METRIC

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MILITARY STANDARD

INORGANIC SALTS AND COMPOUNDS, TECHNICAL GRADE

(POTASSIUM BICARBONATE THROUGH SILVER CYANIDE) (METRIC)

DEPARTMENT OF DEFENSE
UNITED STATES OF AMERICA

AMSC N/A

FSC 6810

DEPARTMENT OF DEFENSE
Washington, DC 20301

Inorganic Salts And Compounds, Technical Grade
(Potassium Bicarbonate Through Silver Cyanide)

MIL-STD-1207B

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.

FOREWORD

This 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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TABLES

1. SCOPE

1.1 Purpose. The purpose of this standard is to present the nomenclature, formulas, physical and chemical properties, specification requirements, military and typical commercial uses, safety information, storage information, and disposal information for inorganic salts and compounds, technical grade (potassium bicarbonate through silver cyanide). This standard does not necessarily include all of those items which are commercially available. It does contain items preferred for use in the selection of inorganic compounds, for application by the Department of Defense.

1.2 Application. Inorganic compounds, technical grade, are used in formulating munition fillings, in metal cleaning and finishing, in electroplating, in gas purification, in water treatment, as chemical intermediates, and in the formulation of products for a variety of applications.

2. REFERENCED DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks. Unless otherwise specified, the following specifications, standards, and handbooks of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DODISS) specified in the solicitation form a part of this standard to the extent specified herein.

SPECIFICATIONS

FEDERAL

O-P-553 - Potassium Chloride (Muriate of Potash); For Fertilizer Purposes
O-PC-559 - Potassium Dichromate: (Potassium Bichromate) Technical Grade
PPP-C-2020 - Chemicals, Liquid, Dry and Paste, Packaging of

MILITARY

MIL-P-150 - Potassium Chlorate, Technical
MIL-P-156 - Potassium Nitrate
MIL-P-193 - Potassium Sulfate (For Ordnance Use)
JAN-P-217 - Potassium Perchlorate, Technical
MIL-P-3173 - Potassium Bicarbonate, Technical
MIL-P-11970 - Potassium Permanganate, Technical (Metric)
MIL-P-23409 - Potassium Tetraborate Tetrahydrate
MIL-P-51315 - Potassium Bifluoride, Technical
DOD-P-51455 - Potassium Carbonate, Anhydrous, Technical (Metric)

STANDARDS

FEDERAL

FED-STD-313 - Material Safety Data Sheets, Preparation And The Submission Of

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.

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)

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 document(s) form a part of this standard 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 specified in the solicitation. The issues of documents which have not been adopted shall be those in effect on the date of the cited DODISS.

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.

Volume 13: Transactions of ACGIH Activities 1985 Conference.

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

ASTM

ASTM E 11 - Wire-Cloth Sieves For Testing Purposes

(Application for copies should be addressed to ASTM, 1916 Race Street, Philadelphia, PA 19103.)

INTERNATIONAL AGENCY FOR RESEARCH ON CANCER (IARC)

Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man.

(Application for copies should be addressed to World Health Organization, International Agency for Research on Cancer, 49 Sheridan Street, Albany, New York.)

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

3. DEFINITIONS

3.1 Oxidizing agent - A substance that gains electrons as a result of an oxidation-reduction reaction. It causes an increase in the oxidation state of another substance.

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

3.3 Reducing agent - A substance that loses electrons during an oxidation-reduction reaction. It causes a decrease in the oxidation state of another substance.

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 in 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) or by particular respiratory schedules of the Bureau of Mines (BM) 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 where there is a potential for direct contact with harmful chemicals.

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 accordance 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 Exercises. 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 (54.5°C). Materials with flash points of 200°F or higher are to be considered as burnable. The Environmental Protection Agency (EPA), in Part 261, Subpart C, Section 261.21 of 40 CFR*, 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.* 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 waterproof, located on high ground, and separated from other storage areas.

*Refers only to materials that have become waste materials.

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, Part 1910, Subpart Z; and NIOSH Recommendation for Environmental Exposure Limits. Such information is also shown in MSDSs and the HMIS referred to in 4.2. The identity of sources establishing if a chemical is a carcinogen or potential carcinogen, for hazard communication purposes, is shown in 29 CFR 1910.1200 (d)(4).

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 261.11(a)(3) of 40 CFR.* 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 40 CFR.* Some commercial chemical products are listed as acute hazardous in toxicity under Subpart D, Section 261.33(e).

4.3.4.3 EPA Extraction Procedure Toxicity (EP Toxicity) (E). Some chemical contaminants, that are not listed in Subpart D, have been designated by the EPA as exhibiting the characteristic of EP toxicity, and are listed in Section 261.24 Table 1 of 40 CFR.*

4.3.4.4 Hazardous toxic constituents. A list of chemical compounds and substances, shown to have toxic effects on humans or other life forms, is contained in Appendix VIII to 40 CFR Part 261; and the Registry of Toxic Effects of Chemical Substances.

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 Utiliza-

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*Refers only to materials that have become waste materials.

tion 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 (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 4.4.3.2, 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 Contigency 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.

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.

5. DETAILED REQUIREMENTS

5.1 Name. Potassium Bicarbonate $KHCO_3$ FW 100.12
Potassium acid carbonate
Potassium hydrogen carbonate

5.1.1 Technical Description. Potassium bicarbonate (pure) is in the form of colorless monoclinic crystals with a density of 2.17 g/cm^3. It does not melt but decomposes on heating between 100° and 200°C with release of H_2O and CO_2 and formation of K_2CO_3. The most decomposition occurs between 100° and 120°C. Its solubility in water is 22.4 g/100 cm^3 at room temperature, and 60 g/100 cm^3 at 60°C. Its aqueous solutions are slightly alkaline. It is insoluble in alcohol. It reacts with acids or acid salts, in the presence of moisture, to evolve carbon dioxide.

5.1.2 Specification. Military, MIL-P-3173, Potassium Bicarbonate, Technical.

5.1.2.1 Requirements. The military specification covers one technical grade of potassium bicarbonate with the chemical and physical characteristics conforming to the requirements shown in Table I.

TABLE I. Potassium Bicarbonate, Technical - military specification requirements.

Assay (as $KHCO_3$), % by wt, min	98.0
Moisture, % by wt, max	1.0
Loss on heating, % by wt, min	29.5
Carbonate (as meq/g), max	0.5
Sodium salts	Not more than a trace
Particle size 1/, % by wt, retained on sieve:	
250 micrometers (No. 60),	
min	0
max	5
150 micrometers (No. 100),	
min	5
max	15
75 micrometers (No. 200)	
min	45
max	55

1/ Note: Sieve dimensions in accordance with ASTM E 11.

5.1.3 Use. Potassium bicarbonate, technical grade is intended for military use as an ingredient in colored smoke mixtures. Commercial applications include use as an ingredient in dry powder type fire extinguishers, as a buffering agent in detergents, as a blowing agent in the manufacture of plastics, as a dusting agent in rubber manufacture, and for the setting of resins in textile finishing.

5.1.4 Safety. Potassium bicarbonate dust can be irritating to the upper respiratory tract and eyes, and exposure to dust shall be avoided. There is no PEL or TLV referenced for potassium bicarbonate. In case of eye exposure, irrigate with water for at least twenty minutes, and obtain medical attention. (Refer to 4.3.1)

5.1.5 Storage. Potassium bicarbonate shall be stored in tightly sealed containers in a cool dry place. (Refer to 4.3.2)

5.1.6 Disposal. In case of dry spills, gather up and place in containers. 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.

5.2 Name. Potassium Bifluoride KHF_2 FW 78.11
Potassium acid fluoride
Potassium hydrogen fluoride

5.2.1 Technical Description. Potassium bifluoride (pure) is in the form of colorless cubic crystals with a density of 2.37 g/cm^3. On heating it has a crystal transition temperature of 196.7°C, and a melting point of 238.8°C. It starts to decompose at about 225°C, and decomposes at 440°C to KF and HF. Potassium bifluoride is deliquescent, and its solubility in water is 39 g/100 cm^3 at 20°C, 78 g/100 cm^3 at 60°C, and 114 g/100 cm^3 at 80°C. Its solubility in water is increased by hydrofluoric acid. It is insoluble in absolute alcohol. KHF_2 is the salt of the dimer acid, H_2F_2, which forms the stable hydrogen difluoride ion, HF_2, in solution. Solutions of KHF_2 are acidic, and can react with silica and silicates. Potassium bifluoride can react with strong acids to form hydrofluoric acid.

5.2.2 Specification. Military, MIL-P-51315, Potassium Bifluoride, Technical.

5.2.2.1 Requirements. The military specification covers one technical grade of potassium bifluoride (KHF_2), with the chemical characteristics conforming to the requirements shown in Table II.

TABLE II. Potassium Bifluoride, Technical - military specification requirements.

Assay, as KHF_2, % by wt, min	99.0
Chloride, as Cl, % by wt, max	0.02
Iron, as Fe, % by wt, max	0.05
Potassium fluosilicate (K_2SiF_6), % by wt, max	0.5

5.2.3 Use. Potassium bifluoride, technical, is intended for military use in glass etching, metal finishing, and in organic synthesis for the introduction of fluorine. Commercial applications include use as an electrolyte in the manufacture of fluorine, as a component of fluxes for soldering or silver brazing, in a mixture with citric acid for etching aluminum prior to coating, as a catalyst for the alkylation of benzene with olefins, and for the etching, frosting and polishing of glass.

5.2.4 Safety. Potassium bifluoride dust or solution mist can be highly irritating to the upper respiratory tract, skin, and eyes, and exposure shall be avoided. The PEL or TLV for fluorides, as F, is 2.5 mg/m^3. Potassium bifluoride shall be handled as toxic material. In case of skin exposure wash affected area thoroughly with soap and water, and then flush with water to remove completely. In case of eye exposure, irrigate with water for at least twenty minutes, and obtain medical attention. (Refer to 4.3.1)

5.2.5 Storage. Potassium bifluoride,anhydrous, shall be stored in tightly sealed containers, lined with polyethylene, in a cool dry place, away from acids, and alkalies. Access by atmospheric moisture into the containers shall be prevented. (Refer to 4.3.2)

5.2.6 Disposal. In case of dry spills, gather up and place in containers. Water can be used to complete clean-up of residue. In case of small solution spills control with dry sodium carbonate or soda ash. In case of large solution spills, dike with nonreactive materials, such as polyethylene, to prevent spreading. Solution spills and washings can be neutralized with soda ash or lime. 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. Potassium Carbonate K_2CO_3 FW 138.21
Pearl ash
Potash

5.3.1 Technical Description. Potassium carbonate, anhydrous (pure) is in the form of colorless monoclinic crystals with a refractive index of 1.531, and a density of 2.428 g/cm^3 at 19°C. It starts to decompose at temperatures above 950°C to form K_2O and release carbon dioxide. Potassium carbonate is hygroscopic and forms three hydrates, containing one, two and three molecules of water of crystallization. Its solubility in water is 112 g/100 cm^3 at 20°C and 156 g/100 cm^3 at 100°C. It is slightly soluble in methanol, very slightly soluble in ethanol and practically insoluble in acetone. Its aqueous solutions are strongly alkaline, and it can react with carbon dioxide and other acidic gases. It reacts with excess acid or acid salts, in the presence of moisture to release carbon dioxide.

5.3.2 Specification. Military, DOD-P-51455, Potassium Carbonate, Anhydrous, Technical (Metric).

5.3.2.1 Requirements. The military specification covers two types of technical grade anhydrous potassium carbonate (K_2CO_3), with the chemical and physical characteristics conforming to the requirements shown in Table III:

Type I - Granular Form and Type II - Powder Form.

TABLE III. Potassium Carbonate, Anhydrous, Technical - military specification requirements - chemical and physical characteristics.

Characteristics	Type I		Type II	
	Minimum	Maximum	Minimum	Maximum
Assay (as K_2CO_3, equivalent to total alkalinity), % by wt	99.0	---	99.0	---
Loss on heating, percent by weight	---	1.0	---	1.0
Apparent density, grams per cubic centimeter	0.85	1.33	0.85	0.90
Particle size distribution, % by wt				

TABLE III. Potassium Carbonate, Anhydrous, Technical - military specification requirements - chemical and physical characteristics (Continued).

Characteristics	Type I		Type II	
	Minimum	Maximum	Minimum	Maximum
Retained on No. 8 sieve (2.36 millimeter) 1/	---	0	---	---
Retained on No. 16 sieve (1.18 millimeter)	0	1	---	---
Retained on No. 20 sieve (850 micrometer)	0.6	12	---	0
Retained on No. 40 sieve (425 micrometer)	40	80	0	5
Retained on No. 70 sieve (212 micrometer)	18	50	5	15
Retained on No. 100 sieve (150 micrometer)	0	15	5	15
Passed through No. 100 sieve (150 micrometer)	0	2	---	---
Retained on No. 200 sieve (75 micrometer)	---	---	5	15
Passed through No. 200 sieve (75 micrometer)	---	---	60	85

1/ Sieve dimensions in accordance with ASTM E 11.

5.3.3 Use. Potassium carbonate, anhydrous, technical grade is intended for military use as a carbon dioxide absorbent. Commercial applications include use as a source of K_2O for the manufacture of special glasses, and enamel frits; as a chemical intermediate for the production of other potassium salts and potassium soap; as an ingredient of cleaning compounds and boiler treatment compounds; and in aqueous solution as an absorbent for the removal of carbon dioxide and other acidic gases in the purification of natural gas, other hydrocarbon gases, hydrogen, and petrochemical products.

5.3.4 Safety. Potassium carbonate dust can be irritating to the upper respiratory tract, eyes and skin, and exposure to dust shall be avoided. There is no PEL or TLV referenced for potassium carbonate. In case of skin exposure wash affected area with water. In case of eye exposure, irrigate with water for at least twenty minutes, and obtain medical attention. (Refer to 4.3.1)

5.3.5 Storage. Potassium carbonate, anhydrous, shall be stored in tightly sealed containers in a cool dry place. Access by atmospheric moisture and carbon dioxide into the containers shall be prevented. (Refer to 4.3.2)

5.3.6 Disposal. In case of dry spills, gather up and place in containers. In case of small solution spills, control with nonreactive absorbent. In case of large solution spills, dike to prevent spreading. 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.

5.4 Name. Potassium Chlorate $KClO_3$ FW 122.55
Chlorate of potash
Potash chlorate

5.4.1 Technical Description. Potassium chlorate (pure) is in the form of colorless monoclinic crystals with a density of 2.32 g/cm^3 and a melting point of 356°C. It starts to decompose on heating to 400°C. At moderate temperatures it forms potassium perchlorate and potassium chloride. At high temperatures potassium chloride is formed and oxygen is released. Its solubility in water is 7.1 g/100 cm^3 at 20°C and 57 g/100 cm^3 at 100°C. Potassium chlorate is a strong oxidizing agent and is very reactive with reducing agents. It is reduced to potassium chloride by such reactions. It is reactive with concentrated sulfuric acid to form unstable Cl_2O. It is reactive with concentrated hydrochloric acid to form chlorine.

5.4.2 Specification. Military, MIL-P-150, Potassium Chlorate, Technical.

5.4.2.1 Requirements. The military specification covers three grades and seven classes of technical grade potassium chlorate:

Grade A - Low bromate
Grade B - High bromate
Grade C - With magnesium carbonate

Class 1 - No. 80 sieve, nominal
Class 2 - No. 100 sieve, nominal
Class 3 - No. 60 sieve, nominal
Class 4 - No. 100 sieve, nominal, fine
Class 5 - No. 50 sieve, nominal
Class 6 - No. 325 sieve, nominal
Class 7 - No. 80 sieve, nominal, fine

The chemical characteristics are shown in Table IV, and the granulation characteristics are shown in Table V.

TABLE IV. Potassium Chlorate, Technical - military specification requirements - chemical characteristics.

Characteristics	Grade A	Grade B	Grade C
	% by wt	% by wt	% by wt
Moisture, max	0.05	0.05	0.05
Assay, as $KClO_3$, min	99.5	99.5	96.5
Water-insoluble matter, max	0.02	0.10	3.20
pH of water-soluble matter	5 to 8	5 to 8	---
Hypochlorites (KI-starch paper test)	Negative	Negative	Negative
Chlorites (sulfuric acid-KI-starch paper test)	Negative	---	---
Chlorides, as KCl, max	0.10	0.10	0.10
Bromates, as $KBrO_3$, max	0.02	0.10	0.10
Heavy metals (H_2S test)	Negative	Negative	Negative
Alkaline earths (oxalate test)	Negative	Negative	---
Sodium, max	0.04	0.04	0.04
Magnesium carbonate content	---	---	3.0±0.2

TABLE V. Potassium Chlorate, Technical - military specification requirements - granulation characteristics.

Sieve Size	Percent by weight passing													
	Class 1		Class 2		Class 3		Class 4		Class 5		Class 6 1/		Class 7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
No. 50	--	--	--	--	--	--	--	--	98.0	--	--	--	--	--
No. 60	--	--	--	--	99.5	--	--	--	--	--	--	--	--	--
No. 70	99.0	--	--	--	60.0	--	--	--	--	--	--	--	99.0	--
No. 100	--	--	99.9	--	--	--	99.9	--	85.0	--	--	--	--	--
No. 140	45.0	55.0	--	--	--	--	45.0	55.0	--	--	--	--	--	--
No. 200	17.0	23.0	--	5.0	--	--	--	40.0	40.0	70.0	--	--	90.0	--
No. 325	--	--	--	--	--	--	--	--	--	--	95.0	--	60.0	--

1/ Isopropanol wash method.

5.4.3 Use. Potassium chlorate, technical, is intended for military use as follows:

Grade A -As an ingredient in primer mixtures.
Grade B -As an ingredient in pyrotechnic mixtures.
Grade C -As an ingredient in colored smoke mixtures.

Commercial applications include use as an ingredient in matches, explosives, and pyrotechnics including fireworks. It is also used as a source of oxygen, and for bleaching in paper manufacture and textile printing.

5.4.4 Safety. Potassium chlorate is a strong oxidizing agent, and in contact with finely divided oxidizable materials, such as organic compounds, carbon, sulfur, or metals, forms explosively reactive mixtures that are very sensitive to impact or friction. In the presence of fire or other sources of heat, potassium chlorate will decompose to release oxygen and support combustion. Dry clothing, leather or paper, contaminated with potassium chlorate, can be easily ignited. Potassium chlorate dust can be irritating to the upper respiratory tract, eyes and skin, and explosure to dust shall be avoided. There is no PEL or TLV referenced for potassium chlorate. In case of skin exposure, wash affected areas with water. In case of eye exposure, irrigate with water for at least twenty minutes, and obtain medical attention. (Refer to 4.3.1)

5.4.5 Storage. Potassium chlorate, anhydrous, shall be stored in tightly sealed containers in a cool dry place, away from combustible or oxidizable material. Access by atmospheric moisture into the containers shall be prevented. (Refer to 4.3.2)

5.4.6 Disposal. In case of dry spills, gather up and place in containers. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4)

Potassium chlorate has an EPA hazardous Waste Classification - Ignitable; Waste No. D001.

5.5 Name. Potassium Chloride KCl FW 74.56
Muriate of potash
Sylvite (natural)

5.5.1 Technical Description. Potassium chloride (pure) is in the form of cubic colorless crystals with a refractive index of 1.490, a density of 1.984 g/cm^3 and a melting point of 776°C. It sublimes on heating to 1500°C. Its solubility in water is 27.6 g/100 cm^3 at 0°C, 34.7 g/100 cm^3 at 20°C and 56.7 g/100 cm^3 at 100°C. It is very slightly soluble in alcohol, and soluble in glycerol. The theoretical potassium content, as K_2O, is 63.17 percent. It is reactive with concentrated sulfuric acid to produce hydrogen chloride.

5.5.2 Specification. Federal, O-P-553, Potassium Chloride (Muriate of Potash); For Fertilizer Purposes.

5.5.2.1 Requirements. The federal specification covers one grade of potassium chloride with the requirement that the potash content shall be not less than 60 percent by weight water soluble, calculated as K_2O.

5.5.3 Use. Potassium chloride, agricultural grade is intended for military use as a fertilizer. Potassium chloride, industrial grade, is intended for military use in the manufacture of other potassium compounds. Commercial applications are the same.

5.5.4 Safety. Potassium chloride dust can be irritating to the upper respiratory tract and eyes, and exposure to dust shall be avoided. There is no PEL or TLV referenced for potassium chloride. In case of eye exposure, irrigate with water for at least twenty minutes and obtain medical attention. (Refer to 4.3.1)

5.5.5 Storage. Potassium chloride shall be stored in tightly sealed containers in a cool dry place. (Refer to 4.3.2)

5.5.6 Disposal. In case of dry spills, gather up and place in containers. 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. Potassium Chromate K_2CrO_4 FW 194.20
Natural tarapacaite

5.6.1 Technical Description. Potassium chromate (pure) is in the form of yellow rhombic crystals with a refractive index of 1.74 for the β-form. It has a density of 2.732 g/cm^3 at 18°C. Referenced melting points are 968.3 to 975°C. Its solubility in water is 62.9 g/100 cm^3 at 20°C and 79.2 g/100 cm^3 at 100°C. Its solutions are alkaline. It is insoluble in alcohol. By addition of an acid to a potassium chromate solution, the yellow CrO_4^{2-} ions are converted to the orange-red dichromate ions $Cr_2O_7^{2-}$ by reaction with hydrogen ions, H^+. The reaction is reversed by addition of hydroxyl ions, OH^-, from a base. The chromate ion is an oxidizing agent, and can be reduced to the green Cr(III) ion by reducing agents.

5.6.2 Specification. Manufacturer's requirements. (No Government specification).

5.6.2.1 Requirements. Potassium chromate, technical, is commercially available from a chemical manufacturer as a granular material. No specification or typical analysis is available for this product. The melting point of this product is 973°C.

5.6.3 Use. Potassium chromate is intended for military use as a corrosion inhibitor. Commercial applications include use in production of chromium trioxide; and chromate pigments, such as barium chromate and lead chromate. It is also used in leather tanning and finishing.

5.6.4 Safety. Potassium chromate, is an oxidizing agent, and in contact with finely divided oxidizable materials, such as organic compounds, carbon, sulfur, or metals, forms explosively reactive mixtures that are very sensitive to impact or friction. If present in a fire it can support combustion. Potassium chromate is a strong irritant of the eyes, skin and mucous membranes. As a Cr(VI) compound, it is considered a confirmed carcinogen by the International Agency for Research on Cancer (IARC) and Transactions of ACGIH. The PEL for potassium chromate, as CrO_3, is 0.1 mg/m^3. The TLV, as a water soluble Cr(VI) compound, is 0.05 mg/m^3 as Cr. In case of contact with the skin, wash affected area thoroughly with water. For eyes irrigate with water for at least twenty minutes, and obtain medical attention. (Refer to 4.3.1)

5.6.5 Storage. Potassium chromate shall be stored in tightly sealed containers away from heat sources and reducing agents. (Refer to 4.3.2)

5.6.6 Disposal. In case of dry spills, gather up and place in containers. In case of small solution spills, control with nonreactive absorbent. In case of large solution spills, dike to prevent spreading. Waste products containing Cr(VI) shall be reduced to Cr(III), and alkali added to precipitate Cr(III) as sludge. Where permitted by governing laws and regulation, the sludge can be encased in concrete for disposal in a permitted landfill. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4)

Potassium chromate has an EPA Hazardous Waste Classification of EP Toxic - Waste No. D007.

5.7 Name. Potassium Dichromate $K_2Cr_2O_7$ FW 294.19
Potassium bichromate

5.7.1 Technical Description. Potassium dichromate (pure) is in the form of orange-red monoclinic or triclinic crystals with a refractive index of 1.738, and a density of 2.676 g/cm^3 at 25°C. It has a transition point from triclinic to monoclinic form at 241.6°C, and a melting point of 398°C. It decomposes at about 500°C. It is not hygroscopic, and its solubility in water is 4.9 g/100 cm^3 at 0°C and 102 g/100 cm^3 at 100°C. Its aqueous solutions are acidic. It is insoluble in alcohol. On heating to decomposition it releases oxygen, and forms Cr_2O_3 and K_2CrO_4. By addition of a base to a potassium dichromate solution, the orange-red $Cr_2O_7{}^{2-}$ ions are converted to the yellow $Cr_2O_4{}^{2-}$ ions by reaction with hydroxyl ions, OH^-. The reaction is reversed by addition of an acid. The dichromate ion is a strong oxidizing agent, and can be reduced to the green Cr(III) ion by reducing agents.

5.7.2 Specification. Federal, O-P-559, Potassium Dichromate (Potassium Bichromate) Technical Grade.

5.7.2.1 Requirements. The federal specification covers one type and grade of potassium dichromate with the chemical and physical characteristics conforming to the requirements shown in Table VI. The potassium dichromate shall be in crystalline form and not caked in the container.

TABLE VI. Potassium Dichromate, Technical - federal specification requirements.

Assay, as $K_2Cr_2O_7$, % by wt, min	99.0
Volatile matter (115° to 125°C), % by wt, max	0.2
Water insoluble matter, % by wt, max	0.1
Sulfates, as SO_4, % by wt, max	0.1
Chlorides, as Cl, % by wt, max	0.1
Particle size	
Pass through US Sieve No. 10	
(2.00 mm), % by wt, min	100
Pass through US Sieve No. 100	
(150 micrometers), % by wt, max	25

5.7.3 Use. Potassium dichromate is intended for military use as an oxidizer in pyrotechnics, and as a corrosion inhibitor additive for boilers and cooling systems. Commercial applications include use as an oxidizer in matches, as a corrosion inhibitor additive, as a chemical intermediate for the production of chromium trioxide, as an oxidizing agent in the production of organic compounds, as a depolarizer for dry cells, and in the manufacture of frits, glass and glazes.

5.7.4 Safety. Potassium dichromate is a strong oxidizing agent, and in contact with finely divided oxidizable materials, such as organic compounds, carbon, sulfur, or metals, forms violently reactive mixtures. In the presence of fire or other sources of heat, potassium dichromate will decompose to release oxygen and support combustion. Dry clothing, leather or paper, contaminated with potassium dichromate, can be easily ignited. Potassium dichromate is a strong irritant of the eyes, skin and mucous membranes. As a Cr(VI) compound, it is considered a confirmed carcinogen by the International Agency for Research on Cancer (IARC) and Transactions of ACGIH. The PEL for potassium dichromate, as CrO_3, is 0.1 mg/m^3. The TLV, as a water soluble Cr(VI) compound, is 0.05 mg/m^3 as Cr. In case of contact with the skin, wash affected area thoroughly with soap and water and then flush with water to remove completely. For eyes irrigate with water for at least twenty minutes, and obtain medical attention. (Refer to 4.3.1)

5.7.5 Storage. Potassium dichromate shall be stored in tightly sealed containers away from heat sources and reducing agents, including combustible material. (Refer to 4.3.2)

5.7.6 Disposal. In case of dry spills, gather up and place in containers. In case of small solution spills, control with nonreactive absorbent. In case of large solution spills, dike to prevent spreading. Waste products containing Cr(VI) shall be reduced to Cr(III), and alkali added to precipitate Cr(III) as sludge. Where permitted by governing laws and regulation, the sludge can be encased in concrete for disposal in a permitted landfill. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4)

Potassium dichromate has an EPA Hazardous Waste Classification of EP Toxic - Waste No. D007.

5.8 Name. Potassium Nitrate KNO_3 FW 101.11
Nitrate of potash
Saltpeter

5.8.1 Technical Description. Potassium nitrate (pure) is in the form of colorless rhombic or trigonal crystals with indices of refraction of 1.335, 1.5056, and 1.5064. It has a density of 2.109 g/cm^3 at 16°C. It has a transition point of trigonal at 129°C, and a melting point of 334°C. It decomposes at 400°C. It is slightly hygroscopic, and its solubility in water is 13.3 g/100 cm^3 at 0°C, and 247 g/100 cm^3 at 100°C. It is very soluble in liquid ammonia and glycerol. It is insoluble in alcohol. Potassium nitrate decomposes on heating to evolve oxygen and form potassium nitrite, KNO_2. Potassium nitrate is an oxidizing agent.

5.8.2 Specification. Military, MIL-P-156, Potassium Nitrate.

5.8.2.1 Requirements. The military specification covers three classes of potassium nitrate with the chemical requirements shown in Table VII, and the granulation requirements are shown in Table VIII.

TABLE VII. Potassium Nitrate - chemical requirements.

	Class 1	Class 2	Class 3
Nitrogen, %, min	13.77	13.77	13.77
Ammonium compounds	None	None	---
Sodium, as oxide, %, max	0.25	0.25	---
Calcium and magnesium, as oxides, %, max	0.5	0.5	0.5
Iron and aluminum, as oxides, %, max	0.5	0.5	---
Chlorates and perchlorates, as $KClO_4$, %, max	0.5	0.5	0.5
Chlorides, as KCl, %, max	0.07	0.07	0.07
Water insoluble material, %, max	0.1	0.1	0.1
Moisture, %, max	0.2	0.2	0.2
pH value	7 ± 1	7 ± 1	7 ± 1
Grit	None	None	None

TABLE VIII. Potassium Nitrate (classes 2 and 3) - granulation requirements.

	Class 2	Class 3
Pass through US Sieve No., %, min 1/		
No. 60 (250 micrometers)	99.9	-----
No. 80 (180 micrometers)	----	99.9
No. 100 (150 micrometers)	40	----

1/ Sieve dimensions in accordance with ASTM E 11.

Class 1 potassium nitrate shall be furnished in lump form.

5.8.3 Use. Potassium nitrate, technical grade, is intended for military use as follows:

Class 1 - For use in black powder and chemical munitions.
Class 2 - For use in pyrotechnic compositions.
Class 3 - For use in propellants.

Commercial applications include use in pyrotechnic, explosive and propellant compositions, glass manufacture, and metallurgy. It is also useful as a fertilizer.

5.8.4 Safety. Potassium nitrate is a strong oxidizing agent, and in contact with finely divided oxidizable material, such as organic compounds, carbon, sulfur or metals, forms explosively reactive mixtures that are sensitive to impact or friction. In the presence of fire or other sources of heat, potassium nitrate will decompose to release oxygen and support combustion. Potassium nitrate dust can be irritating to the upper respiratory tract eyes and skin, and exposure to dust shall be avoided. There is no PEL or TLV referenced for potassium nitrate. In case of eye exposure, irrigate with water for at least twenty minutes and obtain medical attention. (Refer to 4.3.1)

5.8.5 Storage. Potassium nitrate shall be stored in tightly sealed containers in a cool dry place, away from combustible or oxidizable materials. (Refer to 4.3.2)

5.8.6 Disposal. In case of dry spills, gather up and place in containers. In case of small solution spills, control with nonreactive absorbent. In case of large solution spills dike to prevent spreading. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4)

Potassium nitrate has an EPA Hazardous Waste Classification of Ignitable - Waste No. D001.

5.9 Name. Potassium Perchlorate $KClO_4$ FW 138.55
Potassium hyperchlorate

5.9.1 Technical Description. Potassium perchlorate (pure) is in the form of colorless rhombic crystals with a density of 2.52 g/cm^3 at 10°C, and a melting point of 610°C. It decomposes on heating to 653°C. Its solubility in water is 0.75 g/100 cm^3 at 0°C, 21.8 g/100 cm^3 at 100°C. Potassium perchlorate is more stable and less reactive than potassium chlorate at room temperature. Potassium perchlorate is a strong oxidizing agent and is very reactive with reducing agents, such as carbon, sulfur, organic compounds, and finely divided metals, when heated. It is reduced to potassium chloride by such reactions. Potassium perchlorate reacts with sulfuric acid to form perchloric acid, which is a very strong oxidizing agent that is unstable at concentrations above 72 percent.

5.9.2 Specification. Military, MIL-P-217, Potassium Perchlorate.

5.9.2.1 Requirements. The military specification covers two grades and five classes of potassium perchlorate.

Grade A - Low moisture content.
Grade B - High moisture content.
Class 1 - Through US Standard Sieve No. 40.
Class 2 - Through US Standard Sieve No. 100.
Class 3 - Through US Standard Sieve No. 80 and 200.
Class 4 - Average particle diameter in micrometers, 20 ± 5.
Class 5 - Average particle diameter in micrometers, 70 ± 30.

The chemical characteristics are shown in Table IX, and the granulation and particle size characteristics are shown in Table X.

TABLE IX. Potassium Perchlorate - military specification requirements - chemical characteristics.

	Grade A (% by wt)	Grade B (% by wt)
Assay, as $KClO_4$, min	99.0	99.0
Moisture, max	0.02	0.04
Chlorides, as KCl, max	0.10	0.10
Chlorates, as $KClO_3$, max	0.10	0.086
Hypochlorites	None	None
Bromates, as $KBrO_3$, max	0.02	0.004
Sodium, as $NaClO_4$, max	0.20	0.20
Calcium and magnesium salts, as oxides, max	0.20	0.080
Grit and water insoluble material, max	0.02	0.02
Iron, as Fe_2O_3, max	---	0.004
pH of water solution	7 ± 1.5	7 ± 1.5

TABLE X. Potassium Perchlorate - military specification requirements - granulation and particle size characteristics.

US Standard Sieves - Passing	Class 1 (% by wt)	Class 2 (% by wt)	Class 3 (% by wt)	Class 4 ---	Class 5 ---
No. 40 (425 micrometers)	99.0	---	---	---	---
No. 80 (180 micrometers)	---	---	99 min	---	---
No. 100 (150 micrometers)	---	99.9	---	---	---
No. 200 (75 micrometers)	---	---	80 to 90	---	---
Average Particle Diameter (micrometers)				20±5	70±30

5.9.3 Use. Potassium perchlorate is intended for military use as follows:

Grade A is intended for use in pyrotechnics, explosives and propellants.
Grade B is intended for use by the Navy in rocket propellants.

Commercial applications include use in railroad flares; in pyrotechnics, including fireworks, where it replaces potassium chlorate for improved mixture stability; and in photography.

5.9.4 Safety. Potassium perchlorate is a strong oxidizing agent, and in contact with finely divided oxidizable materials, such as organic compounds, carbon, sulfur, or metals, forms explosively reactive mixtures that are sensitive to impact or friction. Dry clothing, leather, or paper, contaminated with potassium perchlorate, can be easily ignited. Potassium perchlorate dust can be irritating to the upper respiratory tract, eyes and skin, and exposure to dust shall be avoided. There is no PEL or TLV referenced for potassium perchlorate. In case of skin exposure, wash affected areas with water. In case of eye exposure, irrigate with water for at least twenty minutes and obtain medical attention. (Refer to 4.3.1)

5.9.5 Storage. Potassium perchlorate shall be stored in tightly sealed containers in a cool dry place, away from combustible or oxidizable material. Access by atmospheric moisture into the containers shall be prevented. (Refer to 4.3.2)

5.9.6 Disposal. In case of dry spills, gather up and place in containers. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4)

Potassium perchlorate has an EPA Hazardous Waste Classification of Ignitable - Waste No. D001.

5.10 Name. Potassium Permanganate $KMnO_4$ FW 158.04
Permanganate of potash

5.10.1 Technical Description. Potassium permanganate (pure) is in the form of purple rhombic crystals with a refractive index of 1.59, and a density of 2.703 g/cm^3. On heating it starts to decompose at 150°C. Its solubility in water is 6.38 g/100 cm^3 at 20°C, 25 g/100 cm^3 at 65°C and 50 g/100 cm^3 at 100°C. It is soluble in methyl alcohol and acetone. On heating below 200°C, it decomposes to evolve oxygen and form K_2MnO_4 and MnO_2. On heating above 200°C, it decomposes to evolve oxygen and form K_2MnO_3 and MnO_2. Potassium permanganate is a strong oxidizing agent. In acid solutions, the MnO_4^- ions are reduced to Mn^{2+} ions; and in alkaline solutions the MnO_4^- ions are reduced to MnO_2 by reaction with reducing agents. Potassium permanganate can react with hydrochloric acid to produce chlorine.

5.10.2 Specification. Military, MIL-P-11970, Potassium Permanganate, Technical (Metric).

5.10.2.1 Requirements. The military specification covers a technical grade of potassium permanganate in the form of free-flowing dark purple crystals, that are free from any lumps or caking. The assay shall not be less than 97.0 percent as $KMnO_4$.

5.10.3 Use. Potassium permanganate, technical grade, is intended for military use in the preparation of scrubbing solutions for hydrogen and carbon dioxide generators; and for the treatment of water supplies for potable and industrial use. Commercial applications include use as an oxidizing agent in organic synthesis and inorganic chemical manufacture, water treatment, metal surface treatment, purification of gases, and control of hydrogen sulfide and acetylene emissions from not slag quenching.

5.10.4 Safety. Potassium permanganate is a strong oxidizing agent, and in contact with finely divided oxidizable materials, such as organic compounds, carbon, sulfur or metals, forms explosively reactive mixtures that are sensitive to impact or friction. In the presence of fire or other sources of heat, potassium permanganate will decompose to release oxygen and support combustion. Potassium permanganate dust can be irritating to the upper respiratory tract, eyes and skin, and exposure to dust shall be avoided. The PEL and TLV for manganese compounds, as Mn, is 5 mg/m^3 as a ceiling limit. In case of skin exposure, wash affected areas with water. In case of eye exposure, irrigate with water for at least twenty minutes and obtain medical attention. (Refer to 4.3.1)

5.10.5 Storage. Potassium permanganate shall be stored in tightly sealed containers in a cool dry place, away from combustible or oxidizable material. (Refer to 4.3.2)

5.10.6 Disposal. In case of dry spills, gather up and place in containers. In case of small solution spills, control with nonreactive absorbent. In case of large solution spills, dike to prevent spreading. Reduce the permanganate and precipitate as sludge, as shown by disappearance of purple color from the solution. The sludge can be buried in a permitted landfill. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4)

Potassium permanganate has an EPA Hazardous Waste Classification of Ignitable - Waste No. D001.

5.11 Name. Potassium Sulfate K_2SO_4 FW 174.27
Arcanite (natural)
Sulfate of potash

5.11.1 Technical Description. Potassium sulfate (pure) is in the form of colorless rhombic or hexagonal crystals with refractive indices of 1.494, 1.495, and 1.497. It has a density of 2.662 g/cm^3, a transition point of 588°C, a melting point of 1069°C, and a boiling point of 1689°C. Its solubility in water is 12 g/100 cm^3 at 25°C and 24.1 g/100 cm^3 at 100°C. It is insoluble in alcohol and acetone. Potassium sulfate reacts with sulfuric acid to form potassium hydrogen sulfate, $KHSO_4$. A solution of K_2SO_4 mixed with a solution of $Al_2(SO_4)_3$, can form crystals of potassium alum, $KAl(SO_4)_2 \cdot 12H_2O$, upon evaporation.

5.11.2 Specification. Military, MIL-P-193, Potassium Sulfate (For Ordnance Use).

5.11.2.1 Requirements. The military specification covers four types of potassium sulfate with the chemical requirements shown in Table XI for types I and II, and the granulation requirements shown in Table XII for types I, II, III, IV.

TABLE XI. Potassium Sulfate (for ordnance use) - chemical requirements - (types I and II).

Potassium sulfate purity (moisture-free basis):	
Based on sulfate content, %, min	99.0
Based on potassium content, %, min	99.0
Moisture, %, max	1.0

TABLE XI. Potassium Sulfate (for ordnance use) - chemical requirements - (types I and II) (Continued).

Insoluble matter, %, max	0.1
Grit	None
pH	7 ± 1
Chlorides, as KCl, %, max	0.02

TABLE XII. Potassium Sulfate (for ordnance use) - granulation requirements.

US Standard Sieve 2/	Type I		Type II 1/		Type III		Type IV	
	% min	% max	% min	% max	% min	% max	% min	% max
Through No. 4 (4.75 millimeter)	---	---	100	---	---	---	---	---
Retained on No. 30 (600 micrometer)	---	---	30	---	---	---	---	---
Through No. 50 (300 micrometer)	100	---	---	5	---	---	---	---
Retained on No. 70 (212 micrometer)	---	5	---	---	---	---	---	5
Through No. 100 (150 micrometer)	---	---	---	---	---	---	90	---
Through No. 200 (75 micrometer)	---	---	---	---	100	---	---	---
Retained on No. 325 (45 micrometer)	---	---	---	---	---	20	---	---

1/ The average particle size for Type II shall be 0.5 micrometers minimum.
2/ Sieve dimensions in accordance with ASTM E 11.

5.11.3 Use. Potassium sulfate is intended for military use as follows:

Type I - In the manufacture of propellants.
Type II - In flash-reducing mixtures.
Type III - As a filler in thermosetting resin potting applications.
Type IV - In ballistic salt rods.

Commercial applications include use in alum manufacture, glass manufacture, and in gypsum cements. An agricultural grade is used as a fertilizer for chloride-sensitive crops.

5.11.4 Safety. Potassium sulfate dust can be irritating to the upper respiratory tract, eyes, and skin. There is no PEL or TLV referenced for potassium sulfate. In case of skin exposure, wash affected areas with water. In case of eye exposure, irrigate with water for at least twenty minutes and obtain medical attention. (Refer to 4.3.1)

5.11.5 Storage. Potassium sulfate shall be stored in tightly sealed containers in a cool dry place. (Refer to 4.3.2)

5.11.6 Disposal. In case of dry spills, gather up and place in containers. 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.

5.12 Name. Silver Cyanide AgCN FW 133.88
Argentous cyanide

5.12.1 Technical Description. Silver cyanide (pure) is in the form of white hexagonal crystals with a density of 3.95 g/cm^3. It decomposes on heating to 320°C. It darkens on exposure to light. Silver cyanide is practically insoluble in water, with a solubility of 0.000023 g/100 mL at 20°C. It is soluble in a concentrated aqueous ammonia solution by formation of complex $[Ag(NH_3)_2]^+$ ions. It is soluble in an aqueous sodium or potassium cyanide solution by formation of complex $[Ag(CN)_2]^-$ ions. It is soluble in an aqueous sodium thiosulfate solution by formation of complex $[Ag(S_2O_3)_2]^{3-}$ ions. It is decomposed by strong mineral acids liberating hydrogen cyanide (HCN). It is oxidized by hot concentrated nitric acid. It is insoluble in alcohol. The theoretical silver content is 80.57 percent.

5.12.2 Specification. Manufacturer's requirements. (No Government specification).

5.12.2.1 Requirement. Commercially available silver cyanide, technical grade, is procured for military use with a minimum silver content of 80.0 percent by weight.

5.12.3 Use. Silver cyanide is intended for use in silver plating.

5.12.3 Safety. Silver cyanide is not burnable, but can emit irritating and toxic fumes if heated to decomposition. The PEL or TLV for cyanides, as CN, (including skin) is 5 mg/m^3. Contact of silver cyanide with acids shall be avoided to prevent release of toxic hydrogen cyanide. Contact of silver cyanide with the eyes, skin, and mucous membranes shall be avoided. (Refer to 4.3.1)

5.12.5 Storage. Silver cyanide shall be stored in a cool, dry place in tightly sealed containers, away from acids and acid fumes. (Refer to 4.3.2)

5.12.6 Disposal. In case of dry spills, gather up and place in containers for disposal. Silver cyanide, as a cyanide waste, can be oxidized by means of an alkaline solution of calcium hypochlorite before final disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4)

Silver cyanide has an EPA Hazardous Waste Classification of Acute Hazardous Toxic - Waste No. P104.

6. NOTES

6.1 Subject term (key word) listing.

Exposure limits, hazardous chemicals
Potassium Bicarbonate
Potassium Bifluoride
Potassium Carbonate
Potassium Chlorate
Potassium Chloride
Potassium Chromate
Potassium Dichromate
Potassium Nitrate
Potassium Perchlorate
Potassium Permanganate
Potassium Sulfate
Safety, hazardous chemicals
Silver Cyanide

6.2 Changes from previous issue. Asterisks or vertical lines are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

6.3 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.

Preparing activity: Army - EA

Project Number 6810-1026

Custodians:
Army - EA
Navy - YD
Air Force - 68

Review activities:
Army - AR, GL, MD, MI
DLA - GS

User activities:
Army - EL, ME
Navy - AS, MC, OS, SA, SH

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STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions – Reverse Side)

1. DOCUMENT NUMBER
MIL-STD-1207B

2. DOCUMENT TITLE INORGANIC SALTS AND COMPOUNDS, TECHNICAL GRADE (POTASSIUM BICARBONATE THROUGH SILVER CYANIDE) (METRIC)

3a. NAME OF SUBMITTING ORGANIZATION

4. TYPE OF ORGANIZATION *(Mark one)*

☐ VENDOR

☐ USER

☐ MANUFACTURER

☐ OTHER *(Specify)* ______

b. ADDRESS *(Street, City, State, ZIP Code)*

5. PROBLEM AREAS

a. Paragraph Number and Wording:

b. Recommended Wording:

c. Reason/Rationale for Recommendation:

6. REMARKS

7a. NAME OF SUBMITTER *(Last, First, MI)* – Optional

b. WORK TELEPHONE NUMBER *(Include Area Code)* – Optional

c. MAILING ADDRESS *(Street, City, State, ZIP Code)* – Optional

8. DATE OF SUBMISSION *(YYMMDD)*

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