should be avoided in order to prevent breathing by the containers and loss of volatile components, thereby causing a change in composition of the solvent, and also to prevent condensation of moisture in the containers.

5.5.7 Disposal data. Large volumes of the compound are reclaimable for reuse after purification. Small volumes of the compound will be lost in use. Spills of the compound and residues of the soiled solvent must be handled by procedures described in disposal data of paragraph 4.8.

5.6 Name. SOLVENT, CLEANING, HIGH TEMPERATURE SPRAY
Cleaning Compound, Solvent; Cleaning Solvent.

5.6.1 Specification. MIL-S-10561, Solvent Cleaning, High Temperature Spray.

5.6.2 Technical description. The solvent is a homogeneous one-phase petroleum distillate liquid, containing not less than 90% by volume of paraffinic and naphthenic hydrocarbons, and showing no separation into liquid or solid phases when tested as specified. The solvent shall conform to the physical and chemical requirements in Table VII.

TABLE VII. Physical and chemical characteristics

Characteristic	Requirement
Flash point, Tag closed cup, min	175°F (79.4°C)
Sulfur, % by wt, max	0.12
Kauri butanol value, min	29.0
Aniline point, min	155°F (68.3°C)
Viscosity, cs at 60°F (15.6°C), max	3.0
Viscosity, cs at 100°F (37.8°C), min	1.7
Autogeneous ignition temperature, min	450°F (232°C)
Pour point, max	-30°F (-34°C)
Doctor test	Negative
Corrosion to copper	No discoloration
Distillation requirements	
Initial boiling point	400° - 430°F (204° - 221°C)
50% point	430° - 460°F (221° - 238°C)
90% point	450° - 480°F (232° - 249°C)
End point	470° - 500°F (243° - 260°C)
Recovery, min	97%
Distillation loss, % by vol, max	1.0

5.6.3 Use data. The cleaning solvent is intended for use in removing preservative compounds and corrosion preventives, when applied by spray at 140° to 160°F (60° to 71°C), and at a pressure of approximately 60 lbs/sq in (4.2 kg/sq cm).

5.6.4 Packaging data and labeling.

5.6.4.1 Packaging data. The cleaning solvent shall be unit packed and packed for shipment as specified in the contract or order in accordance with MIL-STD-290.

5.6.4.2 Labeling. Marking shall be in accordance with MIL-STD-129, and nomenclature shall be:

SOLVENT, CLEANING, HIGH
TEMPERATURE PRESSURE SPRAY

In addition, each unit container shall bear the following precautionary label.

CAUTION! COMBUSTIBLE LIQUID

Keep away from heat and open flame.
Emits irritating fumes if heated to decomposition.
Keep container closed.
Avoid breathing vapors.
Avoid contact with eyes, skin and clothing.
In case of contact, flush eyes or skin with water for at least 15 minutes; for eyes, get medical attention.

5.6.5 Safety precautions. The safety precautions of paragraph 4.4.1 are applicable to this hydrocarbon type solvent. Since the actual toxicity of this item is not known and will vary with different sources, the general safety precautions of section 4.4 shall be followed by personnel using this solvent. Also, the normal precautions for use of a combustible solvent shall be followed.

5.6.6 Storage data. The cleaning solvent should be inherently stable. Storage should be in a cool, dry place to assure indefinite storage life, and to avoid pressure effects due to excessive heat. Alternate heating and cooling of containers should be avoided in order to prevent breathing by the containers and loss of volatile components thereby changing the composition of the solvent, and also to prevent condensation of moisture in the containers.

5.6.7 Disposal data. Large volumes of the compound are reclaimable for reuse after purification. Small volumes of the compound will be lost in use. Spills of the compound and soiled solvent residues must be handled for disposal by the procedures described in disposal data of paragraph 4.8.

5.7 Name. COMPOUND, SOLVENT, FOR USE IN INTEGRAL FUEL TANKS; Cleaning Compound, Solvent

5.7.1 Specification. MIL-C-38736, Compound, Solvent, For Use in Integral Fuel Tanks.

5.7.2 Technical description. The compound is a blend of solvents of the following composition.

TABLE VIII. Solvent formulation

Ingredient	Percent by Volume
Aromatic naphtha (TT-N-97, Type I, Grade B)	50 ± 2.5
Ethyl acetate (TT-E-751)	20 ± 1.0
Methyl ethyl ketone (TT-M-261)	20 ± 1.0
Isopropyl alcohol (TT-I-735)	10 ± 0.5

5.7.3 Use data. This cleaning solvent is intended for cleaning chemically treated aluminum alloy surfaces prior to applying corrosion preventive coating, polyurethane fuel tank coating, high-adhesion temperature resistant sealing compound, and also for final cleaning prior to applying chemical conversion coatings.

5.7.4 Packaging data and labeling.

5.7.4.1 Packaging data. The solvent compound shall be unit packed and packed for shipment as specified in the contract or order in accordance with PPP-P-1892.

5.7.4.2 Labeling. Containers shall be marked in accordance with PPP-P-1892 and MIL-STD-129. The following additional marking shall be on each container.

STORAGE LIFE IS SIX MONTHS WHEN STORED IN
ORIGINAL UNOPENED CONTAINERS BELOW 80°F (26.7°C)
MATERIAL IS HYGROSCOPIC

In addition, each unit container shall bear the following precautionary label.

WARNING! FLAMMABLE LIQUID

Keep away from heat, sparks and open flame.
Keep container closed.
Use with adequate ventilation.
Avoid breathing vapor.
Avoid contact with eyes, skin and clothing.
In case of contact, flush eyes or skin with water for at least 15 minutes; for eyes, get medical attention.

5.7.5 Safety precautions. The safety precautions of paragraphs 4.4.1, 4.4.2 and 4.4.4 are applicable to this solvent mixture. The actual toxicity of this item will depend primarily on the toxicity of the aromatic naphtha and will vary with different sources of naphtha. The normal precautions for use of a highly flammable solvent and its vapors must be followed.

5.7.6 Storage data. The cleaning solvent should be inherently stable in hermetically sealed containers, but storage should be in a cool, dry place to avoid pressure effects due to excessive heat. Since commercial containers are not hermetically sealed, alternate heating and cooling of containers should be avoided in order to prevent loss of volatile components thereby changing the composition of the solvent, and also to prevent condensation of moisture in the containers. Since the material is hygroscopic, the storage life is six months in original unopened containers below 80°F (26.7°C).

5.7.7 Disposal data. Large volumes of the compound are reclaimable for reuse after purification. Small volumes of the compound will be lost in use. Spills of the compound and soiled solvent residues must be handled for disposal by the procedures described in disposal data of paragraph 4.8.

5.8 Name. CLEANING COMPOUND, SOLVENT (FOR BORE OF SMALL ARMS AND AUTOMATIC AIRCRAFT WEAPONS); Cleaning Compound, Rifle Bore

5.8.1 Specification. MIL-C-372, Cleaning Compound, Solvent (For Bore of Small Arms and Automatic Aircraft Weapons).

5.8.2 Technical description. The cleaner shall be a clear transparent highly penetrating, mobile liquid free from offensive and disagreeable odors, and of no specified composition, meeting the following physical requirements:

TABLE IX. Physical requirements

Property	Requirement
Flash point, min	120°F (48.9°C)
Viscosity at 100°F (37.8°C) max	15 cs
Viscosity at -20°F (-28.9°C) max	1500 cs

The cleaner shall show no separation after storage throughout a temperature range of -65° to 77°F (-54° to 25°C), and also after storage at 150°F (65.6°C). The residue remaining after evaporation at 150°F (65.6°C) shall be free from solid particles, shall not be tacky, and shall permit fluid movement at -65°F (-54°C). The cleaner shall remove primer salts, prevent rusting, and be capable of protecting parts against corrosion during continuous condensation at temperatures up to 120°F (48.9°C). The cleaner, after storage in contact with water, shall satisfactorily displace water as evidenced by the absence of rust, mottling or other surface stains on steel test panels. The cleaner shall not produce visually evident corrosive effects, or a weight gain or loss in excess of specified limits on electrolytic tinplate.

5.8.3 Use data. The cleaner solvent is intended for use in cleaning the bores of small arms and automatic aircraft weapons. It also provides a temporary rust resistant coating for the cleaned surface.

5.8.4 Packaging data and labeling.

5.8.4.1 Packaging data. The solvent cleaning compound shall be unit packed and packed for shipment as specified in the contract order in accordance with MIL-STD-290.

5.8.4.2 Labeling. Shipping containers shall be marked in accordance with MIL-STD-290. In addition, each unit container shall bear the following precautionary label.

CAUTION! COMBUSTIBLE LIQUID

Keep away from heat and open flame.
Emits irritating fumes if heated to decomposition.
Keep container closed.
Avoid breathing vapor.
Avoid contact with eyes, skin and clothing.
In case of contact, flush eyes or skin with water for at least 15 minutes; for eyes, get medical attention.

5.8.5 Safety precautions. The safety precautions of paragraph 4.4.1 are applicable to this hydrocarbon type solvent. When used for its intended purpose, the cleaner shall have no adverse effect on the health of personnel. The actual toxicity of this item is not known and will vary with different sources. Also, the normal precautions for use of a combustible solvent must be followed.

5.8.6 Storage data. The solvent should be inherently stable. Storage should be in a cool, dry place to assure indefinite storage life, and to avoid pressure effects due to excessive heat. Alternate heating and cooling of containers should be avoided in order to prevent breathing by the containers thereby changing the composition of the solvent, and also to prevent condensation of moisture in the container.

5.8.7 Disposal data. Large volumes of the solvent are reclaimable for reuse after purification. Small volumes will be lost in use. Spills of the compound and soiled solvent residues must be handled for disposal by procedures described in disposal data of paragraph 4.8.

Part 5 of 5 Parts

EMULSIFIABLE SOLVENT CLEANERS

1. SCOPE

1.1 Coverage. Refer to introductory paragraph 1.1. This part of the standard covers five (5) items preferred for use in the selection of emulsifiable solvent cleaners by the Department of Defense.

1.2 Application. Refer to introductory paragraph 1.2.

2. REFERENCED DOCUMENTS

2.1 Issues of documents. The following documents, of the issue in effect on date of invitation for bids or request for proposal, form a part of this standard to the extent specified herein.

SPECIFICATIONS

FEDERAL

O-C-1824	- Cleaning Compound, Solvent, Heavy Duty, Liquid
P-C-444	- Cleaning Compound, Solvent Soluble Grease Emulsifying

MILITARY

MIL-C-6864	- Cleaning Compound, Solvent, Oil Cooler
MIL-C-11090	- Cleaning Compound, Degreasing and Depreserving Solvent, Self-Emulsifying
MIL-C-22230	- Cleaning Compound, Fuel Tank and Bilge
MIL-D-16791	- Detergent, General Purpose (Liquid Nonionic)

3. GLOSSARY

3.1 Definitions. Refer to introductory paragraph 3.1.

3.2 Abbreviations. Refer to introductory paragraph 3.2.

4. GENERAL REQUIREMENTS

4.1 Chemical and physical requirements. Refer to introductory paragraph 4.1.

4.2 Nomenclature. Refer to introductory paragraph 4.2.

4.3 Packaging data and labeling. Refer to introductory paragraph 4.3.

4.4 Safety. These cleaners are composed of a non-aqueous solvent base, biodegradable emulsifiers and detergents, polar cosolvents and in some cases water. Their hazards and toxicity are dependent on their composition. The precautions taken must be applicable to the hazards which are mainly dependent on the composition of the solvent base and cosolvents, and also on the alkalinity of the cleaner and its solutions. The safety precautions as stated in paragraph 4.4 of Parts 1 and 4 shall be employed as applicable to these cleaners.

4.5 Shelf life. Refer to introductory paragraph 4.5.

4.6 Temperature. Refer to introductory paragraph 4.6.

4.7 Pollution potential. Refer to introductory paragraph 4.7.

4.8 Disposal data. Some emulsifiable solvent cleaners can be classified as ignitable hazardous wastes depending on their flash points. Emulsifiable solvent cleaners are handled for disposal dependent on their composition. The mandatory procedures for handling solvent spills and soiled solvent residues that are not recoverable or reclaimable must be followed as stated in paragraph 4.8 of Part 4. The soiled solvent cleaners and residues may be dispersed in water, but they must not be considered suitable for disposal in sewage systems unless approved by the appropriate local, state and federal regulatory agencies for each specific case. Such aqueous dispersions must be handled for disposal as stated in paragraph 4.8 of Part 1.

4.9 DISCLAIMER. Refer to introductory paragraph 4.9.

5. DETAIL REQUIREMENTS

5.1 Name. CLEANING COMPOUND, SOLVENT, OIL COOLER; Cleaning Compound, Solvent

5.1.1 Specification. MIL-C-6864, Cleaning Compound, Solvent, Oil Cooler.

5.1.2 Technical description. The compound solvent shall be a single phase liquid, free of abrasives, silicates (except ethyl silicate as a corrosion preventive), inorganic acids, cyanides, inert fillers, or undissolved material. The composition of the cleaner is not specified but qualified formulations shall meet the requirements in Table I for inclusion in the Qualified Products List. The composition of the control formula to be used as a standard of comparison is in Table II.

5.1.3 Use data. The compound is intended for use in counterflushing oil coolers to remove carbon, oil, gum and lead deposits, after first flushing with a petroleum solvent to remove residual oil and sludge, and finally rinsed with a petroleum solvent.

5.1.4 Packaging data and labeling.

5.1.4.1 Packaging data. The solvent cleaning compound shall be unit packed and packed for shipment as specified in the contract or order.

5.1.4.2 Labeling. Containers shall be marked in accordance with MIL-STD-129. In addition, each unit container shall bear the following precautionary label.

WARNING! FLAMMABLE LIQUID

Keep away from heat, sparks and open flame.
Emits irritating and toxic fumes if heated to decomposition.
Keep container closed.
Avoid breathing vapor.

Avoid contact with eyes, skin and clothing.
In case of contact, flush eyes or skin with water for at least 15 minutes; for eyes, get medical attention.

Marking shall also include directions for use as follows:

Directions for use: The oil cooler shall be cleaned in a washing machine that has a tumbling and surging action caused by pressure and vacuum. The regulators shall be so hooked up that the cleaning compound will circulate in the opposite direction to that of the flow of oil when the regulators are installed on the plane. The oil cooler shall be flushed with any standard petroleum solvent to remove residual oil and sludge. The oil cooler should not be immersed in the cleaning compound. The cooler shall then be flushed with the cleaning compound to remove the carbon deposits, engine oil, gums, lead deposits, and foreign contamination. The cooler shall then be rinsed with a standard petroleum solvent. If the oil cooler is not to be brightened, it shall be filled with a suitable preservative oil and drained prior to use or storage; otherwise, no preservative should be applied.

TABLE I. Requirements

Property	Requirements
Moisture content, max	3% by wt
pH (1% by vol dispersion in water)	9.3 to 10.0
Flash point (open cup)	Not less than 80°F (26.7°C)
Sp gr (77°/77°F or 25°/25°C)	Not less than 1.20
Pour point	Not higher than -20°F (-29°C)
Solubility when	Shall form clear solutions when 10 ml of compound are added to 90 ml of dry cleaning solvent, kerosene and mineral spirits.
Emulsifiability	Shall form a stable emulsion without separation or creaming for at least 6 hours when 4% by vol of compound is added to water.
Water tolerance	Shall remain clear and show no thickening when diluted with water equal to 25% of its vol.
Corrosion	Shall show no visible trace of corrosive attack, oxidation or discoloration when specimens of copper tubing, brass alloy, soldered ends of copper tubing, polished aluminum alloy, and anodized aluminum alloy are immersed in the compound; and shall show no signs of softening, blistering or removal of Heresite coated aluminum alloy surfaces.

Carbon and "lacquer" removal	Shall show ability to loosen carbon and remove hot oil "lacquers" equal to or greater than the control formula when tested as specified.

TABLE II. Control formula

Ingredient	Percent by Weight
Ethyl alcohol (95% grade)	10
Cresol (USP grade)	10
Methylene chloride	70
Potassium oleate	8
Wetting agent Polyethyleneglycol monoalkylaryl ether (MIL-D-16791)	2

5.1.5 Safety precautions. The safety precautions of paragraph 4.4. of Part 4 are applicable to this solvent mixture. This solvent mixture can contain hydrocarbons, oxygenated compounds, and halogenated hydrocarbons. The actual toxicity will vary with the formulation from different sources. The normal precautions for use of a flammable solvent must be followed.

5.1.6 Storage data. The solvent should be inherently stable. Storage should be in a cool, dry place to assure indefinite storage life, and to avoid pressure effects due to excessive heat. Alternate heating and cooling of containers should be avoided in order to prevent breathing by the containers, thereby changing the composition of the solvent; and to prevent condensation of moisture in the containers.

5.1.7 Disposal data. Large volumes of the solvents should be reclaimable for reuse after purification if not emulsified into water. Small volumes will be lost in use. Spills of the compound, solvent residues and unreclaimable solvent emulsified into water must be handled for disposal by procedures described in disposal data of paragraph 4.8.

5.2 Name. CLEANING COMPOUND, DEGREASING AND DEPRESERVING SOLVENT, SELF-EMULSIFYING; Cleaning Compound, Solvent.

5.2.1 Specification. MIL-C-11090, Cleaning Compound, Degreasing and Depreserving Solvent, Self-Emulsifying.

5.2.2 Technical description. The compound solvent composition is not specified but qualified formulations shall conform to the following physical properties:

TABLE III. Physical properties

Property	Requirement
Flash point (Tag closed tester), min	100°F (37.8°C)
Viscosity, at 10°F (-12.2°C), max	15 cs
Emulsion stability, time, min (10 parts compound to 90 parts water	6 hours

The compound shall be free from abrasive materials and contain none of the following:

(1) Phenolic or cresylic acids or their salts, i.e., compounds in which a hydroxyl group is directly attached to an aromatic nucleus or in which the hydrogen of the hydroxyl group has been replaced to form a metal derivative.

(2) Chlorinated hydrocarbons or other chlorine compounds.

(3) Benzene or toluene.

The synthetic detergents used in the compound shall be 90% minimum biodegradable.

The compound shall be a homogeneous stable material, and shall show no separation into separate phases, precipitation or gelation greater than that of the comparison formula after storage for six months at 100°F (37.8°C). The compound shall not cause any corrosion or discoloration on steel, aluminum and magnesium test panels greater than the comparison formula. The compound shall show no evidence of loosening of paint when tested as specified. The comparison formula is shown below.

TABLE IV. Comparison formula composition

Solvent, composed of:	
High-flash coal tar naphtha	70 ml
Kerosene	30 ml
Detergent concentrate, composed of:	
Cyclohexanol	1.00 ml
Ethylene glycol monobutylether	0.50 ml
Diacetone - diethylene triamine condensate	0.25 ml
Diglycol oleate	1.00 ml
Lauric acid, technical (98% min)	0.41 g
Oleic acid, USP (75% min)	3.28 g
Palmitic acid, tech. (85% min)	0.20 g
Ethanolamine	0.86 g

5.2.3 Use data. The compound is intended for use in removing oils, greases, asphalt, tars and preservative type materials from metallic and painted surfaces. The compound should be capable of application by swab, brush, spray or soak. The compound is applied undiluted and allowed to remain on work for 3 to 5 minutes to soften the soil, and the application is repeated if necessary. In the first method, the softened soil is removed by rinsing with steam or hot water, but if water must be avoided then rinsing should be done with Stoddard solvent. In the second method, the compound is applied by spray gun at a pressure of 20 lbs/sq in (1.4 kg/sq cm) to remove the soil without rinsing, thereby enabling the compound to be repeatedly recycled and reused. The compound cannot be used on acrylic plastics, and may be deleterious to other plastics and rubbers.

5.2.4 Packaging data and labeling.

5.2.4.1 Packaging data. The compound shall be unit packed and packed for shipment as specified in the contract or order.

5.2.4.2 Labeling. Marking shall be in accordance with MIL-STD-129, and labeling shall include the following printed instructions attached to each container.

Instructions for use: The cleaning compound may be used by soak, brush or spray application. Do not dilute. Allow the cleaning compound to remain on work for 3 to 5 minutes before rinsing. Two recommended procedures for spray application are as follows:

Method 1. Apply compound by spray gun at a pressure of 4 lbs/sq in. Hold spray nozzle of the gun about 6 in away from the work. Use a heavy stream of liquid rather than a dispersion. Examine the soil 3 to 5 minutes after application. If the soil is not softened, spray a second application of the compound. Allow 3 to 5 minutes, then rinse by means of a steam jenny at pressure of 40 to 50 lbs/sq in, or if not available, then with hot water preferably at a pressure of 25 to 50 lbs/sq in. If water must be avoided, rinse with Stoddard Solvent.

Method 2. Apply compound by spray gun at pressure of 20 lbs/sq in. Hold spray nozzle of the gun about 6 in away from the work. Do not rinse. In this method, the compound may be repeatedly recycled and reused.

Caution: DO NOT USE ON ACRYLIC PLASTICS. Care should be exercised when using this solvent on other plastics, rubber, etc., including pretesting on the specific material, to insure no deleterious effects.

In addition, each unit container shall bear the following precautionary label.

CAUTION! COMBUSTIBLE LIQUID

Keep away from heat or flame.
Use with adequate ventilation.
Avoid breathing vapor.
May be irritating to skin, eyes, and respiratory tract.
In case of contact, flush eyes or skin with water for
 at least 15 minutes; for eyes, get medical attention.
Do not take internally.

5.2.5 Safety precautions. The safety precautions of paragraph 4.4.1 of Part 4 are applicable to this hydrocarbon type solvent. This item is primarily a hydrocarbon solvent mixture containing detergents and possibly ethanolamine soaps. The actual toxicity will vary with the formulation from different sources. The general safety precautions of paragraph 4.4 must be followed by personnel using this solvent. Also the normal precautions for use of a combustible solvent must be followed.

5.2.6 Storage data. The solvent should be inherently stable. Storage should be in a cool, dry place to assure indefinite storage life, and to avoid pressure effects due to excessive heat. Alternate heating and cooling of containers should be avoided in order to prevent breathing by the containers which could change the composition of the solvent, and to prevent condensation of moisture in the containers.

5.2.7 Disposal data. Solvent that has not been emulsified into water can be reclaimed for reuse. Small volumes will be lost in use. Spills of the compound, soiled solvent residues and unreclaimable solvent emulsified into water must be handled for disposal by procedures described in disposal data of paragraph 4.8.

5.3 Name. CLEANING COMPOUND, FUEL TANK AND BILGE; Cleaning Compound, Solvent

5.3.1 Specification. MIL-C-22230, Cleaning Compound, Fuel Tank and Bilge.

5.3.2 Technical description. The compound shall be a single phase liquid, solution, free from insoluble suspended or precipitated solids, and shall show no evidence of separation, gelation or solidification. The liquid solution shall be composed of solvents, and emulsifiers, and be free from caustic soda, benzol and chlorinated compounds. The viscosity of the compound shall be 800 cp maximum at 50°F (10°C), and the closed cup flash point shall be 150°F (65.6°C) minimum. The compound shall be readily miscible in a 3.5% salt solution, and shall readily emulsify Navy Special fuel oil in salt water and resist demulsification when diluted with salt water. Aqueous solutions of the compound shall not be more corrosive than a 3.5% salt water solution to mild steel, aluminum and brass.

5.3.3 Use data. The compound is intended for use in cleaning fuel oil tanks (Navy Special or Diesel), lubricating oil tanks, and machinery space bilges by emulsification of the oil. The compound should not be used in cleaning jet fuel (JP-5) or gasoline tanks because of detrimental effects of trace residues of the cleaner on the performance of coalescer type filters installed for these tanks.

5.3.4 Packaging data and labeling.

5.3.4.1 Packaging data. The compound shall be unit packed and packed for shipment as specified in the contract or order.

5.3.4.2 Labeling. Container shall be marked in accordance with MIL-STD-129. In addition, each unit container shall bear the following precautionary label.

CAUTION! COMBUSTIBLE LIQUID

Keep away from heat and open flame.
Do not apply full strength to hot surfaces, near open flames, sparks, or electrical fixtures.
Keep container closed.
Avoid breathing vapor.
Use with adequate ventilation.
Avoid contact with skin and eyes.
In case of contact, flush eyes or skin with water for at least 15 minutes; for eyes, get medical attention.

Also, each unit container shall be labeled with the following information.

INTENDED USE

This compound is intended for use in cleaning fuel oil tanks (Navy Special or Diesel), lubricating oil tanks, and machinery space bilges by emulsification of the oil. This compound should not be used in cleaning JP-5 or gasoline tanks because of detrimental effects of trace residues of the cleaner on performance of coalescer type filters installed for these tanks.

5.3.5 Safety precautions. The safety precautions of paragraphs 4.4.1, 4.4.2 and 4.4.4 are applicable to this solvent mixture. This item is primarily a solvent mixture and can contain non-aromatic hydrocarbons and oxygenated organic solvents. The actual toxicity will vary with the formulation from different sources. The general safety precautions of section 4.4 shall be followed by personnel using this solvent. Also, the normal precautions for use of a combustible solvent must be followed.

5.3.6 Storage data. The solvent should be inherently stable. Storage should be in a cool, dry place to assure indefinite storage life, and to avoid pressure effects due to excessive heat. Alternate heating and cooling of containers should be avoided in order to prevent breathing by the containers which could change the composition of the solvent, and to prevent condensation of moisture in the container.

5.3.7 Disposal data. The disposal of oily aqueous wastes from government vessels must be done in accordance with applicable regulations and directives by the service controlling the operation of the vessels.

5.4 Name. CLEANING COMPOUND, SOLVENT, HEAVY DUTY LIQUID; Cleaning Compound, Solvent

5.4.1 Specification. O-C-1824, Cleaning Compound, Solvent, Heavy Duty, Liquid.

5.4.2 Technical description. The compound shall be a clear, homogeneous liquid consisting essentially of organic solvents, soap and water. The solvent content shall be not less than 45% by wt. The composition of the compound is not specified but the compound shall not contain any chlorinated or other toxic solvents. The compound shall conform to the following chemical and physical requirements.

TABLE V. Chemical and physical requirements

Characteristic	Requirement
Flash point, min	180°F (82.2°C)
Pour point, max	10°F (-12.2°C)
pH, min (1 part compound/1 part water by vol)	11.0
Solubility in water	Forms clear or opalescent single stable homogeneous phase.
Mixed aniline point (max)	95°F (35°C)

The compound shall give complete removal of and shall not show any redeposition of designated soils from mild steel and bronze surfaces when tested as specified. The compound shall show no greater change in weight of steel and bronze than as follows when tested as specified.

Steel - 0.0002 g/sq in (0.000031 g/sq cm)
Bronze - 0.0003 g/sq in (0.000046 g/sq cm)

5.4.3 Use data. The compound is intended for use in the cleaning of copper alloy (brass and bronze) and ferrous metal surfaces from oils, greases, asphalts, tars, and some rust preventive compounds. The compound may be diluted with from two to ten parts of fresh water depending upon the type and degree of soil to be removed. The diluted compound is applied to the soiled object by spraying, dipping or brushing and allowed to soak until the soil is softened. A high pressure water rinse emulsifies the compound and removes the soil. For cleaning closed systems, the diluted compound is recirculated through the system, then rinsed with hot water and steam, then air dried if desired. The compound does not remove rust and corrosion, and must not be used on aluminum or zinc surfaces.

5.4.4 Packaging data and labeling.

5.4.4.1 Packaging data. The compound shall be unit packed and packed for shipment as specified in the contract or order.

5.4.4.2 Labeling. Labeling and marking shall comply with the Federal Hazardous Substances Act. Marking of containers shall be in accordance with MIL-STD-129. A suitable label with the following instructions shall be attached to each container.

Directions for Use:

1. This product is designed to remove such materials as oil, grease, asphalt, tar, and some rust preventive compounds, from ferrous and copper alloy (brass, bronze) surfaces. It will not remove rust and corrosion. It shall not be used on aluminum or zinc.

2. Heavy duty cleaning compound is concentrated and shall be diluted with from two to ten parts of fresh water depending upon the type and degree of soil to be removed.

3. Apply the diluted compound to the soiled object by spraying, dipping or brushing, and allow to soak until the soil is softened. A high pressure water rinse will emulsify the compound and remove the soil.

4. For closed systems, such as fuel oil heaters, the following procedure shall be used: Drain the system and steam for one hour or until no more oily drops appear in the exit steam. Recirculate diluted compound heated to about 150°F (65.6°C) through the system for one to two hours. Rinse system with hot water for approximately 15 minutes and then steam for 15 to 30 minutes. If desired, a final blow-out with air may be made.

In addition, each unit container must bear the following precautionary label:

DANGER! CORROSIVE COMBUSTIBLE LIQUID
CAUSES BURNS

Keep away from heat and open flame.
Keep container closed.
Use with adequate ventilation.
Avoid breathing vapor.
Avoid contact with eyes, skin and clothing.
In case of contact, flush eyes or skin with water for at least 15 minutes; for eyes, get medical attention.

5.4.5 Safety precautions. The safety precautions of paragraphs 4.4.1, 4.4.2 and 4.4.4 of Part 4 are applicable to this solvent mixture. This item is primarily a solvent mixture and can contain hydrocarbons and oxygenated organic solvents. The actual toxicity will vary with the formulation from different sources. The general safety precautions of 4.4 shall be followed by personnel using this solvent. Also, the normal precautions for use of a combustible solvent must be followed.

5.4.6 Storage data. The compound should be inherently stable. Storage should be in a cool, dry place to assure indefinite storage life, and to avoid pressure effects due to excessive heat. Alternate heating and cooling of containers should be avoided in order to prevent breathing by the containers which could change the composition of the solvent, and to prevent condensation of moisture in the containers.

5.4.7 Disposal data. Solvent that has not been emulsified into water can be reclaimed for reuse. Small volumes will be lost in use. Solvent spills, soiled solvent residues, and unreclaimable solvent emulsified into water, must be handled for disposal by procedures described in disposal data of paragraph 4.8.

5.5 Name. CLEANING COMPOUND, SOLVENT SOLUBLE GREASE EMULSIFYING; Cleaning Compound, Solvent

5.5.1 Specification. P-C-444, Cleaning Compound, Solvent Soluble, Grease Emulsifying.

5.5.2 Technical description. The compound is a liquid solvent of unspecified composition in two types:

5.5.2.1 Type I - Non-phenolic. The type I compound shall have a phenolic material content not greater than that of a control solution composed of 0.005% phenol in distilled water.

5.5.2.2 Type II - Phenolic. The type II compound shall contain between 15 and 25% by vol of phenolic material, but shall contain less than 3% by wt of phenol (C_6H_5OH).

5.5.2.3 Requirements. Both types of compound shall meet the following requirements.

5.5.2.3.1 Form. The original liquid compound, after exposure to air of a 250 ml sample in a specified open container of cross sectional area 25 to 28 sq in (161 to 181 sq cm) at 70° to 80°F (21° to 27°C), shall readily redissolve by stirring any surface skin which may have formed.

5.5.2.3.2 Free alkali. None when tested as specified.

5.5.2.3.3 Volatile matter. Less than 10.0% loss in wt when tested as specified.

5.5.2.3.4 Flash point, closed cup. Not less than 110°F (43°C).

5.5.2.3.5 Pour point. Not more than 35°F (1.7°C).

5.5.2.3.6 Solubility in mineral spirits. One vol of original compound in 9 vol of mineral spirits shall dissolve to give a clear liquid without the presence of undissolved matter. The solution shall retain its clarity and show no separation at the top or bottom after 24 hours at room temperature. An air exposed sample prepared as in 5.5.2.3.1 shall be tested likewise.

5.5.2.3.7 Solubility in water. One vol of compound shall dissolve or emulsify in 18 vol of 12.5 grain hard water. After standing for 6 hours at room temperature there shall be no emulsion breakdown by separation of a water or oil phase, but a creamy layer is permissible. An air exposed sample prepared as in 5.5.2.3.1 shall be tested likewise.

5.5.2.3.8 Emulsion stability. The compound diluted to 10% by vol with mineral spirits, and then added as 1 part to 9 parts by vol of the hard water shall show no evidence of emulsion breakdown after standing 6 hours at room temperature as above. An air exposed sample prepared as in 5.5.2.3.1 shall be tested likewise.

5.5.2.3.9 Cleaning performance. The compound diluted to 10% by vol with mineral spirits, shall clean oil and carbon from doped fabric panels with no visible evidence of soil, soap films, or other remaining residue. An air exposed sample prepared as in 5.5.2.3.1 shall be tested likewise.

5.5.2.3.10 Chemical corrosion. The compound shall not stain, discolor or corrosively attack specified metal test panels of polished, anodized and clad aluminum alloys, polished and cadmium plated steel, and chrome-pickle finished magnesium when tested as specified. Slight discoloration of cadmium plated steel is permitted.

5.5.2.3.11 Electrolytic corrosion. The compound shall cause a weight loss of not more than 0.002 g for magnesium specimens and not more than 0.0015 g for others without pitting or etching when tested as specified. The other specimens shall be copper, aluminum, steel and cadmium plated steel.

5.5.2.3.12 Effects on acrylic base plastic. Type I compound shall cause no crazing, cracking or other kind of attack on acrylic base plastic when tested as specified.

5.5.2.3.13 Effects on lacquered surface. Type I compound shall cause no permanent softening, loss of gloss, discoloration, bleeding, or any film irregularity on lacquered surfaces when tested as specified.

5.5.2.3.14 Cold stability. When exposed at -15°F (-26°C) for one hour and then warmed to room temperature, the compound shall return to its original condition.

5.5.2.3.15 Storage stability. After six months storage at room temperature, the compound shall show no evidence of layer formation, gelation, or heavy precipitation; and shall not require agitation prior to use.

5.5.3 Use data. The compound is intended for use in removing grease, oil, dirt, etc., from various surfaces.

5.5.3.1 Type I. The type I compound is intended for use in general cleaning of painted and unpainted surfaces and parts, and can be used to remove corrosion preventive coatings.

5.5.3.2 Type II. The type II compound is intended for use in heavy duty cleaning of unpainted surfaces. When mixed with trichloroethylene, it can be used for ultrasonic cleaning of heavily soiled aircraft bearings. It can only be used with extreme caution on rubber, plastics, painted surfaces, etc., as the compound will soften these by long contact.

5.5.3.3 Concentrations. The compound is normally used in mineral spirits solutions in concentrations ranging from 1 part compound to 9 parts mineral spirits, and 1 part compound to 4 parts mineral spirits by vol, depending on the degree of soil. The solutions may be applied by wiping, spraying or immersion, followed by rinsing with clear water.

5.5.4 Packaging data and labeling.

5.5.4.1 Packaging data. The compounds shall be unit packed and packed for shipment as specified in the contract or order.

5.5.4.2 Labeling. Containers shall be marked in accordance with MIL-STD-129. In addition, each unit container shall be marked with the following information:

Directions:

The cleaning compound is normally used in mineral spirits solutions in concentrations ranging between 1 part compound and 9 parts mineral spirits to 1 part compound and 4 parts mineral spirits by vol depending on the degree of soil. The cleaning solution may be applied by rag, spray, or immersion; followed by rinsing with clear water immediately after application. The compound will generally remove hard and soft film corrosion preventive coatings and, hence, should not be used on parts thus protected unless removal of such films is desired.

The marking on containers of the type I cleaning compound shall also include:

Intended use: For general cleaning of painted as well as unpainted surfaces and parts can be used to remove paralketone and similar corrosion preventive coatings.

The marking on containers of type II cleaning compound shall also include:

The cleaning compound is primarily intended for heavy duty cleaning on unpainted surfaces. When this compound is mixed with trichloroethylene, it can be used for ultrasonic cleaning of heavily soiled general aircraft bearings. It should be used with extreme caution on rubber, plastics, decalcomanias, painted surfaces, etc., as the compound will soften these if allowed to remain on the surface too long. The compound will have an irritating action in contact with the skin and eyes; therefore, rubber gloves and goggles are recommended to be worn by personnel using this compound.

Each unit container shall, also, bear the following precautionary label.

CAUTION! COMBUSTIBLE LIQUID

Keep away from heat and open flame.
Keep container closed.
Use with adequate ventilation.
Avoid breathing vapor.
Avoid contact with eyes, skin and clothing.
In case of contact, flush eyes or skin with water for at least 15 minutes; for eyes, get medical attention.

5.5.5 Safety precautions. The safety precautions of paragraphs 4.4.1, 4.4.2 and 4.4.4 of Part 4 are applicable to these solvent mixtures. These compounds are primarily solvent mixtures and can contain hydrocarbons and oxygenated organic solvents including phenolics in the case of type II compound. The actual toxicity will vary with the formulations from different sources. The general safety precautions of section 4.4 should be followed by personnel using this solvent. When used with trichloroethylene, a potential carcinogen, any exposure must be avoided. Also, the normal precautions for use of a combustible solvent must be followed.

5.5.6 Storage data. The compounds should be inherently stable. Storage should be in a cool, dry place to assure indefinite storage life, and to avoid pressure effects due to excessive heat. Alternate heating and cooling of containers should be avoided in order to prevent breathing by the containers which could change the composition of the solvent, and to prevent condensation of moisture in the containers.

5.5.7 Disposal data. Solvents that have not been emulsified into water can be reclaimed for reuse. Small volumes will be lost in use. Spills of the compounds, soiled solvent residues, and unreclaimable solvent residues emulsified into water, must be handled for disposal by procedures described in disposal data of paragraph 4.8.

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

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MIL-STD-1428 CLEANING COMPOUNDS

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