

INCH-POUND

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MILITARY STANDARD
ESTERS AND METAL ORGANICS, TECHNICAL GRADE



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MIL-STD-1214A

DEPARTMENT OF DEFENSE
Washington, DC 20301

Esters and Metal Organics, Technical Grade

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1. This Military Standard is mandatory for use by all Departments and Agencies of the Department of Defense, to assure that selection of new items is limited to essential items, for which no comparable standard item exists. This document is not intended to restrict any service in selecting new items required to support state-of-the-art changes.
2. Recommended corrections, additions, or deletions should be addressed to the Commanding Officer, U.S. Army Chemical Research, Development and Engineering Center, ATTN: SMCCR-SPT-S, Aberdeen Proving Ground, MD 21010-5423.

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F O R E W O R D

This is the first book format standard generated on esters and metal organics, technical grade. This document is mandatory for use by all departments and agencies of the Department of Defense in selecting items for application. It is intended to prevent the entry of unnecessary items (sizes, types, varieties) into the Department of Defense logistics system. This is not a procurement document. This document is not intended to restrict any service in selecting new items required to support state-of-the-art changes.

The Revision A of this standard has added dibutyl phthalate, magnesium stearate and 4,4-methylene bis (2,6-di-tert-butylphenol) as well as safety, storage and disposal guidance for all materials.

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1. SCOPE

1.1 Coverage. This standard is a presentation of nomenclature, formulas, physical and chemical properties, specification requirements, military and typical commercial uses, safety information, storage information and disposal information for esters and metal organics, technical grade. This standard does not include all of the items represented by the title or all those items which are commercially available. It does contain items preferred for use in the selection of esters and metal organics, technical grade for application by the Department of Defense.

1.2 Application. Esters and metal organics, technical grade are used in synthesis and pyrotechnics and as neutralizing agents, desiccating agents, clarifying agents and as pigments and corrosion inhibitors.

1.3 Classification. The items in this standard are classified on the basis of chemical composition as esters and metal organics, technical grade.

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2. REFERENCED DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation.

SPECIFICATIONS

FEDERAL

O-E-760	Ethyl Alcohol (Ethanol), Denatured Alcohol; Proprietary Solvent and Special Industrial Solvents
O-M-232	Methanol (Methyl Alcohol)
TT-A-511	Amyl Acetate, Technical
TT-E-751	Ethyl Acetate, Technical
TT-I-735	Isopropyl Alcohol
TT-N-95	Naphtha, Aliphatic
TT-N-97	Naphtha, Aromatic
TT-S-735	Standard Test Fluids, Hydrocarbon
TT-T-548	Toluene, Technical
TT-T-656	Tricresyl Phosphate
PPP-C-2020	Chemicals, Liquid, Dry, and Paste, Packaging of

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MIL-D-218	Dibutyl Phthalate, Technical (Metric)
JAN-D-242	Diethylphthalate (For Use in Explosives)
JAN-C-263	Calcium Stearate
MIL-M-542	Magnesium Stearate (For Use in Ammunition)
JAN-C-628	Calcium Oxalate (For Use in Ammunition)
JAN-D-709	Dimethylphthalate (For Use in Explosives)
MIL-L-3061	Lecithin (For Use in Explosives)
MIL-E-7125	Ethylene Glycol Monoethyl Ether Acetate, Technical
MIL-D-13796	Di-2 Ethylhexylphthalate
MIL-D-14130	b-,b'-Dihydroxyldiethyl Sulfide (Thiodiglycol), Technical
MIL-C-20470	Calcium Resinate
MIL-B-21465	Butyl Stearate - Normal
MIL-D-50006	Diphenylphthalate, Technical
MIL-L-51131	Lithium Stearate
DOD-M-82730	4,4-Methylenebis (2,6-Di-Tert-Butylphenol)

STANDARDS

FEDERAL

FED-STD-313	Material Safety Data Sheets, Preparation and the Submission of
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MILITARY

MIL-STD-12 Abbreviations for Use on Drawings, Specifications,
Standards and in Technical Documents

(Unless otherwise indicated, copies of federal and military specifications, standards and handbooks are available from the Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.1.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this standard to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation.

PUBLIC LAW (PL)

94-580 Resource Conservation and Recovery Act

CODE OF FEDERAL REGULATIONS (CFR)

Title 29 Department of Labor, Occupational Safety and Health
Administration
Title 40 Protection of the Environment; Environmental Protec-
tion Agency
Title 49 Department of Transportation; Hazardous Materials
Regulations

DEPARTMENT OF DEFENSE (DOD)

DODISS Department of Defense Index of Specifications and
Standards
DOD 4145.19-R-1 Storage and Materials Handling
DOD 4160.21-M Defense Utilization and Disposal Manual
DOD 6050.5 DOD Hazardous Materials Information System, Hazardous
Item Listing
TB MED 502 Occupational and Environmental Health Respiratory
(DLAM 1000.2) Protection Program
TB MED 506 Occupational and Environmental Health Occupational
Vision
TM 38-250 Packaging, Materials Handling - Preparation of
Hazardous Materials for Military Air Shipment

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH (NIOSH)

Registry of Toxic Effects of Chemical Substances
Recommendation for Environmental Exposure Limits

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

2.2 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted shall be those listed in the issue of DODISS cited in the solicitation. Unless otherwise specified, the issues of

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documents not listed in the DODISS are the issues of the documents cited in the solicitation.

AMERICAN CONFERENCE OF GOVERNMENT INDUSTRIAL HYGIENISTS (ACGIH)

TLVs* Threshold Limit Values for Chemical Substances in the Work Environment Adopted by American Conference of Government Industrial Hygienists (ACGIH) with Intended Changes.

(Application for copies should be addressed to American Conference of Governmental Industrial Hygienists, 6500 Glenway Avenue, Bldg D-7, Cincinnati, OH 45211.)

AMERICAN SOCIETY FOR TESTING AND MATERIAL (ASTM)

D 608	Dibutyl Phthalate
D 1249	Octyl Ortho-Phthalate Ester, Specification for
D 1718	Isobutyl Acetate (95% Grade)
D 4615	N-Butyl Acetate (All Grades)
E 11	Standard Specification for Wire-Cloth Sieves for Testing Purposes
E 380	Metric Practice

(Application for copies should be addressed to American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

National Fire Codes

(Application for copies should be addressed to National Fire Protection Association, Battery March Park, Quincy, MA 02269.)

(Nongovernment standards are generally available for reference from libraries. They are also distributed among nongovernment standards bodies and using Federal agencies.)

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

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3. DEFINITIONS (Not applicable)

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4. GENERAL REQUIREMENTS

4.1 Packaging data and labeling. All chemicals included in this standard shall be packaged in accordance with Federal Specification PPP-C-2020 and all applicable documents referenced therein. Shipping containers shall be labeled in accordance with current Department of Transportation (DOT) Hazardous Materials Regulations applicable to each chemical. When shipping by military aircraft the requirements of TM 38-250 shall apply. In addition, each item shall be packaged and labeled as specified in the applicable contract or order. All labels shall also comply with Hazard Communication Standard, 29 CFR 1910.1200(f).

4.2 Hazardous materials information. DOD 6050.5, DOD Hazardous Materials Information System (HMIS) acquires, reviews, stores, and disseminates Material Safety Data Sheet (MSDS) information for all hazardous materials used by DOD. The contractual acquisition of a MSDS is accomplished through use of Federal Acquisition Regulation, paragraph 52.223-3, Hazardous Material Identification and Material Safety Data. The MSDS is prepared in accordance with the instructions of FED-STD-313; and shall comply with requirements of Hazard Communication Standard, 29 CFR 1910.1200(g).

4.3 Safety.

4.3.1 Personal protective measures. The necessary respiratory, eye and skin protection to be used when handling chemicals shall be prescribed by the responsible installation industrial hygiene, medical and safety authorities.

4.3.1.1 Respiratory protection. Respirators, approved by the National Institute for Occupational Safety and Health (NIOSH) or the Mine Safety and Health Administration (MSHA) for the compounds being used, may be employed for intermittent exposure or for supplementing other control measures (refer to TB MED 502 or DLAM 1000.2). Ventilation shall be adequate to remove hazardous concentrations.

4.3.1.2 Skin protection. Personnel using these compounds shall be provided with and required to use impervious gloves, sleeves, aprons, and boots whenever indicated. Protective creams and ointments commonly known as "barrier creams" may be of value in certain cases. However, barrier creams shall not be used to replace protective clothing. In case of contact with the skin, wash affected areas thoroughly with water. Eye lavages and emergency showers shall be located within 50 feet of where there is a potential for direct contact with harmful chemicals. When transferring chemicals, eye lavages and emergency showers shall be within 50 feet of the transfer point. Emergency showers shall be equipped with a valve that will fully open with one pull and deliver 30 gallons of water per minute.

4.3.1.3 Face and eye protection. Personnel using these compounds shall be provided with and required to wear chemical splash-proof safety goggles. In addition, face shields shall be provided and worn over the goggles if splashing could occur. In case of contact with the eyes, immediately irrigate with copious amounts of water for at least 20-30 minutes, and obtain medical attention. (Refer to TB MED 506.)

4.3.1.4 Training. Employers shall provide employees with training and information including MSDS on all chemical items in their work area, in accor-

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dance with 29 CFR 1910.1200(h), to ensure that employees know potential hazards of the chemicals with which they come in contact and the symptoms of exposure as well as how these chemicals affect the body and bodily functions. Employees shall be adequately trained to render first aid.

4.3.1.5 Exercise. Participation in training exercises shall be stressed to demonstrate skills in the use of personal protective equipment and emergency response equipment.

4.3.2 Storage conditions. DOD 4145.19-R-1 describes general storage practices and requirements for hazardous materials in the DOD supply system. Specific requirements provided in the following paragraphs are supplementary in nature and shall be observed in consonance with the DOD storage regulations.

4.3.2.1 Flammable, combustible, pyrophoric and ignitable materials. A flammable material is generally any solid, liquid, vapor or gas that ignites easily and burns rapidly. Combustible materials are generally those that are difficult to ignite and burn slowly. The DOT, in Part 173, Subpart D, Section 173.115 of 49 CFR, defines a flammable liquid as one having a closed cup flash point below 100°F (37.8°C). A combustible liquid is defined, by DOT in the above reference, as one having a closed cup flash point at or above 100°F and below 200°F (93.3°C). A pyrophoric liquid is defined, by DOT in the above reference, as one that ignites spontaneously in dry or moist air at or below 130°F (54.4°C). Materials with flash points of 200°F or higher are not considered to be nonflammable or noncombustible, but are to be considered as burnable. The Environmental Protection Agency (EPA), in Part 261, Subpart C, Section 261.21 of 40 CFR (refers only to materials that have become waste materials), designates the criteria for flammable and combustible materials and oxidizers that exhibit the characteristic of ignitability (I). Liquids with closed cup flash points of less than 140°F (60°C) are defined by EPA as ignitable. The autoignition point (temperature) of a substance is generally defined as the minimum temperature required to initiate or cause self-sustained combustion in the absence of a spark or flame. Materials that ignite easily under normal industrial conditions are considered to be dangerous fire hazards. Such Materials shall be stored in a manner to prevent ignition and combustion. Easily ignitable substances, such as reducing agents, shall be kept away from strong oxidizing agents. All containers shall be tightly sealed. It is important to provide adequate ventilation in storage areas, and to locate the storage areas of these items away from fire hazards. Ample fire control equipment shall be easily accessible. Storage buildings, rooms and cabinets shall comply with provisions of the National Fire Codes. The building shall be electrically grounded and signs posted to prevent the lighting of matches or smoking in the area. Flammable storage areas shall be equipped with smoke or fire detection equipment.

4.3.2.2 Water-sensitive fire and explosive hazardous materials. These are materials that react on contact with water or steam to ignite or evolve heat or explosive gases. Such materials exhibit the characteristic of reactivity (R) as designated by the EPA in Section 261.23 of the above reference. (Refers only to materials that have become waste materials.) These materials shall be stored in well-ventilated, cool, dry areas. All containers shall be tightly sealed. These materials are a fire hazard in contact with water or moisture; therefore, it is essential that no sprinkler be used. Otherwise, the building shall conform to that required for storage of flammable materials. The building shall be water-proof, located on high ground, and separated from other storage areas.

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4.3.2.3 Incompatible materials. Materials that are chemically incompatible shall be segregated in the storage of both serviceable and unserviceable items. The degree of segregation will depend upon DOD 4145.19-R-1 and local supplementary requirements that insure safe storage conditions. Hazardous storage compatibility codes are provided in the HMIS referred to in 4.2.

4.3.3 Chemical hazardous exposure limits. Chemical hazardous exposure limits for airborne concentrations of substances are obtained from the current TLVs* Threshold Limit Values for Chemical Substances in the Work Environment, adopted by the American Conference of Government Industrial Hygienists (ACGIH); current Occupational Safety and Health Administration (OSHA) Permissible Exposure Limits (PEL), 29 CFR, Section 1910.1000; and NIOSH Recommendation for Environmental Exposure Limits. Such information is also shown in MSDSs and the HMIS referred to in 4.2. Carcinogenic substances are listed by OSHA in Category I for confirmed carcinogens, and in Category II for suspected carcinogens. Category I substances have standard exposure limits set at the lowest possible levels. Category II substances have standard exposure limits set to prevent acute or chronic effects.

4.3.4 Toxicity. Toxicity information for chemical compounds is available from various publications and from MSDSs, which are collected in DOD 6050.5 Hazardous Materials Information System.

4.3.4.1 EPA toxic (T). Some chemical compounds have been designated by the EPA as toxic (T) in accordance with the criteria shown in Part 261, Subpart B, Section 261.119(a)(3) of 40 CFR. (Refers only to materials that have become waste materials.) Some commercial chemical products are listed as toxic under Subpart D, Section 261.33(f).

4.3.4.2 EPA acute hazardous toxicity (H). Some chemical compounds have been designated by the EPA as acute hazardous (H) in toxicity in accordance with the criteria shown in Subpart B, Section 261.11(a)(2) of the above reference. (Refers only to materials that have become waste materials.) Some commercial chemical products are listed as acute hazardous in toxicity under Subpart D, Section 261.33(e).

4.4 Pollution and disposal.

4.4.1 Pollution potential. All items described in this standard shall be assumed to have a pollution potential. However, to minimize this potential, the proper use, storage and disposal methods shall be strictly followed.

4.4.2 Disposal of excess or unserviceable material. To minimize disposal problems, it is recommended that no more than a one year's supply of each item listed in this standard be stocked. When stocks have been declared excess or unserviceable, they will be disposed of in accordance with the Defense Utilization and Disposal Manual, DOD 4160.21-M, and applicable DOD Policy Memoranda. Guidance can be obtained from your servicing Defense Reutilization and Marketing Office (DRMO) on procedures required for proper reporting and turn-in.

4.4.3 Disposal and storage of hazardous wastes. Items are classified and managed as hazardous wastes as defined by the Resource Conservation and Recovery Act (RCRA) (Public Law 94-580). Items have been identified as meeting the characteristics (i.e., ignitable, corrosive, reactive or EP toxic) or are listed

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(i.e., toxic or acute hazardous) according to Identification and Listing of Hazardous Waste, Part 261; 40 CFR; or have been determined to be hazardous wastes by declaration of the Defense Reutilization and Marketing Service (DRMS) in accordance with procedures set forth in DOD 4160.21-M. Disposal of such items shall be managed in accordance with the Installation Environmental Office, the DRMO, or the Safety and Health Office to insure proper reporting of disposal and treatment actions to the US EPA and State; and shall be managed in accordance with Federal, State and local laws. The three main disposal methods are turn-in to the DRMO, on-post disposal by installation personnel, or disposal by commercial contract. Hazardous wastes that cannot be used, or disposed of as stated in 4.4.3.4.2, shall be stored under environmentally safe conditions until suitable methods of disposal are determined. Short-term storage (less than 90 days) requires proper containment (i.e., packaging and facilities) 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 (RCRA), in compliance with the requirements of 40 CFR Parts 264 and 265. Physical custody will be accomplished by the activity with conforming storage or most nearly conforming storage. When physical custody is in question, the Post Commander will make the final decision. 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 shall be maintained and recorded in accordance with Part 262 of the above reference. Transportation of the waste shall be in accordance with Part 263 of the above reference, Standards Applicable to Transporters of Hazardous Waste.

4.4.3.1 Cleanup of liquid spills. To control the migration of spilled or leaking liquids, dike around the item with an inert, dry absorbent (e.g., clay, sawdust or vermiculite) or follow installations spill plans (Spill Prevention Control and Countermeasure Plan and Installations Spill Contingency Plan). Control entry to the spill site and segregate salvageable materials away from the spill area. Initiate waste cleanup operations immediately in accordance with local procedures. The residue shall be safely handled and transported to an approved or permitted disposal or storage facility. Packaging, labeling, transportation and record-keeping requirements for this waste material are determined by the appropriate Federal and State agencies and local procedures. It is recommended that all activities involving disposal preparation and transportation to commercial facilities be properly coordinated with the appropriate Federal and State agencies responsible for health and environmental aspects of hazardous materials. It is imperative that the proper description of waste accompany the packaged item at all times. Final disposal of the waste item shall be accomplished by reutilization, transfer, donation or sales by DRMS in accordance with DOD 4160.21-M or by ultimate disposal as described in 4.4.3.2. Spill residue, including contaminants, to be turned in to the DRMO shall first be properly identified, containerized, and labeled. For large scale spills that grossly contaminate the environment, the Chemical Transportation Emergency Center (CHEMTREC), can be called for assistance. Applicable procedures of the local spill control plan shall be followed. Necessary respiratory, eye, and skin protection measures are to be used while performing cleanup operations.

4.4.3.2 Ultimate disposal. Ultimate disposal shall be accomplished at a permitted or approved hazardous waste treatment or disposal facility designated by the Installation Environmental Office, DRMO, or Safety and Health Offices.

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4.4.4 DISCLAIMER. RECOMMENDED DISPOSAL INSTRUCTIONS 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 CONTRACTING 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.

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5. DETAIL REQUIREMENTS

5.1 Name. ALUMINUM STEARATE, TECHNICAL $Al(C_{18}H_{35}O_2)_3$ FW 877.42
Aluminum Tristearate

5.1.1 Technical description. Aluminum stearate is a tribasic soap. This compound is a white powder having a neutral to slightly fatty-acid odor, a specific gravity of 1.010, and a melting point of 103°C. It is insoluble in water, but is soluble in alcohol, benzene, turpentine, and alkalis.

5.1.2 Specifications. None.

5.1.2.1 Requirements. The requirements for the chemical and physical properties of aluminum stearate are as shown in Table I.

TABLE I. Chemical and physical requirements of aluminum stearate, technical.

Property	Requirement	
	Minimum	Maximum
	<u>% by Wt</u>	<u>% by Wt</u>
Aluminum oxide (Al_2O_3)	5.80	6.90
Water soluble salts	---	1.75
Iron (Fe)	---	0.10
Moisture	---	1.50
Free fatty acid	25	35

5.1.3 Use. Aluminum stearate, technical is intended for military use as a drier in paints and other protective coatings. Typical commercial applications include use in paint and varnish driers; greases; waterproofing agents; cement additives; lubricants; cutting compounds; flatting agents; cosmetics and pharmaceuticals; and additives for chewing gum.

5.1.4 Safety. Aluminum stearate is non-toxic. Normal laboratory safety precautions are required in handling aluminum stearate. Aluminum stearate is considered a nuisance particulate with a TLV^o of 10 mg/m³ of total dust. Aluminum stearate shall be used with adequate ventilation. (Refer to 4.3.1)

5.1.5 Storage. Aluminum stearate shall be stored in a cool, dry place in tightly closed containers. (Refer to 4.3.2)

5.1.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4)

An EPA Hazardous Waste Classification is not listed in 40 CFR.

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5.2 Name. AMYL ACETATE, TECHNICAL $\text{CH}_3\text{COOC}_5\text{H}_{11}$ FW 130.19
 Isoamyl Acetate
 Amyl Acetic Ester
 Pentyl Acetate
 Banana Oil
 Pear Oil
 (HAZARDOUS)

5.2.1 Technical description. This material is usually a mixture of isomers, principally the isoamyl, normal-, and secondary-amyl acetates. It is a colorless liquid with a distinctive banana-like odor, very slightly soluble in water and miscible with alcohol and ether. The chemical and physical properties vary according to composition and degree of purity. For military use, the synthetic type amyl acetate shall be clear and free from sediment and suspended matter and shall leave no residual odor after drying from filter paper for two hours. It shall be miscible without turbidity with 19 volumes of 10° Heptane at 20°C and shall be completely soluble in 85 percent sulfuric acid.

5.2.2 Specifications. Federal, TT-A-511, Amyl Acetate (For Use in Organic Coatings).

5.2.2.1 Chemical characteristics. The Federal Specification chemical characteristics are as shown in Table II.

TABLE II. Chemical and physical characteristics of amyl acetate.

Characteristic	Requirements	
	Minimum	Maximum
Color (platinum-cobalt scale)	---	Number 15
Water content (% by weight)	---	0.2
Specific gravity at 20°/20°C	0.871	0.879
Nonvolatile matter (g/100 mL)	---	0.005
Acidity (mg of KOH/g)	---	0.28
Distillation at 760 mm pressure Hg:		
Initial boiling point (°C)	124	---
Distillate below 130°C (% by volume)	---	10
Distillate below 140°C (% by volume)	---	75
Dry point (°C)	---	155
Ester content (% by weight)	95	---

5.2.3 Use. Amyl acetate, technical is intended for military use as a solvent; for testing gas filter units; and for use in organic coatings. Typical commercial applications include use as a solvent for organic nitrocellulose compounds; as an ingredient in paints and lacquers; in the making of drycleaning compounds; bronzing liquids, linoleum, oil cloth, and soap solvent. It is also extensively used in photo engraving.

5.2.4 Safety. Amyl acetate is a flammable liquid with a flash point of 25°C (87°F) or less. Although used as an odorant, amyl acetate is an irritant to the skin, eyes and respiratory tract and can be toxic as an inhalant. In case

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of contact with the skin, flush affected areas with water. In case of contact with the eyes, flush with water for at least 20 minutes and obtain medical attention. In case of inhalation, obtain medical attention immediately. There is no TLV* or PEL referenced for amyl acetate. (Refer to 4.3.1)

5.2.5 Storage. Amyl acetate shall be stored in approved containers at a temperature of 9° to 22°C (48° to 72°F). Keep away from heat sources and combustible materials.

5.2.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices (Refer to 4.4).

An EPA Hazardous Waste Classification is not listed in 40 CFR.

5.3 Name. n-BUTYL ACETATE, TECHNICAL $\text{CH}_3\text{COO}(\text{CH}_2)_3\text{CH}_3$ FW 116.16
Acetate Acid, Butyl Ester
Butyl Ethanoate
(HAZARDOUS)

5.3.1 Specifications. ASTM D 4615, N-Butyl Acetate (All Grades).

5.3.2 Technical description. n-Butyl acetate is a colorless liquid with a characteristic fruity odor. It is a medium-evaporating solvent, only slightly soluble in water, but miscible with alcohol, ether and hydrocarbons.

5.3.3 Use. n-Butyl acetate is intended for military use as an ingredient in protective coatings and a solvent for nitrocellulose. Typical commercial applications include use in the manufacture of airplane dopes, artificial leather, celluloid products, cement, coated paper, plastic, wood, linoleum, fingernail enamel and printing compounds. It is also used as a solvent for other natural and synthetic resins and for chemical and pharmaceutical processing.

5.3.4 Safety. n-Butyl acetate is a flammable liquid with a flash point of 38°C (100°F). n-Butyl acetate is an irritant to the skin, eyes, and respiratory tract and can be toxic as an inhalant. In case of contact with the skin, flush affected areas with water. In case of contact with the eyes, flush with water for at least 20 minutes and obtain medical attention. In case of inhalation, obtain medical attention immediately. There are no TLV* or PEL referenced for n-butyl acetate. (Refer to 4.3.1)

5.3.5 Storage. n-Butyl acetate shall be stored in approved containers at a temperature of not more than 29°C (84°F). Keep away from heat sources and combustible materials.

5.3.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4)

An EPA Hazardous Waste Classification is not listed in 40 CFR.

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TABLE III. Chemical and physical requirements of n-butyl acetate, all grades.

Property	Grades			
	90-92	98	99.5	99.5U*
Purity, wt %, min	90-92	98.0	99.5	*99.5
Alcohol, wt %, max	---	---	0.5	0.5
Color, Pt/Co units, max	10	10	10	10
Distillation range, °C	118-128	120-128	124-129	124-129
Nonvolatile matter, mg/100 ml, max	5	5	5	5
Odor	Non-residual	Non-residual	Non-residual	Non-residual
Water, wt %, max	0.2	0.1	0.1	0.05*
Acidity, wt %, max	0.01	0.01	0.01	0.01
Apparent specific gravity: 20/20°C	0.874-0.876	0.880-0.883	0.880-0.883	0.880-0.883
20/25°C	0.870-0.872	0.876-0.879	0.876-0.879	0.876-0.879

*Urethane grade material.

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5.4 Name. DIBUTYL PHTHALATE 1,2-(C₄H₉OOO)₂C₆H₄ FW 278.34
 Phthalic Acid Dibutyl Ester
 1,2-Benzenedicarboxylic Acid Dibutyl Ester (IUPAC)
 DBP

5.4.1 Technical description. This material is a 99 percent by weight technical grade dibutyl phthalate ester, which is an oily liquid having a boiling point of 340°C (644°F), soluble in 2500 parts of water, very soluble in ethanol, ether, acetone and benzene.

5.4.2 Specifications. Military, MIL-D-218, Dibutyl Phthalate, Technical, ASTM D-608, Dibutyl Phthalate.

5.4.2.1 Commercial Requirements. The commercial requirements are meeting ASTM D-608, having a purity of 99 percent by weight, and as shown in Table IV.

TABLE IV. Properties of Dibutyl Phthalate (99% Grade).

Properties	Requirement	
	Minimum	Maximum
Specific gravity (apparent) (20/25°C)	1.046	1.050
(25/25°C)	1.043	1.049
Color (Pt/Co scale)	---	20
Odor	---	Non-residual
Water	---	0.2
Acidity (free acid as phthalic acid), % by wt	---	0.01
Ester value, % by wt	99	---

5.4.2.2 Military Requirements. Dibutyl phthalate is a colorless, nonvolatile nontoxic, stable, oily liquid. It is only slightly soluble in water, but is miscible with the common organic solvents. In addition to the requirements listed in Table V, this material is clear and free from sediment and suspended matter, and is miscible without turbidity with 19 volumes of 10° Heptane at 20°C.

TABLE V. Chemical and physical requirements of dibutyl phthalate, technical.

Property	Requirement	
	Minimum	Maximum
Acidity (as phthalic acid), % by wt	---	0.03
Ash, % by wt	---	0.02
Color (Pt/Co scale)	---	20
Ester content, % by wt	99	---
Refractive index (20°C)	1.490	1.492
Specific gravity (20/20°C)	1.044	1.054

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5.4.3 Use. Dibutyl phthalate, technical is intended for military use as an adhesive and plasticizer for resins, and in the manufacture of smokeless powder and as an insect repellent for impregnating clothing. Typical commercial applications include use as a plasticizer in protective coatings; as a nitrocellulose solvent; as a solvent for textile lubricating agents; and in the making of safety glass, leather, airplane dope, and insecticides.

5.4.4 Safety. Dibutyl phthalate is a flammable liquid with a flash point of 152°C (305°F). Dibutyl phthalate is an irritant to the skin, eyes and respiratory tract and can be toxic as an inhalant. In case of contact with the skin, flush affected areas with water. In case of contact with the eyes, flush with water for at least 20 minutes and obtain medical attention. In case of inhalation, obtain medical attention immediately. There are no TLV* or PEL referenced for dibutyl phthalate. (Refer to 4.3.1)

5.4.5 Storage. Dibutyl phthalate shall be stored in approved containers at a temperature of not more than 40°C (104°F). Keep away from heat sources and combustible materials.

5.4.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4)

An EPA Hazardous Waste Classification is listed in 40 CFR as U069.

5.5 Name. n-BUTYL STEARATE, TECHNICAL $C_{17}H_{35}COOC_4H_9$ FW 340.59
Butyl Octadecanoate
Octadecanoic Butyl Ester (IUPAC)

5.5.1 Specifications. Military, MIL-B-21465, Butyl Stearate - Normal, Technical.

5.5.2 Technical description. n-Butyl stearate is normally a colorless, stable, oily liquid with a faint, fatty odor. The material is insoluble in water, but soluble in alcohol and ether and miscible with mineral and vegetable oils. Among the requirements of this material for military use are those listed in Table VI below.

TABLE VI. Chemical and physical requirements of n-butyl stearate, technical.

Property	Requirement	
	Minimum	Maximum
Acidity, as stearic acid, %	---	0.5
Flash point (open cup), °F	370	---
Iodine number	---	6.0
Saponification number	165	176
Specific gravity (20/20°C)	0.850	0.860

In addition, the material shall be free of suspended matter and shall exhibit no turbidity when one volume is mixed with 19 volumes of 66° gasoline.

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TABLE VII. Physical constants of n-butyl stearate.

Property	Constant
Boiling point (°C, 25 mm pressure)	220-225
Melting point, °C	19.5
Refractive index (20°C)	1.4430
Vapor density (air = 1.00)	11.4

5.5.3 Use. n-Butyl stearate is intended for military use as a lubricant and propellant powder. Typical commercial applications include use: as constituent in polishes, special lubricants and coatings; in lubricants for metals, textiles and moldings; in wash polishes as the dye solvent; in plasticizer for laminated fiber products, rubber hydrochloride, chlorinated rubber, and cable lacquers; in carbon paper; as an emollient in cosmetic and pharmaceutical products; and as damp-proofer for concrete.

5.5.4 Safety. n-Butyl stearate has an open-cup flash point of 196°C (385°F) and a closed-cup flash point of 160°C (320°F). This compound is an irritant to the skin, eyes and respiratory tract and can be toxic as an inhalant. In case of contact with the skin, flush area with water. In case of contact with the eyes, flush with water for at least 20 minutes and obtain medical attention. In case of inhalation, obtain medical attention immediately. There are no TLV^o or PEL referenced for n-Butyl stearate. (Refer to 4.3.1)

5.5.5 Storage. n-Butyl stearate shall be stored in approved containers (cans containing 7 or 35-pounds or drums containing 380-pounds of material). The storage area shall be well ventilated, and there shall be no open flames or areas of definite fire hazard nor nearby powerful oxidizing agents.

5.5.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4)

An EPA Hazardous Waste Classification is not listed in 40 CFR.

5.6 Name. CALCIUM OXALATE, TECHNICAL $\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}$ FW 146.12
(HAZARDOUS)

5.6.1 Specifications. Military, JAN-C-628, Calcium Oxalate (For Use in Ammunition).

5.6.2 Technical description. Calcium oxalate is a white, crystalline powder. It is soluble in dilute hydrochloric acid, dilute nitric acid, but insoluble in acetic acid and water. Among the requirements of this material for military use are those listed in Table VIII below.

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TABLE VIII. Chemical and physical requirements of calcium oxalate, technical.

Property	Requirement ^{1/}	
	Minimum	Maximum
	<u>% by Wt</u>	<u>% by Wt</u>
Barium salts	---	0.5
Calcium	26.6	---
Material insoluble in dilute HCl	---	0.5
Material soluble in water	---	0.4
Moisture	---	0.5
Oxalate	58.4	---

^{1/} This material shall be grit-free and a minimum of 99.0 percent shall pass through a No. 100 US Standard sieve.

5.6.3 Use. Calcium oxalate, technical is intended for military use in pyrotechnic compositions. Typical commercial applications include use in making oxalic acid and organic oxalates.

5.6.4 Safety. Calcium oxalate is a toxic material and skin and eye contact should be avoided. It is also a lung irritant. Avoid ingestion. In case of contact with skin, flush the area with water. In case of contact with the eyes, flush with water for at least 20 minutes and obtain medical attention. In case of inhalation, obtain medical attention immediately. There are no TLV* or PEL referenced for calcium oxalate. (Refer to 4.3.1)

5.6.5 Storage. Calcium oxalate shall be stored in approved containers (16-gallon drums containing 100 pounds of material). The storage area should be ventilated, cool and dry.

5.6.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4)

An EPA Hazardous Waste Classification is not listed in 40 CFR.

5.7 Name. CALCIUM RESINATE, TECHNICAL $\text{Ca}(\text{C}_4\text{H}_6\text{O}_4)_2$ FW 1350.04
(HAZARDOUS)

5.7.1 Specifications. Military, MIL-C-20470, Calcium Resinate.

5.7.2 Technical description. Calcium resinate is in the form of yellowish-white amorphous powder or yellow or brown lumps depending on the method of derivation. It is fused in lumps and precipitated in the form of powder. The material is insoluble in water but is soluble in acid, amyl acetate, butyl acetate, ether, and amyl alcohol. Calcium resinate shall conform to Table IX.

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TABLE IX. Chemical and physical requirements of calcium resinate, technical.

Property	Requirement			
	Fused		Precipitated	
	Minimum	Maximum	Minimum	Maximum
Calcium resinate content, % by wt	56.0	---	77.0	---
Acid number	---	64	---	33
Chloroform insoluble matter, % by wt	---	2.0	---	3.0
Granulation through 60 U.S. Standard sieve, % by wt	---	---	75	---
Granulation through 4 U.S. Standard sieve, % by wt	90	---	---	---
Water content, % by wt	---	2.0	---	5.0

5.7.3 Use. Calcium resinate is intended for military use in the manufacture of pyrotechnics. Typical commercial applications of this material include use in waterproofing; manufacturing paint dryers, porcelains, perfumes, cosmetics, and enamels; for fabrics, wood, and paper; as an amber substitute; and in tanning leather.

5.7.4 Safety. Calcium resinate is a flammable material. It is nontoxic. Calcium resinate may cause some irritation to the eyes and skin. Generally, calcium compounds should be considered toxic only when they contain a toxic component such as arsenic or a calcium oxide or hydroxide. Reasonable care and cleanliness should be exercised in the handling of calcium resinate. Calcium resinate a nuisance particulate with a TLV* of 10 mg/m³ of total dust. Calcium resinate shall be used with adequate ventilation. (Refer to 4.3.1)

5.7.5 Storage. Calcium resinate shall be stored in the original container (fused calcium resinate in a 16-gallon steel drums with 100-pound content and precipitated calcium resinate in 55-gallon steel drums.) Calcium resinate is a flammable material and shall be stored in a cool place away from areas of acute fire hazard and open flame. The containers shall be stored upside down to prevent waste intrusion into the container. The maximum storage time is two years from the date of manufacture.

5.7.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4)

An EPA Hazardous Waste Classification is not listed in 40 CFR.

5.8 Name. CALCIUM STEARATE, TECHNICAL $\text{Ca}(\text{C}_{18}\text{H}_{35}\text{O}_2)_2$ FW 607.04

5.8.1 Specifications. Military, JAN-C-263, Calcium Stearate.

5.8.2 Technical description. Calcium stearate is a fatty acid derivative in white, granular, powder form. It is insoluble in water, but slightly soluble in hot alcohol, and decomposed by many acids and alkalies. For military use, in

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addition to the requirements listed in Table X, the material shall be grit-free with a minimum of 98 percent passing through a No. 100 US Standard sieve and 95 percent passing through a No. 200 US Standard sieve. The melting point shall be not less than 150°C (362°F).

TABLE X. Chemical and physical requirements of calcium stearate, technical.

Property	Requirement	
	Minimum	Maximum
	<u>% by Wt</u>	<u>% by Wt</u>
Acidity or alkalinity	---	0.01
Calcium content	9.0	9.4
Moisture	---	3.0
Water-soluble salts	---	0.25

5.8.3 Use. Calcium stearate is intended for military use as a binder and lubricant in the pelleting of explosives. Typical commercial applications include use in waterproofing fabrics, cement, stucco; as a releasing agent for plastic molding powders; lubricant for pills and tablets; in pencils and wax crayons; anticaking agent in food.

5.8.4 Safety. Calcium stearate is a flammable material. It is nontoxic. Calcium stearate may cause some irritation to the eyes and skin. Generally, calcium compounds shall be considered toxic only when they contain a toxic component such as arsenic or a calcium oxide or hydroxide. Reasonable care and cleanliness should be exercised in the handling of calcium stearate. Calcium stearate is a nuisance particulate with a TLV* of 10 mg/m³ of total dust. Calcium stearate shall be used with adequate ventilation. (Refer to 4.3.1)

5.8.5 Storage. Calcium stearate shall be stored in the original container (calcium stearate in 55-gallon steel drums). Calcium stearate is a flammable material and shall be stored in a cool place away from areas of acute fire hazard and open flame.

5.8.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4)

An EPA Hazardous Waste Classification is not listed in 40 CFR.

5.9 Name. COPPER NAPHTHENATE, TECHNICAL (C₆H₁₁COO)₂Cu FW 317.87

5.9.1 Specifications. None.

5.9.2 Technical description. Copper naphthenate, technical is a green-blue liquid, soluble in gasoline and mineral oil distillates. In addition to the requirements listed in Table XI, it shall be manufactured from naphthenic acid occurring in petroleum which shall have an acid number not less than 180 and shall contain not more than 25 percent unsaponifiable matter.

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TABLE XI. Chemical and physical requirements of copper naphthenate, technical.

Property	Requirement
Copper content as metal, % by wt	8 ± 0.1
Flash point, closed cup, °C (°F), min	121°C (250°F)
Volatile matter, % by wt, max	5

5.9.3 Use. Copper naphthenate, technical is intended for military use in the mildew-resistant treatment of fiber rope. Typical commercial applications include use as a powerful germicide, insecticide, and fungicide; also as a preservative for wood, canvas and rope.

5.9.4 Safety. Copper naphthenate is irritating to the eyes, skin and mucous membranes. Inhalation of mists shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Copper naphthenate shall be used with adequate ventilation. The TLV* for copper mists as Cu is 1 mg/m³. The PEL is the same. (Refer to 4.3.1)

5.9.5 Storage. Copper naphthenate shall be stored in a cool, dry place in tightly closed containers. (Refer to 4.3.2)

5.9.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4)

An EPA Hazardous Waste Classification is not listed in 40 CFR.

5.10 Name. DIETHYLENE GLYCOL MONOETHYL ETHER ACETATE, TECHNICAL
 $\text{CH}_3\text{COOCH}_2\text{CH}_2\text{OCH}_2\text{CH}_2\text{OC}_2\text{H}_5$ FW 176.21
 2-(2-Ethoxyethoxy) ethyl acetate
 (HAZARDOUS)

5.10.1 Specifications. None.

5.10.2 Technical description. Diethylene glycol monoethyl ether acetate is a hygroscopic, colorless liquid, soluble in all proportions in water, alcohol, acetone, and ordinary organic solvents. This material conforms to the requirements of Table XII.

TABLE XII. Physical constants of diethylene glycol monoethyl ether acetate, technical.

Property	Constant
Boiling point (760 mm pressure), °C	217.4
Flash point, open cup, °F	230
Melting point, °C	-25
Specific gravity, 20/20°C	1.0114
Vapor density (air = 1.00)	6.07

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5.10.3 Use. Diethylene glycol monoethyl ether acetate is intended for military use as a solvent. Typical commercial applications include use as a solvent for organic compounds such as dyes, nitrocellulose, and cellulose acetate. It is also used in printing; as an adhesive for sealing coated cellophane; in cosmetics; in paint and varnish removers; and in wetting agents.

5.10.4 Safety. Diethyl glycol monoethyl ether acetate is a combustible liquid. Avoid heat, sparks, flame and other ignition sources. Extinguish fires with mechanical foam, dry chemical, water, or carbon dioxide fog. Water stream will spread burning liquid. Cool exposed containers. Use fresh air respirators to fight fire. Carbon monoxide will evolve if burned with insufficient air.

Diethylene glycol monoethyl acetate is irritating to eyes and mucous membranes. Inhalation can cause headache, confusion, impaired coordination, drowsiness, nausea, fatigue, respiratory irritation and damage to the central nervous system. Ingestion can cause gastral/intestinal damage as well as symptoms above. (Refer to 4.3.1)

5.10.5 Storage. Diethylene glycol monoethyl acetate shall be stored in a cool, well ventilated area. Containers shall be kept upright and tightly closed. Do not store near heat, sparks, flame, other ignition sources, strong oxidants, like liquid chloride, strong acids, bases or selected amines. (Refer to 4.3.2)

5.10.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4) Manufacturer recommends incineration using a qualified disposal company at an approved site and IAW Federal, state and local codes. Do not incinerate closed containers.

Diethyl glycol monoethyl acetate has an EPA Hazardous Waste Classification - Ignitable; Waste Number D001.

5.11 Name. DIETHYL PHTHALATE, TECHNICAL $C_6H_4(COOC_2H_5)_2$ FW 222.24
Ethyl phthalate
DEP
(HAZARDOUS)

5.11.1 Specifications. Military, JAN-D-242, Diethylphthalate (For Use in Explosives).

5.11.2 Technical description. Diethyl Phthalate is a water-white, stable, odorless liquid, with a bitter taste. It is miscible with alcohols, ketones, esters, or aromatic hydrocarbons. It is partly miscible with aliphatic solvents, and insoluble in water.

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TABLE XIII. Chemical and physical requirements of diethyl phthalate, technical.

Property	Requirement ^{1/}	
	Minimum	Maximum
Acidity as phthalic acid, % by wt	---	0.03
Ash, % by wt	---	0.01
Ester content as diethyl phthalate, % by wt	---	99.0
Specific gravity (15/15°C)	1.11	1.13

^{1/} The color of 25 ml of this material shall be no darker than that of 0.5 ml of a 0.1N iodine solution in 100 ml of distilled water.

5.11.3 Use. Diethyl phthalate is intended for military use in the manufacture of propellant powder. Typical commercial applications include use as a solvent for nitrocellulose, cellulose acetate; plasticizer; wetting agents; insecticidal sprays; camphor substitutes; plastics; perfumery, as fixative and solvent; alcohol denaturant; mosquito repellants, and as a plasticizer in solid rocket propellants.

5.11.4 Safety. Diethyl phthalate is a flammable liquid and is an irritant to the skin, eyes and respiratory tract and can be toxic as an inhalant. In case of contact with the skin, flush affected areas with water. In case of contact with the eyes, flush with water for at least 20 minutes and obtain medical attention. In case of inhalation, obtain medical attention immediately. There are no TLV* or PEL referenced for diethyl phthalate. (Refer to 4.3.1)

5.11.5 Storage. Diethyl phthalate shall be stored in approved containers. Keep away from heat sources and combustible materials.

5.11.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4)

An EPA Hazardous Waste Classification is listed in 40 CFR as U088.

5.12 Name. b-,b'-DIHYDROXYLDIETHYL SULFIDE, TECHNICAL FW 122.19
 $S(CH_2CH_2OH)_2$
 Thiodiglycol
 Thiodiethylene Glycol
 2,2'-Thiodiethanol
 Bis(hydroxyethyl) sulfide
 (HAZARDOUS)

5.12.1 Specifications. Military, MIL-D-14130, b-,b'-Dihydroxyldiethyl Sulfide (Thiodiglycol), Technical.

5.12.2 Technical description. b-,b'-Dihydroxyldiethyl sulfide is a syrupy, colorless liquid. It is soluble in water, acetone, alcohol, and chloroform; and is slightly soluble in benzene, carbon tetrachloride, and ether. It has a

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melting point of -16.0°C (-3°F) and a boiling point of 168.0°C (368°F) and shall conform to Table XIV.

TABLE XIV. Chemical and physical requirements of b-,b'-dihydroxydiethyl sulfide, technical.

Property	Requirement ^{1/}	
	Minimum	Maximum
Acidity (mg KOH/gm sample)	---	1.0
Alkalinity (mg H ₂ SO ₄ /gm sample)	---	1.0
Ash, % by wt	---	0.02
b-,b'-dihydroxydiethyl sulfide, % by wt	96.0	---
Mercaptans as mercaptoethanol, % by wt	---	0.50
Specific gravity (20/20°C)	1.181	1.186
Water, % by wt	---	1.0

^{1/} This material shall be substantially free of suspended matter and shall be no darker than a light greenish yellow by visual observation with transmitted light.

5.12.3 Use. b-,b'-Dihydroxydiethyl sulfide is intended for military use in the manufacture of chemicals. Typical commercial applications include use in organic synthesis; as a solvent for use in textile printing; and as an antioxidant.

5.12.4 Safety. b-,b'-Dihydroxydiethyl sulfide, when heated to decomposition, emits highly toxic fumes. It reacts strongly with hydrochloric acid and may react with oxidizing materials. b-,b'-dihydroxydiethyl sulfide is a flammable liquid and is an irritant to the skin, eyes and respiratory tract and can be toxic as an inhalant. In case of contact with the skin, flush affected areas with water. In case of contact with the eyes, flush with water for at least 20 minutes and obtain medical attention. In case of inhalation, obtain medical attention immediately. There are no TLV^o or PEL referenced for b-,b'-dihydroxydiethyl sulfide.

5.12.5 Storage. b-,b'-Dihydroxydiethyl sulfide shall be stored in approved containers (100-grams in amber bottles, 5- and 55-gallons in steel drums). Keep away from heat sources.

5.12.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4)

An EPA Hazardous Waste Classification is not listed in 40 CFR.

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5.13 Name. DIMETHYL PHTHALATE, TECHNICAL $C_6H_4(COOCH_3)_2$ FW 194.19
 Dimethyl 1,2-benzenedicarboxylate
 DMP
 Methyl phthalate
 Phthalic acid dimethyl ester
 (HAZARDOUS)

5.13.1 Specifications. JAN-D-709, Dimethylphthalate (For Use in Explosives)

5.13.2 Technical description. Dimethyl phthalate is an odorless, light-fast, stable, nontoxic liquid. It is miscible with alcohol, ether or chloroform, and practically insoluble in water (0.43 gm/100 ml). Dimethyl phthalate conforms to Table XV.

TABLE XV. Chemical and physical requirements of dimethyl phthalate, technical.

Property	Requirement ^{1/}
Acidity, as phthalic acid, % by wt, max	0.03
Ash, % by wt, max	0.01
Ester content, as dimethyl phthalate, % by wt, min	99.0
Specific gravity (15.5/15.5°C)	1.196 ± 0.010

^{1/} For military use, the color of 25 ml of this material shall be no darker than 0.5 ml of a 0.1N iodine solution added to 100 ml of distilled water.

TABLE XVI. Physical constants of dimethyl phthalate.

Property	Constants
Autoignition point, °C	450
Boiling point (760 mm pressure), °C	282
Flash point (open cup, °F)	325
Melting point, °C	0.0
Refractive index (20°C)	1.5168
Vapor pressure (20°C), mm Hg	0.01
Vapor density (air = 1.00)	6.69

5.13.3 Use. Dimethyl phthalate, technical is intended for military use in the manufacture of propellant powder. Typical commercial applications include use as a plasticizer for nitrocellulose and cellulose acetate, resins, and rubber. It is also used in solid rocket propellants, lacquers, plastics, rubber, coating agents, safety glass, molding powders, insect repellents, and perfumes.

5.13.4 Safety. Dimethyl phthalate is an irritant to the skin, eyes and respiratory tract and can be toxic as an inhalant. In case of contact with the skin, flush affected areas with water. In case of contact with the eyes, flush with water for at least 20 minutes and obtain medical attention. In case of

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inhalation, obtain medical attention immediately. There are no TLV* or PEL referenced for dimethyl phthalate. (Refer to 4.3.1)

5.13.5 Storage. Dimethyl phthalate shall be stored in approved containers at a temperature of not more than 29°C (95°F). Keep away from heat sources and combustible materials.

5.13.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4)

An EPA Hazardous Waste Classification is listed in 40 CFR as U102.

5.14 Name. DIOCTYL PHTHALATE, TECHNICAL FW 390.57
 $C_{26}H_{44}[COOCH_2CH(C_{25})C_4H_9]_2$
 Di (2-ethylhexyl) phthalate
 DOP
 Octyl orthophthalate esters
 (HAZARDOUS)

5.14.1 Specifications. MIL-D-13796, Di-2-Ethylhexylphthalate and ASTM D 1249, Octyl Ortho-phthalate Ester

5.14.2 Technical description. Dioctyl phthalate is a clear, colorless, and odorless liquid. The material is insoluble in water, but miscible with mineral oil.

5.14.2.1 Military requirements. Military requirements are as shown in Table XVII.

TABLE XVII. Chemical and physical requirements of dioctyl phthalate, technical.

Property	Requirement
Acidity, as phthalic acid, % by wt, max	0.01
Color, ppm APHA Standard, max	50
Ester content, % by wt, min	99
Flash point range (°F)	413.6 ± 10.8
Specific gravity (20/20°C)	0.984 - 0.988
Water, % by wt, max	0.04

5.14.2.2 Commercial requirements. Commercial requirements are as shown in Table XVIII.

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TABLE XVIII. Chemical and physical requirements of octyl orthophthalate esters.

Property	Requirement			
	Type I		Type II	
	Minimum	Maximum	Minimum	Maximum
Acidity (as acetic acid), % by wt	---	0.007	---	0.007
Acid number (mg of KOH/gm of sample)	---	0.067	---	0.067
Ester content, % by wt	99.0	---	99.0	---
Specific gravity (20/20°C)	0.963	0.983	0.983	0.993
Color (Pt/Co) (APHA) scale	---	35	---	35
Moisture, %	---	0.1	---	0.1

5.14.3 Use. Dioctyl phthalate is intended for military use as a lubricant for vacuum pumps; in a 1 to 1 mixture with bromochloromethane to control and extinguish fires involving metals such as magnesium and titanium; and in explosives and propellants. Typical commercial applications include use as a plasticizer for many resins and synthetic rubber.

5.14.4 Safety. Dioctyl phthalate is an irritant to the skin, eyes, and respiratory tract and can be toxic as an inhalant. In case of contact with the skin, flush affected areas with water. In case of contact with the eyes, flush with water for at least 20 minutes and obtain medical attention. In case of inhalation, obtain medical attention immediately. There are no TLV* or PEL referenced for dioctyl phthalate. (Refer to 4.3.1)

5.14.5 Storage. Dioctyl phthalate shall be stored in a cool, well ventilated area away from definite fire hazards and oxidizing agents. It has an indefinite shelf life if stored in tightly sealed original containers (bottles containing 100 gm or 1000 gm of material or drums containing 5-gallons and 55-gallons of material or bulk) free of moisture. If bulk storage facilities are used, some arrangement should be made for drying the air which will enter the tank. This material need not be checked until the time of use.

5.14.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4)

An EPA Hazardous Waste Classification is listed in 40 CFR as U107.

5.15 Name. DIPHENYLPHthalate, TECHNICAL $C_6H_4(CO_2C_6H_5)_2$ FW 318.33
1,2-Benzene dicarboxylic acid diphenyl ester
(HAZARDOUS)

5.15.1 Specifications. Military, MIL-D-50006, Diphenylphthalate, Technical.

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5.15.2 Technical description. Diphenylphthalate, technical is a yellow-white powder. It has a melting point of 70°C, a boiling point of 405°C, and a flash point of 435°F with a setting point of 69 to 70°C.

TABLE XIX. Chemical and physical requirements of diphenylphthalate, technical.

Property	Requirement	
	Minimum	Maximum
	<u>% by Wt</u>	<u>% by Wt</u>
Acidity, as phthalic acid	---	0.05
Ash	---	0.20
Ester content	99.0	---
Loss in wt at 105°C	---	0.5

5.15.3 Use. Diphenylphthalate, technical is intended for military use as a deterrent coating in smokeless powder. Typical commercial applications include use in plasticizer; plasticizing compositions for ethylcellulose, nitrocellulose, and various synthetic resins.

5.15.4 Safety. Diphenylphthalate is a flammable liquid and is an irritant to the skin, eyes and respiratory tract and can be toxic as an inhalant. In case of contact with the skin, flush affected areas with water. In case of contact with the eyes, flush with water for at least 20 minutes and obtain medical attention. In case of inhalation, obtain medical attention immediately. There are no TLV* or PEL referenced for diphenyl phthalate. (Refer to 4.3.1)

5.15.5 Storage. Diphenylphthalate shall be stored in original containers (55-gallon drums), in a cool well ventilated area away from definite fire hazards and oxidizing agents. If stored as recommended, the shelf life is indefinite.

5.15.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4)

An EPA Hazardous Waste Classification is not listed in 40 CFR.

5.16 Name. ETHYL ACETATE, TECHNICAL $\text{CH}_3\text{COOC}_2\text{H}_5$ FW 88.11
 Acetic ether
 Acetic ester
 Vinegar naphtha
 (HAZARDOUS)

5.16.1 Specifications. Federal, IT-E-751, Ethyl Acetate, Technical.

5.16.2 Technical description. Ethyl Acetate is a colorless liquid with an apple-like odor. The product is moderately soluble in water and miscible with alcohol and ether.

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TABLE XX. Chemical and physical requirements of ethyl acetate, technical.

Property	Requirements ^{1/}	
	Minimum	Maximum
Acidity (mg KOH per gm sample)	---	0.01
Color (Pt/Co scale)	---	10
Ester content, as ethyl acetate, % by wt	85.0	88.0
Nonvolatile matter, gm per 100 ml	---	0.005
Specific gravity (20/20°C)	0.883	0.888
Water content, % by wt	---	0.20
Distillation range at 760 mm Hg		
Initial boiling point, °C	70	---
Dry point, °C	---	80
Color, Pt/Co (APHA) scale	---	10

^{1/} This material shall be clear and free from sediment and suspended matter and shall leave no residual odor on drying. None of this material shall distill below 71.0°C or above 79.0°C.

TABLE XXI. Physical constants of ethyl acetate.

Property	Value
Autoignition point, °F	907
Boiling point (760 mm pressure), °C	77
Explosive limits, % by volume in air	218-11.5
Flash point (Tag open cup), °F	40
Melting point, °C	-83.6
Refractive index (20°C)	1.3919
Vapor pressure (at 25°C), mm Hg	100
Vapor density (air = 1.00)	3.04

5.16.3 Use. Ethyl acetate is intended for military use as an ingredient in cellulose lacquers, lacquer thinners and the manufacture of explosives. Typical commercial applications include use as an ingredient in cellulose lacquers and thinners; in the production of lacquer, horse hair, artificial leather, inks, photographic film, and plastic wood; in textile sizing, printing compounds and washable wall paper.

5.16.4 Safety. Ethyl acetate is a flammable liquid with a flash point of 40°F and a boiling point of 77°F. It is an irritant to the skin, eyes and respiratory tract and can be toxic as an inhalant. In case of contact with the skin, flush affected areas with water. In case of contact with the eyes, flush with water for at least 20 minutes and obtain medical attention. In case of inhalation, obtain medical attention immediately. There are no TLV^o of PEL referenced for ethyl acetate. (Refer to 4.3.1)

5.16.5 Storage. Ethyl acetate shall be stored in original containers (1-quart, 1-gallon and 5-gallon cans and 55-gallon drums). The material shall be

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kept away from heat and open flames. The storage area shall have adequate ventilation and shall be kept under 120°F. If stored as recommended, the shelf life of this material is indefinite.

5.16.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4)

An EPA Hazardous Waste Classification is listed in 40 CFR as U112.

5.16.7 Special features. Because ethyl acetate readily saponifies with alkali to ethyl alcohol and salt of acetic acid, the addition of a denaturant is required by the Treasury Department to prevent this solvent from being used as an illegal source of ethyl alcohol.

5.17 Name. ETHYLENE GLYCOL MONOETHYL ETHER ACETATE, TECHNICAL
 $\text{CH}_3\text{COOCH}_2\text{CH}_2\text{OC}_2\text{H}_5$ FW 132.16
 Ethoxy acetate
 2-Ethoxyethyl acetate
 Ethyl glycol acetate
 (HAZARDOUS)

5.17.1 Specifications. Military, MIL-E-7125, Ethylene Glycol Monoethyl Ether Acetate, Technical.

5.17.2 Technical description. Ethylene glycol monoethyl ether acetate is a colorless liquid with a mild, pleasant, ester-like odor. It is miscible with aromatic hydrocarbons, and slightly miscible with water and conforms to Table XXII.

TABLE XXII. Chemical and physical requirements of ethylene glycol monoethyl ether acetate, technical.

Property	Requirement ^{1/}	
	Minimum	Maximum
Acidity (as acetic acid)	---	0.02
Ester content, % by wt	99.0	---
Specific gravity (20/20°C)	0.973	0.976
Water content, % by wt	---	0.10
Alcohol, % by wt (as 2-ethoxy ethanol)	---	0.5
Distillation range at 760 mm Hg		
Initial boiling point, °C	150	---
Dry point, °C	---	160
Color, Pt/Co units	---	15

^{1/} This material shall be clear and free from sediment and suspended matter; shall leave no residual odor on drying from filter paper; and shall be miscible without turbidity or sediment with 19 volumes of naphtha.

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5.17.3 Use. Ethylene glycol monoethyl ether acetate is intended for military use as a solvent. Typical commercial applications include use as a solvent for nitrocellulose, oils and resins; retards "blushing" in lacquers; varnish removers; wood stains, textiles, and leather.

5.17.4 Safety. Ethylene glycol monoethyl ether acetate is a flammable liquid with a flash point of 120°F and a boiling point of 1563°F. It is an irritant to the skin, eyes and respiratory tract and can be toxic as an inhalant. In case of contact with the skin, flush affected areas with water. In case of contact with the eyes, flush with water for at least 20 minutes and obtain medical attention. In case of inhalation, obtain medical attention immediately. There are no TLV* or PEL referenced for ethyl glycol monoethyl ether acetate. (Refer to 4.3.1)

5.17.5 Storage. Ethylene glycol monoethyl ether acetate shall be stored in original containers (5-gallon cans and 55-gallon drums). The material shall be kept away from heat and open flames. The storage area shall have adequate ventilation and shall be kept under 120°F. If stored as recommended, the shelf life of this material is indefinite.

5.17.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4)

An EPA Hazardous Waste Classification is not listed in 40 CFR.

5.18 Name. FERRIC AMMONIUM CITRATE, TECHNICAL
Iron Ammonium Citrate
Ammonium Ferric Citrate

5.18.1 Specifications. None.

5.18.2 Technical description. Ferric ammonium citrate, technical, is in the form of green flakes or granules containing about 14 to 16 percent iron. It is very deliquescent and is readily reduced by light to the bivalent ion. It is very soluble in water and insoluble in alcohol.

5.18.3 Use. Ferric ammonium citrate is intended for military use as a sensitizing agent for blueprint paper. Typical commercial applications include use as a sensitizing agent for blueprinting, and as a medicine and animal feed additive.

5.18.4 Safety. Ferric ammonium citrate is nontoxic. Normal laboratory safety precautions are required when handling ferric ammonium citrate. Ferric ammonium citrate is considered a nuisance particulate with a TLV* of 10 mg/m³ of total dust. The material shall be used with adequate ventilation. (Refer to 4.3.1)

5.18.5 Storage. Ferric ammonium citrate shall be stored in a cool, dry place in tightly closed containers away from acids. (Refer to 4.3.2) This material is deliquescent and is reduced to the ferrous salt. Store in original containers (1-pound bottles and 50-pound drums) away from light.

5.18.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4)

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An EPA Hazardous Waste Classification is not listed in 40 CFR.

5.19 Name. FERRIC AMMONIUM OXALATE, TRIHYDRATE, TECHNICAL FW 428.07
 $(\text{NH}_4)_3 \text{Fe} (\text{C}_2\text{O}_4)_3 \cdot 3\text{H}_2\text{O}$
 Ammonioferric oxalate
 Iron ammonium oxalate

5.19.1 Specifications. None.

5.19.2 Technical description. Ferric ammonium oxalate conforms to Table XXIII and is in the form of green crystals. These crystals are soluble in water and are sensitive to light.

TABLE XXIII. Chemical and physical requirements of ferric ammonium oxalate trihydrate, technical.

Property	Requirement ^{1/}	
	Minimum	Maximum
	<u>% by Wt</u>	<u>% by Wt</u>
Chlorides	---	0.02
Ferric ammonium oxalate	99.0	---
Ferrous iron	---	0.05
Water insolubles	---	0.2

^{1/} None of this material shall be retained on a US Standard No. 10 sieve and no less than 90 percent shall be retained on a No. 60 sieve.

5.19.3 Use. Ferric ammonium oxalate, trihydrate, technical is intended for military use in the sensitization of blueprint paper. Typical commercial applications include use in blueprints and blueprint photography.

5.19.4 Safety. Ferric ammonium oxalate is not considered a hazardous material. It is nonflammable and nontoxic. Normal safety precautions shall be exercised in the handling of this material. The generation of dust shall be avoided. The material is considered a nuisance particulate with a TLV^o of 10 mg/m³ of total dust. Ferric ammonium oxalate shall be used with adequate ventilation. (Refer to 4.3.1)

5.19.5 Storage. Ferric ammonium oxalate shall be stored in original containers (1-pound bottles and 5-pound drums) in a cool, dry place in tightly closed containers. The containers shall be kept away from direct sunlight. (Refer to 4.3.2)

5.19.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4)

An EPA Hazardous Waste Classification is not listed in 40 CFR.

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5.20 Name. FERRIC OXALATE, TECHNICAL $\text{Fe}_2(\text{C}_2\text{O}_4)_3$ FW 375.75
 Iron Oxalate
 (HAZARDOUS)

5.20.1 Specifications. None.

5.20.2 Technical description. Ferric oxalate is in the form of odorless, pale, yellow, amorphous powder or scales. It is soluble in water and acids, and insoluble in alcohol or alkali. This material decomposes when heated to 160°C. The specific gravity is 2.28. It is sparingly soluble in hot and cold water (0.026 and 0.022 gm/100 ml H_2O , respectively).

5.20.3 Use. Ferric oxalate, technical is intended for military use in photography. Typical commercial applications include use as a catalyst in making oxygen and in the production of silvertone photographic paper.

5.20.4 Safety. Ferric oxalate is a corrosive acid powder and decomposes rapidly when heated. It is an acid irritant to the skin, eyes and respiratory tract and can be toxic as an inhalant. In case of contact with the skin, flush affected areas with water for at least 20 minutes and obtain medical attention immediately. There are no TLV* or PEL referenced for ferric oxalate. (Refer to 4.3.1)

5.20.5 Storage. Ferric oxalate shall be stored in original containers (5-pound bottles) at temperatures below 120°F in a well ventilated area. If stored as recommended, the material will have an indefinite shelf life.

5.20.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4)

An EPA Hazardous Waste Classification is not listed in 40 CFR.

5.21 Name. FERRIC SODIUM OXALATE, TECHNICAL FW 487.96
 $\text{Na}_3\text{Fe}(\text{C}_2\text{O}_4)_3 \cdot 5\frac{1}{2} \text{H}_2\text{O}$
 Iron Soda Oxalate
 (HAZARDOUS)

5.21.1 Specifications. None.

5.21.2 Technical description. Ferric sodium oxalate, technical appears as emerald-green crystals, which are easily decomposed by heat and light. The material is reduced to ferrous form by light. It is soluble in water; and it loses 4 waters of hydration when heated to its melting point, 100°C, and all waters of hydration at its boiling point, 200°C.

5.21.3 Use. Ferric sodium oxalate, technical is intended for military use in blueprinting. Typical commercial applications include use in photography and blueprinting.

5.21.4 Safety. Ferric sodium oxalate is a corrosive powder and decomposes rapidly when heated. It is an irritant to the skin, eyes and respiratory tract and can be toxic as an inhalant. In case of contact with the skin, flush affected areas with water for at least 20 minutes and obtain medical attention immedi-

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ately. There are no TLV* or PEL referenced for ferric sodium oxalate. (Refer to 4.3.1)

5.21.5 Storage. Ferric sodium oxalate shall be stored in original containers (100-pound drums) at temperatures below 120°F in a well ventilated area. If stored as recommended, the material will have an indefinite shelf life.

5.21.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4)

An EPA Hazardous Waste Classification is not listed in 40 CFR.

5.22 HYDROGENATED METHYL ABIETATE, TECHNICAL FW 318.48
 $C_{19}H_{31}COOCH_3$
 (HAZARDOUS)

5.22.1 Specifications. None.

5.22.2 Technical description. Hydrogenated methyl abietate is derived from alcoholic esters of abietic acid, whereby the more reactive double bond is saturated with hydrogen, rendering it more resistant to oxidation and discoloration. The product is normally a colorless to yellow liquid, insoluble in water, but miscible with the usual organic solvents and with aliphatic hydrocarbons. It has a boiling point range of 360-365°C with decomposition to the top of the range. The flash point range is between 180 and 218°C and conforms to Table XXIV.

TABLE XXIV. Typical properties of a hydrogenated methyl abietate.

Property	Value	
	Minimum	Maximum
Acid number (mg KOH per gm sample)	---	8
Color (Gardner standard)	---	18
Refractive index (20°C)	1.515	1.520
Specific gravity (25/25°C)	1.018	1.028
Viscosity (Gardner - Holdt, 25°C)	Z ₁	Z ₂

5.22.3 Use. Hydrogenated methyl abietate, technical is intended for military use as a plasticizer in organic coatings. Typical commercial applications include use as a solvent for ester gums, many resins, ethyl cellulose, and rubber; in the manufacture of varnish resins; and as an ingredient in adhesives.

5.22.4 Safety. Methyl abietate is a flammable liquid with a flash point of 180 to 218°C and a boiling point range of 360-365°C. It is an irritant to the skin, eyes and respiratory tract and can be toxic as an inhalant. In case of contact with the skin, flush affected areas with water. In case of contact with the eyes, flush with water for at least 20 minutes and obtain medical attention. In case of inhalation, obtain medical attention immediately. There are no TLV* or PEL referenced for methyl abietate. (Refer to 4.3.1)

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5.22.5 Storage. Methyl abietate shall be stored in original containers (5-gallon and 55-gallon drums). The material shall be kept away from heat and open flames. The storage area shall have adequate ventilation and shall be kept under 120°F. If stored as recommended, the shelf life of this material is indefinite.

5.22.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4)

An EPA Hazardous Waste Classification is not listed in 40 CFR.

5.23 Name. LEAD ACETATE, TRIHYDRATE, TECHNICAL FW 379.33
 $Pb(C_2H_3O_2)_2 \cdot 3H_2O$
 Sugar of Lead
 Salt of Saturn
 (HAZARDOUS)

5.23.1 Specifications. None.

5.23.2 Technical description. Lead acetate, trihydrate, technical appears as colorless crystals, white granules or powder. The material has a density of 2.55, melts at 75°C when rapidly heated; at a little above 100°C it begins to lose acetic acid; and it decomposes completely above 200°C. This material is soluble in water, slightly soluble in alcohol and freely soluble in glycerol. Lead acetate, trihydrate, absorbs CO₂ from the air, becoming an insoluble carbonate.

5.23.3 Use. Lead acetate, trihydrate, is intended for military use in the manufacture of antifouling paint for ships and boats. Typical commercial applications include use in dyeing and printing cottons; weighting silks; manufacture of lead salts and chrome-yellow; also for various analytical procedures, e.g., detection of sulfide, determination of CrO₃; MoO₃; and for medical and veterinary use.

5.23.4 Safety. Lead acetate is a corrosive powder and decomposes rapidly when heated. It is an acid irritant to the skin, eyes and respiratory tract as well as a lead poison and is toxic as an inhalant. In case of contact with the skin, flush affected areas with water for at least 20 minutes and obtain medical attention immediately. There are no TLV* or PEL referenced for lead acetate. (Refer to 4.3.1)

5.23.5 Storage. Lead acetate shall be stored in original containers (50-pound drums) at temperatures below 120°F in a well ventilated area. If stored as recommended, the material will have an indefinite shelf life.

5.23.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4)

An EPA Hazardous Waste Classification is listed in 40 CFR as U144.

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5.24 Name. LECITHIN, TECHNICAL $C_{43}H_{88}NO_9P$ (approx) FW 794.16
 Lecithol
 Ovolecithin
 Phospholutein

5.24.1 Specifications. Military, MIL-L-3061, Lecithin (For Use in Explosives).

5.24.2 Technical description. Lecithin is a mixture of the diglycerides of stearic, palmitic, and oleic acids, linked to the choline ester of phosphoric acid. The substance is found in all living organisms (plants and animals). It is a significant constituent of nervous tissue and brain substance. Lecithin is a yellowish-brown, hygroscopic, amorphous substance, but can be readily crystallized from ether at low temperatures. Although it is white when freshly prepared, it darkens rapidly on exposure to air. It is soluble in alcohol, ether, or chloroform, and swells in water to form a colloidal dispersion. Lecithin is generally obtained from soybeans as a byproduct in the manufacture of soybean oil and conforms to Table XXV.

TABLE XXV. Chemical and physical requirements of lecithin, technical.

Property	Requirement	
	Minimum	Maximum
Acetone insoluble matter, % by wt	68.0	---
Acid number (mg KOH per gm sample)	---	24
Benzene insoluble matter, % by wt	---	0.1
Dropping point, °C	63	69
Iodine number	95	105
Moisture, % by wt	---	1.0
Nitrogen, % by wt	0.90	1.00
Penetration (25°C)	---	180
Specific gravity (25/25°C)	1.035	1.045
Unsaponifiable matter, % by wt	---	3.0
Lecithin, % by wt	19.0	---

5.24.3 Use. Lecithin is intended for military use in explosives. Typical commercial applications include use as an emulsifier in margarine, chocolate, and the food industry in general. It is also used in pharmaceuticals, cosmetics, and the treatment of leather and textiles.

5.24.4 Safety. Lecithin is nontoxic. Normal safety precautions are required when handling this material. (Refer to 4.3.1)

5.24.5 Storage. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4)

An EPA Hazardous Waste Classification is not listed in 40 CFR.

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5.25 Name. LITHIUM STEARATE, TECHNICAL $\text{LiC}_{19}\text{H}_{35}\text{O}_2$ FW 289.9

5.25.1 Specifications. Military, MIL-L-51131, Lithium Stearate.

5.25.2 Technical description. Lithium stearate appears as white crystals, with a specific gravity of 1.025. It is insoluble in water, alcohol or ethyl acetate; forms gels with mineral oils. For military use, in addition to the requirements listed in Table XXVI, the particles size of this material shall be such that a minimum of 99 percent shall pass through a US Standard sieve No. 100.

TABLE XXVI. Chemical and physical requirements of lithium stearate, technical.

Property	Requirement			
	Type I		Type II	
	Min	Max	Min	Max
Moisture, % by wt	---	0.1	---	0.2
Water soluble material, % by wt	---	1.5	---	0.5
pH	8	10	8	10
Lithium content, % by wt	2.2	2.8	2.2	2.8
Stearate content, % by wt	94.6	97.8	94.6	97.8
Melting point, °C	200	---	200	---
Melting point of fatty acid, °C	55	---	55	---
Iodine number of fatty acid	---	5.0	---	5.0
Free alkali (calculated as $\text{LiOH}\cdot\text{H}_2\text{O}$)	---	---	---	None
Free acid (calculated as stearic acid), % by wt	---	---	---	0.5
Chloride, % by wt	---	---	---	0.01

5.25.3 Use. Lithium stearate is intended for military use as a lubricant in fuzes. Typical commercial applications include use in cosmetics; plastics; waxes; greases, lubricant in powder metallurgy; corrosion inhibitor in petroleum; flatting agent in varnishes and lacquers, and in high temperature lubrication.

5.25.4 Safety. Lithium stearate is nontoxic. Normal precautions are required when handling this material. (Refer to 4.3.1)

5.25.5 Storage. Lithium stearate shall be stored in a cool, dry place in original containers (55-gallon drums). When stored under ideal conditions, this material has an indefinite shelf life.

5.25.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4)

An EPA Hazardous Waste Classification is not listed in 40 CFR.

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5.26 Name. MAGNESIUM STEARATE $\text{Mg C}_{36}\text{H}_{70}\text{O}_4$ FW 591.27
Octadecanoic Acid Magnesium Salt

5.26.1 Specifications. Military, MIL-M-542, Magnesium Stearate (For Use in Ammunition).

5.26.2 Technical description. Magnesium stearate appears as white crystals or powder. It is insoluble in water, alcohol or ethyl acetate; forms gels with mineral oil. Magnesium stearate shall conform to Table XXVII.

TABLE XXVII. Chemical and physical requirements of magnesium stearate.

Property	Requirement	
	Minimum	Maximum
Moisture, % by wt	---	6.5
Water soluble salts, % by wt	---	0.2
Magnesium content, % by wt	4.1	4.5
Alkalinity, % by wt	---	0.3
Mineral activity	---	None
Total stearate content (as stearate acid), % by wt	92	97
Iodine number	---	5.5
Melting point, °C	130	---
Particle size		
Passing No. 100, U.S. Standard sieve	100	---
Passing No. 200, U.S. Standard sieve	95	---

5.26.3 Use. Magnesium stearate is used in baby dusting powder, as a tablet lubricant and as an ingredient in rocket propellant.

5.26.4 Safety. Magnesium stearate is nontoxic. Normal precautions are required when handling this material. (Refer to 4.3.1)

5.26.5 Storage. Magnesium stearate shall be stored in a cool, dry place in original containers (50-pound, 5-ply paper sacks). When stored under ideal conditions, this material has an indefinite shelf life.

5.26.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4)

An EPA Hazardous Waste Classification is not listed in 40 CFR.

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5.27 Name. p-METHYLAMINOPHENOL SULFATE, TECHNICAL FW 344.39
 $(\text{HO}C_6H_4\text{NHCH}_3)_2 \cdot \text{H}_2\text{SO}_4$
 Mono-methyl-para-aminophenol sulfate
 p-Hydroxymethylaniline sulfate
 (HAZARDOUS)

5.27.1 Specifications. None.

5.27.2 Technical description. p-Methylaminophenol sulfate appears as colorless, crystalline needles which discolor in air. The crystals melt at 250-260°C with decomposition. The solubility is 5 gm per 100 ml of cold water and 16.7 gm per 100 ml of boiling water. It is slightly soluble in alcohol, and insoluble in ether.

5.27.3 Use. p-Methylaminophenol sulfate is intended for military use as a photographic developer. Typical commercial applications include use as a photographic developer and in dyeing furs.

5.27.4 Safety. p-Methylaminophenol sulfate is toxic and may cause eye and skin irritation. Its fumes are highly toxic when heated to decomposition releasing sulfuric acid and phenolic compounds. In case of contact with the skin, flush affected areas with water. In case of contact with the eyes, flush with water for at least 20 minutes and obtain medical attention. In case of inhalation, obtain medical attention immediately. In case of contact with the skin, flush affected areas with water. In case of contact with the eyes, flush with water for at least 20 minutes and obtain medical attention. In case of inhalation of crystals or fumes, obtain medical attention immediately. There are no TLV* or PEL referenced for p-methylaminophenol sulfate. (Refer to 4.3.1)

5.27.5 Storage. p-Methylaminophenol sulfate shall be stored in original containers (1-pound bottles) away from light. If properly stored, this material has an indefinite shelf life.

5.27.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4)

An EPA Hazardous Waste Classification is not listed in 40 CFR.

5.28 Name. 4,4-METHYLENEBIS (2,6-DI-TERT-BUTYLPHENOL) FW 300
 $\text{C}_{21}\text{H}_{26}\text{O}_2$

5.28.1 Specifications. Military, DOD-M-82730, 4,4-Methylenebis (2,6-di-tert-butylphenol).

5.28.2 Technical description. 4,4-Methylenebis (2,6-Di-Tert-Butylphenol) is a dry crystalline solid and shall meet the requirements in Table XXVIII.

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TABLE XXVIII. Chemical and physical properties of 4,4-Methylenebis (2,6-di-tert-butylphenol).

Property	Requirement	
	Minimum	Maximum
4,4-Methylenebis (2,6-di-tert-butylphenol), % by wt	98	---
Melting point, °C	154.0	155.2
Benzene insolubles, % by wt	---	0.2
Moisture, % by wt	---	0.05

5.28.3 Use. 4,4-Methylenebis (2,6-di-tert-butylphenol) is used in the manufacture of liner material for torpedo warheads and as a component of plastic-bonded explosive formulations.

5.28.4 Safety. 4,4-Methylenebis (2,6-di-tert-butylphenol) is an irritant to the skin, eyes and respiratory tract and can be toxic as an inhalant. In case of contact with the skin, flush affected areas with water. In case of contact with the eyes, flush with water for at least 20 minutes and obtain medical attention. In case of inhalation, obtain medical attention immediately. There are no TLV* or PEL referenced for diphenyl phthalate. (Refer to 4.3.1)

5.28.5 Storage. This material shall be stored in original containers (55-gallon drums), in a cool well ventilated area away from definite fire hazards and oxidizing agents. If stored as recommended, the shelf life is indefinite.

5.28.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4)

An EPA Hazardous Waste Classification is not listed in 40 CFR.

5.29 Name. NICKEL FORMATE, DIHYDRATE, TECHNICAL FW 184.7
 $\text{Ni}(\text{HCOO})_2 \cdot 2\text{H}_2\text{O}$

5.29.1 Specifications. None.

5.29.2 Technical description. Nickel formate, dihydrate, is in the form of green crystals, soluble in water. The product has a specific gravity of 2.154 (20/4°C) and decomposes when heated to a range of 180 to 200°C yielding nickel, carbon monoxide, carbon dioxide, hydrogen, water and methane.

5.29.3 Use. Nickel formate, dihydrate, technical is intended for military use in the production of nickel catalysts which is its typical commercial applications as well.

5.29.4 Safety. Upon heating above 180°C, nickel formate decomposes yielding an explosive mixture of gases. It is an irritant to the skin, eyes and respiratory tract and can be toxic as an inhalant. In case of contact with the skin, flush affected areas with water. In case of contact with the eyes, flush with water for at least 20 minutes and obtain medical attention. In case of

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inhalation, obtain medical attention immediately. There are no TLV* or PEL referenced for nickel formate. (Refer to 4.3.1)

5.29.5 Storage. Nickel formate shall be stored in original containers (1-pound bottles). The material shall be kept away from heat and open flames. The storage area shall have adequate ventilation and shall be kept under 120°F. If stored as recommended, the shelf life of this material is approximately 2 years, after which it should be checked.

5.29.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4)

An EPA Hazardous Waste Classification is not listed in 40 CFR.

5.30 Name. SODIUM ACETATE, ANHYDROUS, TECHNICAL $\text{NaC}_2\text{H}_3\text{O}_2$ FW 82.03

5.30.1 Specifications. None.

5.30.2 Technical description. Sodium acetate, anhydrous, is a white hygroscopic powder. It has a specific gravity of 1.528 (20/4°C). It is very soluble in hot water, soluble in cold water, and slightly soluble in alcohol and conforms to Table XXIX.

TABLE XXIX. Chemical and physical requirements of sodium acetate, anhydrous, technical.

Property	Requirement	
	Minimum	Maximum
	<u>% by Wt</u>	<u>% by Wt</u>
Acidity as acetic acid	---	1.00
Impurities limitation		
Calcium as calcium acetate, $\text{Ca}(\text{C}_2\text{H}_3\text{O}_2)_2$	---	0.20
Chlorides as sodium chloride	---	0.50
Insoluble matter	---	0.10
Moisture	---	0.50
Sulfates as sodium sulfate, Na_2SO_4	---	0.50
Total iron as Fe	---	0.10
Particles size:		
Passing No. 12, U.S. Standard Sieve	99.0	---
Passing No. 200, U.S. Standard Sieve	25.0	---
Sodium acetate, $\text{NaC}_2\text{H}_3\text{O}_2$, content	98.0	---

5.30.3 Use. Sodium acetate, anhydrous, is intended for military use in the manufacture of chemicals. Typical commercial applications include use as an auxiliary in acetylations.

5.30.4 Safety. Sodium acetate is nontoxic. This material is a mild alkaline irritant to the skin, eyes and respiratory tract and can be toxic as an inhalant. In case of contact with the skin, flush affected areas with water for at least 20 minutes and obtain medical attention immediately. There are no TLV* or PEL referenced for sodium acetate. (Refer to 4.3.1)

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5.30.5 Storage. Sodium acetate shall be stored in original containers (25 pounds in steel drums) at temperatures below 120°F in a well ventilated area. If stored as recommended, the material will have an indefinite shelf life. Care should be taken to prevent take up of moisture.

5.30.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4)

An EPA Hazardous Waste Classification is not listed in 40 CFR.

5.31 Name. TITANIUM POTASSIUM OXALATE, DIHYDRATE, TECHNICAL FW 354.17
 $TiO(KC_2O_4)_2 \cdot 2H_2O$
 Potassium titanium oxalate
 Titanyl potassium oxalate
 (HAZARDOUS)

5.31.1 Specifications. None.

5.31.2 Technical description. Titanium potassium oxalate, dihydrate, technical is in the form of colorless, lusterless, nearly odorless crystals or crystalline powder. The product is very soluble in water.

5.31.3 Use. Titanium potassium oxalate, dihydrate, technical, is intended for military use in dyes and photography. Typical commercial applications include use in the formulation of dyes for leather and other tannin materials. It is also used to fix tannin in cotton; as a mordant in textile dyeing; and in sensitizing aluminum for photography.

5.31.4 Safety. Titanium potassium oxalate is a corrosive acid powder and decomposes rapidly when heated. It is an acid irritant to the skin, eyes and respiratory tract and is toxic as an inhalant. CAUSES BURNS TO THE SKIN. In case of contact with the skin, flush affected areas with water for at least 20 minutes and obtain medical attention immediately. There are no TLV* or PEL referenced for titanium potassium oxalate.

5.31.5 Storage. Titanium potassium oxalate shall be stored in original containers (1-pound bottles). If stored as recommended, the material will have a shelf life of two years, after which it should be checked when used.

5.31.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4)

An EPA Hazardous Waste Classification is not listed in 40 CFR.

5.32 Name. TRI-n-BUTYL BORATE, TECHNICAL $B(OC_4H_9)_3$ FW 230.16
 Boric acid, tributyl ester
 Tributoxyborine

5.32.1 Specifications. None.

5.32.2 Technical description. Tri-n-butyl borate is a colorless clear liquid which decomposes in water but is readily miscible with organic liquids such as alcohol, chloroform, carbon tetrachloride, diacetone, and naphtha. This chemical conforms to Table XXX.

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TABLE XXX. Physical constants of tri-n-butyl borate.

Property	Value
Boiling point (760 mm Hg), °C	230 - 231
Flash point (Cleveland open cup), °F	200
Melting point, °C	-70
Refractive index (26°C)	1.4080
Specific gravity (20/4°C)	0.8567
Vapor density (air = 1.00)	7.95

5.32.3 Use. Tri-n-butyl borate, technical is intended for military use as a shielding oil in nuclear reactors for absorption of thermal neutrons. Typical commercial applications include use with crystalline boric acid as an impregnating agent to render textiles fire resistant; to inhibit the formation of wax crystals in oil at low-temperature; as a gas welding flux; as a drying agent for nonaqueous systems; and as an antigelling agent.

5.32.4 Safety. All precautions shall be taken to exclude moisture from contact with tri-n-butyl borate. Since tri-n-butyl borate reacts violently with water, yielding butane and boric acid, the result could be an explosion or fire. In case of contact with skin, flush affected area with ethanol (ethyl alcohol) followed by using water for at least 20 minutes. In case of contact with the eyes, obtain emergency treatment immediately and see a physician.

5.32.5 Storage. Tri-n-butyl borate shall be stored in original containers (55-gallon drums). Since tri-n-butyl borate hydrolyzes with water, the material shall be kept in tightly sealed containers. If stored as recommended, tri-n-butyl borate should remain stable indefinitely.

5.32.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4)

An EPA Hazardous Waste Classification is not listed in 40 CFR.

5.33 Name. TRICRESYL PHOSPHATE, TECHNICAL $(\text{CH}_3\text{C}_6\text{H}_4)_3\text{PO}_4$ FW 368.37
Tolyl phosphate
Tritolyl phosphate
(HAZARDOUS)

5.33.1 Specifications. Federal, TT-T-656, Tricresyl Phosphate.

5.33.2 Technical description. Tricresyl phosphate, technical, is an isomeric mixture of phosphate esters of cresylic acid derived from petroleum or coal tar. It is an oily, stable, nonvolatile, flame resistant liquid practically colorless and odorless; and insoluble in water, but miscible with all common organic solvents and thinners, linseed oil, castor oil, and other oils. Since this material is a mixture of isomers, the chemical and physical characteristics are dependent upon specific requirements occasioned by its eventual use. These requirements are outlined in the tables below and pertain to the concentrated material for general applications.

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5.33.2.1 General application material. The material shall conform to the requirements of Table XXXI for general applications.

TABLE XXXI. Chemical and physical requirements of tricresyl phosphate, technical (for general applications).

Property	Requirement ^{1/}	
	Minimum	Maximum
Acidity (mg KOH per gm sample)	---	0.02
Color (Hazen Pt/Co scale)	---	100
Ester content as tricresyl phosphate, % by wt	99	---
Nonvolatile matter, % by wt	99.80	---
Phosphite content, % by wt	---	0.05
Refractive index	1.550	1.1560
Specific gravity (20/20°C)	1.150	1.180
Phosphite content, % by wt	---	0.05

^{1/} This material shall be clear and free from sediment and suspended matter and shall have substantially no odor. It shall be free from oxidizable substances when tested with potassium permanganate solution and shall be miscible without turbidity with 19 volumes of 10° heptane at 20°C.

5.33.3 Use. Typical commercial applications include use as a plasticizer for polyvinyl chloride, polystyrene and nitrocellulose; as a fire retardant for nitrocellulose and vinyl chloride; in solvent mixtures; in waterproofing and fireproofing compositions; as an additive to extreme pressure lubricants; and as a hydraulic fluid and heat exchange medium.

5.33.4 Safety. Tricresyl phosphate is an irritant to the skin, eyes and respiratory tract and is toxic as an inhalant. When clothing is soiled, remove them and wash skin thoroughly. In case of contact with the skin, flush affected areas with water. In case of contact with the eyes, flush with water for at least 20 minutes and obtain medical attention. In case of inhalation, obtain medical attention immediately. There are no TLV* or PEL referenced for tricresyl phosphate. (Refer to 4.3.1)

5.33.5 Storage. Tricresyl phosphate shall be stored in original containers (1-gallon and 5-gallon). The material shall be kept away from heat and open flames. The storage area shall have adequate ventilation and shall be kept under 120°F. If stored as recommended, the shelf life of this material is indefinite. However, the blended material is subject to selective evaporation. Carrier solvents may evaporate, increasing tricresyl phosphate concentration, the tricresyl phosphate being nonvolatile. A loss of 4 percent by volume by evaporation may cause analysis to indicate a concentration beyond specification limits. For this reason, quality surveillance samples should be withdrawn within 6 months of date of manufacture, and stock levels should be held to a minimum in order to prohibit longer than 18 months storage life, wherever practicable.

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5.33.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4)

An EPA Hazardous Waste Classification is listed in 40 CFR as U311.

5.34 Name. TRIPHENYL PHOSPHATE, TECHNICAL (C₆H₅O)₃PO FW 326.29
(HAZARDOUS)

5.34.1 Specifications. None.

5.34.2 Technical description. Triphenyl phosphate is supplied in the form of white flakes having a faintly aromatic, characteristic odor. It is a nonflammable material and insoluble in water. It is soluble in benzene, chloroform, ether, and acetone, and is moderately soluble in alcohol. It is also soluble in most lacquers, thinners, and oils. In addition to the requirements listed in Table XXXII, it shall be free from oxidizable substances when tested with potassium permanganate solution.

TABLE XXXII. Chemical and physical requirements of triphenyl phosphate, technical.

Property	Requirement	
	Minimum	Maximum
Acidity (mg KOH gm sample)	---	0.10
Ester content as triphenyl phosphate, % by wt	99	---
Free phenols, % by wt	---	0.15
Melting point, °C	48.5	---
Nonvolatile matter, % by wt	99.8	---

5.34.3 Use. Triphenyl phosphate, technical, is intended for military use in the manufacture of organic coatings. Typical commercial applications include use as a plasticizer in lacquers and varnishes; as a noncombustible substitute for camphor in cellulose; to render cellulose esters and airplane dope stable and fireproof; for impregnating roofing paper; and as a lubricant.

5.34.4 Safety. Triphenyl phosphate is an irritant to the skin, eyes, and respiratory tract and can be toxic as an inhalant. In case of contact with the skin, flush affected areas with water. In case of contact with the eyes, flush with water for at least 20 minutes and obtain medical attention. In case of inhalation, obtain medical attention immediately. There are no TLV* or PEL referenced for triphenyl phosphate. (Refer to 4.3.1)

5.34.5 Storage. Triphenyl phosphate shall be stored in original containers (1-kg amber bottles contained within a cushioned fiber container). The material shall be kept away from heat and open flames. The storage area shall have adequate ventilation. If stored as recommended, the shelf life of this material is indefinite.

5.34.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO or Safety and Health Offices. (Refer to 4.4)

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An EPA Hazardous Waste Classification is not listed in 40 CFR.

5.35 Name. ZINC STEARATE, TECHNICAL $Zn(C_{18}H_{35}O_2)_2$ FW 632.33
(HAZARDOUS)

5.35.1 Specifications. None.

5.35.2 Technical description. Zinc stearate is a mixture of the zinc salts of stearic and palmitic acids and usually with some excess of zinc oxide. Theoretically, pure zinc stearate is expressed as the formula shown in 5.35 above. This material is a white, fine, soft, bulky powder with a slight characteristic odor. It repels water; therefore it is insoluble in water, alcohol and ether. It is soluble in benzene and decomposes in dilute acids. It melts at approximately 120°C.

5.35.3 Use. Zinc stearate, technical is intended for military use as an ingredient in paints, varnishes and lacquers. Typical commercial applications include use in tablet manufacture; in cosmetic and pharmaceutical powders and ointments; as a flatting agent in lacquers; as a drying lubricant and dusting agent for rubber; as a plastic-mold releasing agent; and as a waterproofing agent for concrete, rock wool, paper and textiles.

5.35.4 Safety. Zinc stearate is nontoxic. Normal laboratory safety precautions are required in handling aluminum stearate. Aluminum stearate is considered a nuisance particulate with a TLV ϕ of 10 mg/m³ of total dust. Zinc stearate shall be used with adequate ventilation. (Refer to 4.3.1)

5.35.5 Storage. Zinc stearate shall be stored in a cool, dry place in tightly closed containers. (Refer to 4.3.2)

5.35.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4)

An EPA Hazardous Waste Classification is not listed in 40 CFR.

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6. NOTES

6.1 Intended use. This standard is intended to cite nomenclature, formulas, physical and chemical properties, specification requirements, military and typical commercial uses, safety information, storage information, and disposal information for Esters and Metal Organics preferred for application by the Department of Defense.

6.2 Subject term (key word) listing.

1,2-Benzene dicarboxylic acid diphenyl ester
 1,2-Benzenedicarboxylic Acid Dibutyl Ester (IUPAC)
 2-(2-Ethoxyethoxy) ethyl acetate
 2-Ethoxyethyl acetate
 2,2'-Thiodiethanol
 4,4-Methylenebis (2,6-DI-Tert-Butylphenol)
 Acetate Acid, Butyl Ester
 Acetic ester
 Acetic ether
 Aluminum Stearate, Technical
 Aluminum Tristearate
 Ammonioferric oxalate
 Ammonium Ferric Citrate
 Amyl Acetate, Technical
 Amyl Acetic Ester
 Banana Oil
 b,b'-Dihydroxydiethyl Sulfide, Technical
 Bis(hydroxyethyl) sulfide
 Boric acid, tributyl ester
 Butyl Ethanoate
 Butyl Octadecanoate
 Calcium Oxalate, Technical
 Calcium Resinate, Technical
 Calcium Stearate, Technical
 Copper Naphthenate, Technical
 DBP
 DEP
 Di (2-ethylhexyl) phthalate
 Dibutyl Phthalate
 Dibutyl Phthalate, Technical
 Diethyl Phthalate, Technical
 Diethylene Glycol Monoethyl Ether Acetate, Technical
 Dimethyl 1,2-benzenedicarboxylate
 Dimethyl Phthalate, Technical
 Dioctyl Phthalate, Technical
 Diphenylphthalate, Technical
 DMP
 DOP
 Ethoxy acetate
 Ethyl Acetate, Technical
 Ethyl glycol acetate
 Ethyl phthalate
 Ethylene Glycol Monoethyl Ether Acetate, Technical
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 Ferric Ammonium Oxalate, Trihydrate, Technical
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 Iron ammonium oxalate
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 Iron Soda Oxalate
 Isoamyl Acetate
 Lead Acetate, Trihydrate, Technical
 Lecithin, Technical
 Lecithol
 Lithium Stearate, Technical
 Magnesium Stearate
 Methyl phthalate
 Mono-methyl-para-aminophenol sulfate
 n-Butyl Acetate, Technical
 n-Butyl Stearate, Technical
 Nickel Formate, Dihydrate, Technical
 Octadecanoic Acid Magnesium Salt
 Octadecanoic Butyl Ester (IUPAC)
 Octyl orthophthalate esters
 Ovolecithin
 p-Hydroxymethylaniline sulfate
 p-Methylaminophenol Sulfate, Technical
 Pear Oil
 Pentyl Acetate
 Phospholutein
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 Phthalic acid dimethyl ester
 Potassium titanium oxalate
 Safety, hazardous chemicals
 Salt of Saturn
 Sodium Acetate, Anhydrous, Technical
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 Thiodiethylene Glycol
 Thiodiglycol
 Titanium Potassium Oxalate, Dihydrate, Technical
 Titanyl potassium oxalate
 Tolyl phosphate
 Tri-n-Butyl Borate, Technical
 Tributoxyborine
 Tricresyl Phosphate, Technical
 Triphenyl Phosphate, Technical
 Tritolyl phosphate
 Vinegar naphtha
 Zinc Stearate, Technical

6.3 Changes from previous issue. The changes from the previous issue include the addition of butyl phthalate, magnesium stearate and 4,4-methylene bis

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(2,6-di-tert-butylphenol) as well as the addition of safety, storage and disposal guidance for all materials.

6.4 Abbreviations. The use of abbreviations shall be in accordance with MIL-STD-12 where applicable. Metric system abbreviations and symbols shall be in accordance with ASTM E 380.

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CONCLUDING MATERIAL

Assignee Activity:

Defense General Supply Center - GS

Preparing Activity:

Army - EA
Project No. 6810-1222

Custodians:

Army - EA
Navy - YD
Air Force - 68

Review Activities:

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Navy - AS
Air Force - None

User Activities:

Army - CE, CR, ER
Navy - CG, MC, SH
Air Force - None

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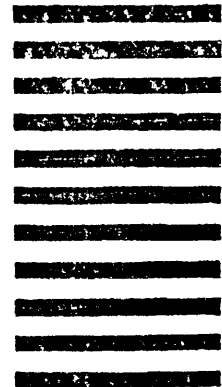
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STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions - Reverse Side)

1. DOCUMENT NUMBER MIL-STD-1214A		2. DOCUMENT TITLE ESTERS AND METAL ORGANICS, TECHNICAL GRADE	
3a. NAME OF SUBMITTING ORGANIZATION		4. TYPE OF ORGANIZATION <i>(Mark one)</i> <input type="checkbox"/> VENDOR <input type="checkbox"/> USER <input type="checkbox"/> MANUFACTURER <input type="checkbox"/> OTHER <i>(Specify):</i> _____	
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a. Paragraph Number and Wording:			
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