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MIL-STD-1448
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MILITARY STANDARD
HYDROCARBON COMPOUNDS AND SOLVENT DISTILLATES,
TECHNICAL GRADE



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DEPARTMENT OF DEFENSE
Washington, DC 20301

Hydrocarbon Compounds and Solvent Distillates, Technical Grade

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1. This Military Standard is approved for use by all Departments and Agencies of the Department of Defense.
2. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, U.S. Army Chemical Research, Development and Engineering Center, Attn: SMCCR-SPD-TS, Aberdeen Proving Ground, MD 21010-5423, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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F O R E W A R D

This military standard is approved for use by all Departments and Agencies of the Department of Defense in the selection of items for application. It is intended to prevent the entry of unnecessary items (sizes, types, varieties) into the Department of Defense logistics system. This document is not intended to restrict any service in selecting new items resulting from state-of-the-art changes.

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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 hydrocarbon compounds and solvent distillates, 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 hydrocarbon compounds and solvent distillates, technical grade for application by the Department of Defense.

1.2 Application. Hydrocarbon compounds and solvent distillates, technical grade are used in soaps, paint finishes and enamels, coatings, as a cleaner for metals and acrylic plastics for degreasing, in making dyestuffs, synthetic resins, tanning agents, celluloid, insecticide, as a binder in ammunition, as an aviation gasoline additive, in chemicals and explosives.

1.3 Classification. The items in this standard are classified on the basis of chemical composition as hydrocarbon compounds and solvent distillates, 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 standard 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 (See 6.2).

SPECIFICATIONS

FEDERAL

A-A-1812	- Naphthalene, Technical
R-N-91	- Naphthalene, Technical
TT-N-95	- Naphtha, Aliphatic
TT-N-97	- Naphtha, Aromatic
TT-T-548	- Toluene, Technical
PPP-C-2020	- Chemicals, Liquid, Dry and Paste, Packaging of

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JAN-T-171	- Toluene
MIL-P-13298	- Polyisobutylene (For Ammunition Use)

STANDARDS

FEDERAL

FED-STD-313	- Material Safety Data, Transportation Data and Disposal Data for Hazardous Materials Furnished to Government Activities
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(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.

CODE OF FEDERAL REGULATIONS (CFR)

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

DEPARTMENT OF DEFENSE (DOD)

DODISS	- Department of Defense Index of Specifications and Standards
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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 (DLAM 1000.2)	- Occupational and Environmental Health Respiratory 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

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

2.2 Other 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 are those listed in the issue of DODISS specified in the solicitation. Unless otherwise specified, the issues of 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 MATERIALS (ASTM)

D 235	Standard Specification for Mineral Spirits (Petroleum Spirits) (Hydrocarbon Dry Cleaning Solvent)
D 362	Standard Specification for Industrial Grade Toluene
E 11	Standard Specification For Wire-Cloth Sieves For Testing Purposes

(Application for copies should be addressed to ASTM, 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.)

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(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 standard and the references cited herein, the text of this standard shall take precedence.

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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 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 of 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 (CHEM-TREC), 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. DETAILED REQUIREMENTS

5.1 Name. Insecticide, Naphthalene

5.1.1 Technical Description. Insecticide, naphthalene is a white to brown volatile solid distilled from coal tar or obtained from natural gas. It is available in three classes: Class A - Balls; Class B - Flakes; Class C - Chips.

5.1.2 Specification. Federal, A-A-1812, Insecticide, Naphthalene.

5.1.2.1 Requirements. The Federal Specification requirements for insecticide, naphthalene are shown in Table I.

TABLE I. Insecticide, naphthalene - federal specification requirements.

Characteristics	Requirements
Solidification point, °C, min	79.8
Evaporation residue, Wt %, max	0.1
Acid wash color, Color standard, max	5
Sulfur, ppm., max	25
Specific Gravity, Solid @ 20°C	1.169

5.1.3 Use. Insecticide, naphthalene, is used as a fumigant against fabric pests.

5.1.4 Safety. Vapors of insecticide, naphthalene are combustible. Vapors are heavier than air and may travel along the ground or be moved by ventilation and be ignited by distant sources. Avoid heat, sparks, flame and other ignition sources. Dust may be an explosion hazard. Extinguish fires with regular foam, water, carbon dioxide fog, or dry chemical. However, water or foam may cause frothing which can be violent especially if sprayed into containers of hot, burning liquid. Use fresh air respirators to fight fires. Toxic materials including carbon monoxide may evolve when burned.

Lower explosive limit is 0.9 percent by volume; upper explosive limit is 5.9 percent by volume. Permissible exposure limit is 10 ppm. Threshold limit value is 10 ppm. Insecticide, naphthalene is irritating to eyes, skin and mucous membranes. Inhalation may cause headache, confusion, nausea, and vomiting. Ingestion can cause gastrointestinal irritation, nausea, vomiting and diarrhea. (Refer to 4.3.1)

5.1.5 Storage. Insecticide, naphthalene shall be stored in a cool, well ventilated area in tightly closed containers. Do not store near heat, sparks, flame, other ignition sources and strong oxidants. (Refer to 4.3.2)

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

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Insecticide, naphthalene has the following EPA Hazardous Waste Classifications:

- (1) Ignitable; Waste Number D001
- (2) Toxic; Waste Number U165

5.2 Name. Mineral Spirits (Petroleum Spirits)(Hydrocarbon Dry Cleaning Solvent)

5.2.1 Technical Description. Various types of hydrocarbon solvents are included under the name "mineral spirits". They are fractionated to match the evaporation rate of gum turpentine. Four types are: regular mineral spirits (Stoddard solvent), high flash point, odorless and low dry point. They are all clear water-white liquids at 60-78°F (15.6-25.6°C).

5.2.2 Specification. ASTM D 235 Standard Specification for Mineral Spirits (Petroleum Spirits)(Hydrocarbon Dry Cleaning Solvent) (No Government specification).

5.2.2.1 Requirements. Mineral spirits are available commercially in four types with the requirements specified in Table II.

TABLE II. Mineral spirits - ASTM specification requirements.¹

Characteristics	Requirements			
	Type I	Type II	Type III	Type IV
Flash point, min, °F (°C)	100(38)	140(60)	100(38)	100(38)
Kauri-Butanol value				
min	29	29	---	29
max	45	45	29	45
Bromine Number, max	5	5	5	5
Distillation, °F (°C)				
Initial boiling point, min	300(149)	350(177)	300(149)	300(149)
50% recovered, max	360(182)	385(196)	385(196)	345(174)
Dry point, max	415(213)	415(213)	415(213)	366(185)
Residue from distillation, % max	1.5	1.5	1.5	1.5
Copper corrosion, max rating, A	2	2	2	2
Apparent Specific Gravity 60/60°F (15.6/15.6°C)				
min	0.754	0.768	---	0.754
max	0.820	0.820	0.775	0.800

^{1/}"Mineral Spirits" of all the Types I-IV may be commercially available to meet certain local air pollution regulations (for example "Rule 66") that limit C₈ and higher aromatics to not more than 8 volume % olefins to not more than 5 volume % and total aromatic plus olefins to not more than 20 volume %. Commercial references for the four types are: Type

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I - regular mineral spirits (Stoddard solvent); Type II - high flash point; Type III - odorless; Type IV - low dry point.

5.2.2.1.1 Appearance. All types of mineral spirits shall be clear and free of suspended matter and undissolved water when observed at 60-78°F (15.6-25.6°C).

5.2.2.1.2 Color. Color shall not be darker than +25 on the Saybolt Scale or 25 on the Pt-Co Scale.

5.2.2.1.3 Odor. Odor shall be characteristic as agreed between purchaser and supplier.

5.2.2.1.4 Sulfur content. Doctor test shall be negative.

5.2.2.1.5 Acidity. Acidity of the residue from distillation shall be neutral.

5.2.3 Use. Mineral spirits are used primarily in the coatings and dry cleaning industries. They are used to manufacture naphtha soaps, cleaning metal parts, degreasing hides and as a thinner for paint finishes and enamels.

5.2.4 Safety. Mineral spirits are combustible liquids. 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. Lower explosive limit ranges typically from 0.7 - 1.1 percent by volume. Upper explosive limit is typically 6.1 percent by volume.

Mineral spirits are 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)

5.2.5 Storage. Mineral spirits 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)

5.2.6 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.

Mineral spirits have an EPA Hazardous Waste Classification - Ignitable; Waste Number D001.

5.3 Name. Naphtha, Aliphatic

5.3.1 Technical Description. Aliphatic naphtha is a petroleum fraction with volatility between gasoline and kerosene. It is a light, colorless to straw-colored liquid.

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5.3.2 Specification. Federal, TT-N-95, Naphtha; Aliphatic.

5.3.2.1 Requirements. The Federal Specification requirements for aliphatic naphtha are shown in Table III.

TABLE III. Naphtha, aliphatic - federal specification requirements.

Characteristics	Requirements	
	Min	Max
Color, Saybolt	+25	
Distillation (at 760 mm, pressure);		
Initial boiling point, °C		85
10 percent fraction (by volume), °C		102
50 percent fraction (by volume), °C		107
90 percent fraction (by volume), °C		121
End point, °C		143
Specific gravity at 20°/20°C	0.708	0.768
Nonvolatile matter, grams per 100 milliliters		0.005
Kauri-butanol value	30	45

5.3.2.1.1 Appearance. Aliphatic naphtha shall be clear; free from suspended matter and undissolved water.

5.3.2.1.2 Odor. Odor shall be normal.

5.3.2.1.3 Copper corrosion. Aliphatic naphtha shall not blacken or corrode clean metallic copper.

5.3.2.1.4 Acidity. Aliphatic naphtha shall contain no free mineral acid.

5.3.2.1.5 Sulfur content. Doctor test shall be negative.

5.3.2.1.6 Dissolved impurities. Spot test shall be negative.

5.3.2.1.7 Crazing. Type II aliphatic naphtha shall resist crazing acrylic plastics.

5.3.3 Use. Aliphatic naphtha is used in organic coatings and as a cleaner for acrylic plastics (Type II only).

5.3.4 Safety. Aliphatic naphtha 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. Lower explosive limit ranges typically from 1.0-1.2 percent by volume. Upper explosive limit is typically 6.7 percent by volume.

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Aliphatic naphtha is irritating to eyes and mucous membranes and causes drying of skin. Inhalation can cause headache, confusion, impaired coordination, drowsiness, nausea, and respiratory irritation. (Refer to 4.3.1)

5.3.5 Storage. Aliphatic naphtha 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)

5.3.6 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.

Aliphatic naphtha has an EPA Hazardous Waste Classification - Ignitable; Waste Number D001.

5.4 Name. Naphtha, Aromatic

5.4.1 Technical Description. Aromatic naphtha is a petroleum fraction with volatility between gasoline and kerosine. It is a water white liquid.

5.4.2 Specification. Federal, TT-N-97, Naphtha; Aromatic.

5.4.2.1 Requirements. The Federal Specification requirements for aromatic naphtha are shown in Table IV.

TABLE IV. Naphtha, aromatic - federal specification requirements.

Characteristics	Requirements			
	Type I		Type II	Type III
	Grade A	Grade B		
Specific gravity at 20°C/20°C, min	0.810	0.770	0.825	0.855
max	0.871	0.845	0.875	0.980
Flash point, min, °C	---	---	27	50
Aniline point, max, °C	---	32	---	---
Mixed aniline point, max, °C	27	---	28	34
Distillation at 760 mm pressure				
Initial boiling point, min, °C	88	88	129	171
50 percent (by volume), min, °C	100	100	143	182
max, °C	116	116	168	200

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TABLE IV. Naphtha, aromatic - federal specification requirements (continued).

Characteristics	Requirements			
	Type I		Type II	Type III
	Grade A	Grade B		
Distillation (cont.) End point, max, °C	140	140	191	218
Color, Saybolt Number, min	+25	+25	+21	+18
Nonvolatile matter (gram/ 100 ml), max	0.2	0.2	0.2	0.2

5.4.3 Use. Aromatic naphtha is used in the formulation of paints.

5.4.4 Safety. Aromatic naphtha 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.

Aromatic naphtha is irritating to eyes and mucous membranes and causes drying of skin. Inhalation can cause headache, confusion, impaired coordination, drowsiness, nausea, vomiting, coma and respiratory irritation. Ingestion may cause vomiting. Chronic effect may cause loss of appetite, nose bleeds and impair liver and kidney functions. (Refer to 4.3.1)

5.4.5 Storage. Aromatic naphtha 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 and strong oxidants like liquid chloride. (Refer to 4.3.2)

5.4.6 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.

Aromatic naphtha has an EPA Hazardous Waste Classification - Ignitable; Waste Number D001.

5.5 Name. Naphthalene, Technical

5.5.1 Technical Description. Naphthalene, technical grade, is a white volatile solid distilled from coal tar or obtained from natural gas. It is available in three classes: balls, flakes and crystals.

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5.5.2 Specification. Federal, R-N-91, Naphthalene, Technical.

5.5.2.1 Requirements. The Federal Specification requirements for naphthalene, technical are shown in Table V.

TABLE V. Naphthalene, technical - federal specification requirements.

Characteristics	Requirements
Solidifying point, minimum, °C	79
Residue on ignition	None
Solubility in water	Insoluble
Solubility in boiling ethanol	Soluble

5.5.3 Use. Naphthalene, technical grade, is used in making dyestuffs, synthetic resins, coatings, tanning agents and celluloid.

5.5.4 Safety. Vapors of naphthalene, technical grade, are combustible. Vapors are heavier than air and may travel along the ground or be moved by ventilation and be ignited by distant sources. Avoid heat, sparks, flame and other ignition sources. Dust may be an explosion hazard. Extinguish fires with regular foam, water, or carbon dioxide fog, or dry chemical. However, water or foam may cause frothing which can be violent especially if sprayed into containers of hot, burning liquid. Use fresh air respirators to fight fires. Toxic materials including carbon monoxide may evolve when burned.

Lower explosive limit is 0.9 percent by volume; upper explosive limit is 5.9 percent by volume. Permissible exposure limit is 10 ppm. Threshold limit value is 10 ppm. Naphthalene, technical grade, is irritating to eyes, skin and mucous membranes. Inhalation may cause headache, confusion, nausea, and vomiting. Ingestion can cause gastrointestinal irritation, nausea, vomiting and diarrhea. (Refer to 4.3.1)

5.5.5 Storage. Naphthalene, technical grade, shall be stored in a cool, well ventilated area in tightly closed containers. Do not store near heat, sparks, flame, other ignition sources and strong oxidants. (Refer to 4.3.2)

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

Naphthalene, technical grade, has the following EPA Hazardous Waste Classifications:

- (1) Ignitable; Waste Number D001
- (2) Toxic; Waste Number U165

5.6 Name. Polyisobutylene (For Ordnance Use)

5.6.1 Technical Description. Polyisobutylene (for ordnance use) is a stabilized, consolidated solid material of 99,000 to 120,000 average molecular weight.

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5.6.2 Specification. Military, MIL-P-13298, Polyisobutylene (For Ammunition Use).

5.6.2.1 Requirements. The Military Specification requirements for polyisobutylene (for ammunition use) are shown in Table VI.

TABLE VI. Polyisobutylene (for ammunition use) - military specification requirements.

Characteristics	Requirements
Intrinsic viscosity, min	3.15
max	3.72
Iodine number, max	1.32
Chlorine, %, max	0.10
Acidity (as HCl), %, max	0.01
Insoluble matter, %, max	0.20

5.6.2.1.1 Product shall be stabilized against depolymerization at 125°F (51.7°C).

5.6.2.1.2 Color of a solution of 5.00 ± 0.01 grams of polyisobutylene in 100 milliliters of diisobutylene shall not be darker than a standard prepared by dissolving 0.0075 ± 0.0001 grams of potassium dichromate in one liter of distilled water. Alternatively, color value shall not be greater than 6½ when determined by using a modified Hellige Aqua Tester, Model 611A using procedures of ASTM method D1524-58T.

5.6.3 Use. Polyisobutylene (for ammunition use) is used in Polyisobutylene Binder.

5.6.4 Safety. Vapors of polyisobutylene (for ammunition use) are combustible. Avoid heat, sparks, flame and other ignition sources. Extinguish fires with water fog, carbon dioxide or dry chemical. Use fresh air respirators to fight fires. Toxic materials including carbon monoxide may evolve when burned.

Polyisobutylene (for ammunition use) is irritating to eyes, skin and mucous membranes. Inhalation of vapors can cause nasal and respiratory irritation. Ingestion can cause gastrointestinal irritation, nausea, vomiting and diarrhea. (Refer to 4.3.1)

5.6.5 Storage. Polyisobutylene (for ammunition use) shall be stored in a cool, well ventilated area in tightly closed containers. Do not store near heat, sparks, flame, other ignition sources and strong oxidants. (Refer to 4.3.2)

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

Polyisobutylene (for ammunition use) has an EPA Hazardous Waste Classification - Ignitable; Waste Number D001.

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5.7 Name. Toluene

5.7.1 Technical Description. Toluene is a colorless liquid derived from coal tar or from the catalytic reforming of petroleum naphthas. It is specified as either Grade A - Nitration Toluene or Grade B - Pure Commercial Toluene.

5.7.2 Specification. Military, JAN-T-171, Toluene.

5.7.2.1 Requirements. The Joint Army-Navy specification requirements for Toluene are shown in Table VII.

TABLE VII. Toluene - Joint Army-Navy specification requirements.

Characteristics	Requirements
Insoluble material, %, max	
Grade A	0.10
Grade B	0.10
Specific Gravity at 15.5/15.5°C	
Grade A	0.8690-0.8730 ^{1/}
Grade B	0.864-0.874

^{1/}Toluene in the range 0.8680 to 0.8689 is acceptable if the paraffin hydrocarbon content is 1.0 percent or above.

5.7.2.1.1 Color. The color of Grade A and Grade B toluene shall not be darker than a standard solution of potassium dichromate.

5.7.2.1.2 Sulfur content. Grade B toluene shall be free from hydrogen sulfide and sulfur dioxide.

5.7.2.1.3 Paraffin hydrocarbons. The paraffin hydrocarbon present in by-product coke plant Grade A toluene shall not exceed 1.5 percent. All other Grade A toluene shall not exceed a maximum of 1.0 percent in this respect.

5.7.2.1.4 Acidity. The residue after distillation of Grade B toluene shall contain no free mineral acid.

5.7.2.1.5 Separated water. Grade A and Grade B toluene shall show no separated water.

5.7.2.1.6 Cloud point. Grade A toluene shall show no cloudiness at 30°C.

5.7.2.1.7 Water test (dryness). Grade B toluene shall show no turbidity when mixed with 19 volumes of 60° Baume gasoline.

5.7.2.1.8 Color or acid wash. The color of the acid layer of Grade A and Grade B toluene shall be not darker than Standard No. 2.

5.7.2.1.9 Copper corrosion. Grade B toluene shall not blacken or corrode clean metallic copper in 30 minutes at the boiling point.

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5.7.2.1.10 Distillation range. Distillation ranges shall be as follows:

Grade A - The toluene shall distill from first drop to dry point within 1°C which range shall include either or both the temperature 110.6° and 110.7°C.

Grade B - The toluene shall distill from first drop to dry point within 8°C, which range shall be completely within the limits of 107.5° and 112.5°C.

5.7.3 Use. Toluene is used as a solvent, for making explosives, dyestuffs, chemicals, and in aviation as an additive to gasoline to improve the octane rating.

5.7.4 Safety. Vapors of toluene are combustible. Vapors are heavier than air and may travel along the ground, or be moved by ventilation and be ignited by distant sources. Avoid heat, sparks, flame, heaters, smoking, electric motors, static discharge and other ignition sources. Extinguish fires with regular foam, carbon dioxide fog or dry chemical. Use fresh air respirators to fight fires. Toxic materials including carbon monoxide may evolve when burned.

Lower explosive limit is 1.2 percent by volume; upper explosive limit is 7.0 percent by volume. Permissible exposure limit is 100 ppm. Threshold limit value is 100 ppm. Toluene is irritating to eyes, skin and mucous membranes. Prolonged skin contact can cause defatting and dermatitis. Inhalation may cause nasal and respiratory irritation, weakness, headache, confusion, nausea, unconsciousness and even death. Ingestion can cause gastrointestinal irritation, nausea, vomiting and diarrhea. Aspiration of toluene into lungs can cause chemical pneumonitis. (Refer to 4.3.1)

5.7.5 Storage. Toluene shall be stored in a cool, well ventilated area in tightly closed containers. Do not store near heat, sparks, flame, other ignition sources and strong oxidants. (Refer to 4.3.2)

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

Toluene has the following EPA Hazardous Waste Classifications:

- (1) Ignitable; Waste Number D001
- (2) Toxic; Waste Number U220

5.8 Name. Toluene, Industrial Grade

5.8.1 Technical Description.

5.8.2 Specification. ASTM D 362 Standard Specification for Industrial Grade Toluene.

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5.8.2.1 Requirements. The ASTM specification requirements for toluene, industrial grade are shown in Table VIII and listed below.

TABLE VIII. Toluene, industrial grade - ASTM specification requirements.

Characteristics	Requirements
Specific Gravity 15.56/15.56°C	0.864 to 0.874
20/20°C	0.860 to 0.870
25/25°C	0.858 to 0.868
Density, 20°C	0.861 to 0.871
Kauri-butanol value, min	100

5.8.2.1.1 Appearance. Toluene, industrial grade shall be a clear liquid, free of sediment or haze at 65 to 78°F (18.3 to 25.6°C).

5.8.2.1.2 Color. Toluene, industrial grade shall not be darker than 20 max on the platinum-cobalt scale.

5.8.2.1.3 Distillation. Distillation range at 760 mm Hg pressure: total distillation shall not be more than 2°C from initial boiling point to dry point, including the temperature 110.6°C.

5.8.2.1.4 Odor. Toluene, industrial grade shall have a characteristic aromatic hydrocarbon odor as agreed upon by the purchaser and the seller, non-residual.

5.8.2.1.5 Water. Toluene, industrial grade shall not have sufficient water to show turbidity at 20°C.

5.8.2.1.6 Acid wash color. Not darker than No. 4 color standard.

5.8.2.1.7 Sulfur compounds. Toluene, industrial grade shall be free of H₂S and SO₂.

5.8.2.1.8 Corrosion. Copper strip shall not show greater discoloration than Class 2 after ½ hour at 100°C.

5.8.3 Use. Toluene is used as a solvent, for making explosives, dyestuffs, chemicals, and in aviation as an additive to gasoline to improve the octane rating.

5.8.4 Safety. Vapors to toluene are combustible. Vapors are heavier than air and may travel along the ground, or be moved by ventilation and be ignited by distant sources. Avoid heat, sparks, flame, heaters, smoking, electric motors, static discharge and other ignition sources. Extinguish fires with regular foam, carbon dioxide fog or dry chemical. Use fresh air respirators to fight fires. Toxic materials including carbon monoxide may evolve when burned.

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Lower explosive limit is 1.2 percent by volume; upper explosive limit is 7.0 percent by volume. Permissible exposure limit is 100 ppm. Threshold limit value is 100 ppm. Toluene is irritating to eyes, skin and mucous membranes. Prolonged skin contact can cause defatting and dermatitis. Inhalation may cause nasal and respiratory irritation, weakness, headache, confusion, nausea, unconsciousness and even death. Ingestion can cause gastrointestinal irritation, nausea, vomiting and diarrhea. Aspiration of toluene into lungs can cause chemical pneumonitis. (Refer to 4.3.1)

5.8.5 Storage. Toluene shall be stored in a cool, well ventilated area in tightly closed containers. Do not store near heat, sparks, flame, other ignition sources and strong oxidants. (Refer to 4.3.2)

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

Toluene, industrial grade has the following EPA Hazardous Waste Classifications:

- (1) Ignitable; Waste Number D001
- (2) Toxic; Waste Number U220

5.9 Name. Toluene, Technical

5.9.1 Technical Description. Toluene, technical is a colorless liquid derived from coal tar or from the catalytic reforming of petroleum naphthas.

5.9.2 Specification. Federal, TT-T-548, Toluene, Technical.

5.9.2.1 Requirements. The Federal Specification requirements for toluene, technical are shown in Table IX.

TABLE IX. Toluene, technical - federal specification requirements.

Characteristics	Requirements
Specific gravity at 20°C	0.860 - 0.870
Color on platinum-cobalt scale	Less than No. 20
Distillation range, °C within 2°C	110.6
Residual odor	None
Turbidity or free water	None
Acidity	None
Acid wash color	Less than No. 4
Sulfur content	None
Copper corrosion	None

5.9.3 Use. Toluene is used as a solvent, for making explosives, dyestuffs, chemicals, and in aviation as an additive to gasoline to improve the octane rating.

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5.9.4 Safety. Vapors to toluene are combustible. Vapors are heavier than air and may travel along the ground, or be moved by ventilation and be ignited by distant sources. Avoid heat, sparks, flame, heaters, smoking, electric motors, static discharge and other ignition sources. Extinguish fires with regular foam, carbon dioxide fog or dry chemical. Use fresh air respirators to fight fires. Toxic materials including carbon monoxide may evolve when burned.

Lower explosive limit is 1.2 percent by volume; upper explosive limit is 7.0 percent by volume. Permissible exposure limit is 100 ppm. Threshold limit value is 100 ppm. Toluene is irritating to eyes, skin and mucous membranes. Prolonged skin contact can cause defatting and dermatitis. Inhalation may cause nasal and respiratory irritation, weakness, headache, confusion, nausea, unconsciousness and even death. Ingestion can cause gastrointestinal irritation, nausea, vomiting and diarrhea. Aspiration of toluene into lungs can cause chemical pneumonitis. (Refer to 4.3.1)

5.9.5 Storage. Toluene shall be stored in a cool, well ventilated area in tightly closed containers. Do not store near heat, sparks, flame, other ignition sources and strong oxidants. (Refer to 4.3.2)

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

Toluene, technical has the following EPA Hazardous Waste Classifications:

- (1) Ignitable; Waste Number D001
- (2) Toxic; Waste Number U220

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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 Hydrocarbon Compounds and Solvent Distillates, Technical Grade preferred for application by the Department of Defense.

6.2 Subject Term (Key Word) Listing.

Insecticide, Naphthalene
Mineral Spirits (Petroleum Spirits)(Hydrocarbon Dry Cleaning Solvent)
Naphtha, Aliphatic
Naphtha, Aromatic
Naphthalene, Technical
Polyisobutylene (For Ordnance Use)
Toluene
Toluene, Industrial Grade
Toluene, Technical
Exposure limits, hazardous chemicals
Hazardous wastes, disposal and storage of
Information, hazardous chemicals
Safety, hazardous chemicals

6.3 Changes from Previous Issue. Not applicable.

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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I N D E X

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Navy - None
Air Force - None

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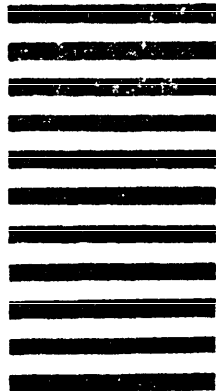
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3a. NAME OF SUBMITTING ORGANIZATION		4. TYPE OF ORGANIZATION (Mark one)	
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7a. NAME OF SUBMITTER (Last, First, MI) - Optional		b. WORK TELEPHONE NUMBER (Include Area Code) - Optional	
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