

METRIC

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MILITARY STANDARD

INORGANIC SODIUM SALTS AND COMPOUNDS, TECHNICAL GRADE
(SODIUM BICARBONATE THROUGH SODIUM TRIPOLYPHOSPHATE)



AMSC N/A

FSC 6810

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FOREWORD

1. 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.
2. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commanding Officer, U.S. Army Chemical Research, Development and Engineering Center, ATTN: SMCCR-PET-S, Aberdeen Proving Ground, MD 21010-5423, by using the self-addressed Standardization Document Improvement Proposal (DDI426) appearing at the end of this document or by letter.
3. Sodium hydroxide and sodium sesquisilicate have been added since the last revision.

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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 inorganic salts and compounds, technical grade (sodium bicarbonate through sodium tripolyphosphate). 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 inorganic salts and compounds, technical grade (sodium bicarbonate through sodium tripolyphosphate), for application by the Department of Defense.

1.2 Application. Inorganic salts and compounds, technical grade (sodium bicarbonate through sodium tripolyphosphate), are used in formulating products such as pyrotechnics, propellants, explosives, metal cleaners, battery electrolytes, and water treatment chemicals. They are also used as chemical intermediates.

1.3 Classification. The items in this standard are classified on the basis of chemical composition as inorganic salts and compounds.

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2. REFERENCED DOCUMENTS

2.1 Government documents.

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

SPECIFICATIONS

FEDERAL

A-A-0051912	Sodium Fluoride, USP, Powder
O-S-571	Sodium Carbonate, Anhydrous, Technical
O-S-576	Sodium Bicarbonate, Technical
O-S-588	Sodium Chromate, Anhydrous, Technical
O-S-595	Sodium Dichromate, Dihydrate, Technical
O-S-602	Sodium Hypochlorite Solution
O-S-604	Sodium Metasilicate, Technical
O-S-634	Sodium Nitrate, Technical (Nitrate of Soda)
O-S-635	Sodium Polyphosphate, Technical
O-S-639	Sodium Phosphate, Dibasic, Anhydrous, Technical
O-S-642	Sodium Phosphate, Tribasic, Technical, Anhydrous, Dodecahydrate, and Monohydrate, Technical
O-S-1926	Sodium Chloride, Technical
P-S-651	Sodium Orthosilicate, Technical
RR-S-366	Sieve, Test
PPP-C-2020	Chemicals, Liquid, Dry, and Paste, Packaging of

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MIL-S-322	Sodium Nitrate
MIL-S-13727	Sodium Phosphate, Monobasic, Anhydrous, Technical
MIL-S-13943	Sodium Sulfite, Anhydrous, Technical
MIL-S-13985	Sodium Hydrosulfite, Anhydrous, Technical
MIL-S-16917	Sodium Bisulfate (Niter Cake)
MIL-S-24521	Sodium Nitrite, Technical
MIL-S-50004	Sodium Sulfate, Anhydrous, Technical (For Ammunition Use)
MIL-S-51078	Sodium Hexametaphosphate, Technical
DOD-S-51517	Sodium Pyrophosphate, Anhydrous, Technical

STANDARDS

FEDERAL

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

MIL-STD-129 Marking for Shipment and Storage

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

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

PUBLIC LAW (PL)

94-580 Resource Conservation and Recovery Act

CODE OF FEDERAL REGULATIONS (CFR)

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

DEPARTMENT OF DEFENSE (DOD)

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

GOVERNMENT PRINTING OFFICE (GPO)

Style Manual

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

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH (NIOSH)

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

(Application for copies should be addressed to NIOSH, 4676 Columbia Parkway, Cincinnati, OH 45226-1998.)

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

Z87.1 Occupational and Educational Eye and Face Protection

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

AMERICAN SOCIETY FOR TESTING AND MATERIAL (ASTM)

D 3400	Liquid Sodium Silicates
D 456	Caustic Soda (Anhydrous)
D 457	Modified Soda (Sesquicarbonate Type)
D 537	Sodium Metasilicate
D 538	Trisodium Phosphate
D 594	Sodium Sesquisilicate
D 595	Tetrasodium Pyrophosphate Anhydrous
D 632	Sodium Chloride
D 928	Sodium Bicarbonate
D 929	Borax
E 380	Metric Practice
E 1099	Soda Ash, Anhydrous (Sodium Carbonate, Anhydrous)

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

AMERICAN WATER WORKS ASSOCIATION (AWWA)

B 702 Sodium Silicofluoride

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.)

(Non-Government standards and other publications are normally available from the organizations that prepare or distribute the documents. These documents also may be available in or through libraries or other informational services.)

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

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3. DEFINITIONS

Abbreviations: (Abbreviations conform to the GPO Style Manual and as shown hereinafter.)

- n_D^{20} - Refractive index at 20°C. The superscript indicates the temperature in degrees Celsius. The subscript indicates the wavelength for sodium light.
- bp_{760} - Boiling point at 760 mm of mercury. The subscript indicating the pressure in millimeters of mercury.
- d_{20}^{20} - Specific gravity at 20°C and 20°C. The superscript indicating the temperature of the measured liquid, and the subscript indicating the temperature of water, viz. This example is 20 degrees Celsius for the liquid under consideration and 20 degrees is the comparative liquid water at 20 degrees Celsius.
- dp_{760} - Dry point at 760 mm of mercury. The subscript indicating the pressure in millimeters of mercury.
- % by wt - Percent by weight.
- PEL - Permissible Exposure Limits.
- LD_{50} - Lethal dose where the subscript indicates the percent of the population who do not survive.
- TCLP - Toxicity Characteristics Leaching Procedures
- TWA - Time weighted average is the employee's average airborne exposure in any 8-hour work shift of a 40-hour work week, which shall not be exceeded.
- Pt/Co scale - Platinum-Cobalt scale for color.
- cal/g-deg - Specific heat in calories per gram per Celcius degree.

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. Use of respirators is allowed under very specific circumstances to include: when effective engineering controls are not feasible or while being instituted. Respirators shall be approved by the National Institute for Occupational Safety (NIOSH) or by the Mine Safety and Health Administration (MSHA). Respiration protection programs shall be established. Employees shall be medically cleared, trained and fit tested prior to using respiratory protection. Respirators shall be selected based on hazard.

4.3.1.2 Skin protection. Personnel using these compounds shall be provided with and required to use protective gloves, sleeves, aprons, and boots whenever indicated. Selection of protective clothing shall be based on evaluation of compounds and their use. Supporting safety or industrial hygiene personnel should be contacted to ensure proper selection of protective clothing. 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. Emergency showers and eye lavages shall meet minimum requirements of ANSI Standard Z87.1. Access to showers and eye lavages shall not be obstructed. 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 clean, potable water for at least 20-30 minutes, open eyelids during irrigation, and obtain medical attention immediately, continue eye irrigation during transport. (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 Exercise. Participation in training exercises shall be stressed to demonstrate skills in the use of personal protective equipment and emergency response equipment.

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

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

4.3.2.2 Water-sensitive fire and explosive hazardous materials. These are materials that react on contact with water or steam to ignite or evolve heat or explosive gases. Such materials exhibit the characteristic of reactivity (R) as designated by the EPA in Section 261.23 of the above reference. (Refers only to

materials that have become waste materials.) These materials shall be stored in well-ventilated, cool, dry areas. All containers shall be tightly sealed. These materials are a fire hazard in contact with water or moisture; therefore, it is essential that no sprinkler be used. Otherwise, the building shall conform to that required for storage of flammable materials. The building shall be water-proof, located on high ground, and separated from other storage areas.

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 and Physical Agents and Biological Exposure Indices, adopted by the American Conference of Government Industrial Hygienists (ACGIH); current Occupational Safety and Health Administration (OSHA) Permissible Exposure Limits (PEL), 29 CFR, Sections 1910.1000 through 1910-1101; 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. The latest information should be provided by consulting competent professionals for values and cautions necessary in handling chemicals described herein.

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. (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, which refers only to materials that have become waste materials. Some commercial chemical products are listed as acute hazardous in toxicity under Subpart D, Section 261.33(e).

4.4 Pollution and disposal.

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

4.4.2 Disposal of excess or unserviceable material. To minimize disposal problems, it is recommended that no more than a one year's supply of each item listed in this standard be stocked. When stocks have been declared excess or

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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 TCLP) 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 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.

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	<u>Name.</u> SODIUM BICARBONATE	NaHCO_3	FW 84.0
	Baking Soda		
	Hydrosodic Carbonate		
	Sodium Acid Carbonate		
	Sodium Hydrogen Carbonate		
	Vichy Salts		

5.1.1 Technical description. Sodium bicarbonate is in the form of white monoclinic prisms or powder which has a cooling, slightly alkaline taste. It is stable in dry air, but slowly decomposes in moist air forming a minor amount of sodium carbonate and is slightly soluble in ethyl alcohol. The aqueous solution is mildly alkaline even though structurally it is an acid salt of carbonic acid. It has properties shown in Table I.

TABLE I. Physical properties of sodium bicarbonate.

Property	Characteristics
Melting point, °C	270 ^{1/}
Refractive index, n_D^{20}	1.5000
Solubility in water (per 100ml) g	
0°C	6.9
60°C	16.4
Specific gravity, d^{20}	2.159

^{1/}Decomposes at this temperature giving off carbon dioxide.

5.1.2 Specifications. Federal, O-S-576, Sodium Bicarbonate and ASTM D 928, Specification for Sodium Bicarbonate.

5.1.2.1 Requirements. Sodium bicarbonate is furnished in Class 1 - coarse powder and Class 2 powdered and conforms to the physical and chemical characteristics in Table II. The particle size is as shown in Table III.

TABLE II. Physical and chemical characteristics of sodium bicarbonate.

Characteristic	Requirement			
	O-S-576		ASTM D 928	
	Min	Max	Min	Max
	<u>% By Wt</u>	<u>% By Wt</u>	<u>% By Wt</u>	<u>% By Wt</u>
Assay	98.0	---	98.0	---
Chlorine	---	0.0	---	---
Loss on heating	35.5	---	---	---
Total alkalinity (as sodium bicarbonate)	98.0	100.3	98.0	100.3
Particle size graduation:				
Passing USS Sieve Size No. 100	99.0	---	---	---
Passing USS Sieve Size No. 200	50.0	80.0	---	---
Sodium carbonate (as Na_2CO_3)	---	---	---	1.5
Insoluble matter	---	0.1	---	0.1

TABLE III. Particle size of sodium bicarbonate.

Sieve Size	Requirement			
	Class 1		Class 2	
	Min	Max	Min	Max
	<u>% By Wt</u>	<u>% By Wt</u>	<u>% By Wt</u>	<u>% By Wt</u>
Pass through No. 100 sieve	99.0	---	99.0	---
Pass through No. 200 sieve	50.0	70.0	55.0	80.0

5.1.3 Use. Sodium bicarbonate is for use in soda-acid fire extinguishers and for other purposes where a technical grade, mildly alkaline material is desired. It is not intended for consumption or medicinal purposes. Typical commercial applications of sodium bicarbonate include use as an ingredient in baking powder and effervescent medicinals, where by reaction with an acid it liberates the necessary gas, carbon dioxide. For these uses it is more suitable than sodium carbonate because the bicarbonate requires only half as much acid to neutralize it. It is also used in manufacturing effervescent salts and beverages, in artificial mineral water, as a reagent in analytical chemistry, in gold and platinum plating, in the tanning industry, in treating wool and silk, in ceramics, for preserving butter, and for the prevention of timber mold.

5.1.4 Safety. Sodium bicarbonate is nonflammable and nontoxic. Normal laboratory safety precautions are required when handling sodium bicarbonate. Sodium bicarbonate is considered a nuisance particulate with a TLV of 10 mg/m³ of total dust. Sodium bicarbonate shall be used with adequate ventilation. (Refer to 4.3.1)

Sodium bicarbonate reacts with acids to evolve carbon dioxide.

5.1.5 Storage. Sodium bicarbonate shall be stored in the original containers (100-lb or 400-lb drums) and in a cool, dry place away from acids. (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)

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

5.2 Name. SODIUM BISULFATE, ANHYDROUS NaHSO₄ FW 120.07
 Niter Cake
 Nitre Cake
 Sodium Acid Sulfate
 Sodium Hydrogen Sulfate
 Sodium Pyrosulfate

5.2.1 Technical description. Sodium bisulfate is a hygroscopic crystalline powder composed of colorless to light straw yellow triclinic crystals as granules or globules in ground or fused form. It will decompose at its boiling point or when dissolved in alcohol. It is insoluble in ammonia and is soluble in water at a rate of 50g (0°C) and 100g (100°C) in 100 ml of water. Its specific gravity

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is 2.742. Its melting point is less than 315°C. When made into an aqueous solution, it becomes strongly acid. Sodium bisulfate covered by this standard shall meet requirements of Type I, in referenced specification.

5.2.2 Specifications. Military, MIL-S-16917, Sodium Bisulfate (Niter Cake).

5.2.2.1 Requirements. Chemical, physical and granulation requirements for anhydrous sodium bisulfate are shown in Tables IV and V.

TABLE IV. Chemical and physical characteristics of sodium bisulfate, anhydrous.

Characteristic	Requirement	
	Min	Max
	<u>% By Wt</u>	<u>% By Wt</u>
Assay (as NaHSO ₄)	73.5	---
Acidity (as H ₂ SO ₄)	30	---
Iron	---	0.15
Insoluble matter	---	0.25
Moisture content	---	1.5

TABLE V. Particle size of sodium bisulfate, anhydrous.

Particle Size	Requirement	
	Min	Max
	<u>% By Wt</u>	<u>% By Wt</u>
6	---	---
8	0	5
20	30	---
30	---	---
40	90	---

5.2.3 Use. Sodium bisulfate is for use as a flux in dissolving minerals and in pickling baths as a substitute for sulfuric acid. Typical commercial applications of sodium bisulfate include use as a controlled acid reagent in dye baths and in general as a mildly acid buffered ingredient. A popular cleaner for automobile radiators and vitreous porcelain consists of this compound with minor added ingredients. It is also used in the manufacture of sodium sulfate, salt cake, soda alum, paper, soap, perfumes, brick, mineral water, glue, carbon dioxide gas; as a water disinfectant; and in washing wool. It is used in the bilirubin assay.

5.2.4 Safety. Sodium bisulfate is nonflammable and nontoxic. Normal laboratory safety precautions are required when handling sodium bisulfate.

Sodium bisulfate is considered a nuisance particulate with a PEL and TLV of 5 mg/m³. The LD₅₀ orally in rats is 4.07 g/kg. (Refer to 4.3.1)

5.2.5 Storage. Sodium bisulfate shall be stored in the original containers (100-pound or 400-pound drums) in a cool dry place. (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)

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

5.3 Name. SODIUM BORATE, DECAHYDRATE Na₂B₄O₇·10H₂O FW 381.37
 Borax
 Borax Decahydrate
 Rasorite
 Sodium Biborate
 Sodium Pyroborate
 Sodium Tetraborate
 Tincal
 Tinkal
 Zola

5.3.1 Technical description. Sodium borate is a colorless and odorless material that comes in the form of monoclinic crystals, granules or powder. Sodium borate is efflorescent in dry air. At red heat it fuses into a glassy mass known as borax glass. Material in the 1 (0.45 kg) and 5 lb (2.25 kg) cartons is in the form of a fine white powder. Material in the 100 lb (45 kg) bag shall be granular in the form of small crystals. Sodium borate has characteristics shown in Table VI. It is insoluble in acid and absolute alcohol, soluble in glycerol and slightly soluble in ethyl alcohol.

TABLE VI. Physical and chemical characteristics of sodium borate.

Characteristic	Nominal Value
Boiling point, °C	320 ^{1/}
Melting point, °C	75 ^{2/}
Refractive indices (of crystal faces), n _D ²⁰	1.447, 1.469, 1.472
Solubility (H ₂ O, g/100 ml)	
25°C	8
100°C	170
Specific gravity, d ²⁰	1.73

^{1/}Loss of H₂O

^{2/}Loss of 8H₂O at 60°C

5.3.2 Specifications. ASTM D 929, Specification for Borax.

5.3.2.1 Requirements. Sodium borate is as shown in Table VII. The particle size is as shown in Table VIII, when specified.

TABLE VII. Chemical and physical properties of sodium borate.

Property	Requirements	
	Min	Max
	<u>% By Wt</u>	<u>% By Wt</u>
Assay ($\text{Na}_2\text{B}_4\text{O}_7$)	52.5	---
Free acid	---	None
Free alkali (as Na_2O)	---	0.2
Water insoluble matter	---	0.1

TABLE VIII. Particle size for sodium borate.

Particle Size	Requirements			
	1 & 5 lb. cartons		100 lb bags	
	Min	Max	Min	Max
	<u>% By Wt</u>	<u>% By Wt</u>	<u>% By Wt</u>	<u>% By Wt</u>
Retained on 2.0 mm sieve (No. 10 US Standard Sieve)	---	---	---	0.1
Retained on $710\mu\text{m}$ sieve (No. 25 US Standard Sieve)	---	0.1	---	---
Retained on $180\mu\text{m}$ sieve (No. 80 US Standard Sieve)	---	---	70	---
Retained on $75\mu\text{m}$ sieve (No. 200 US Standard Sieve)	12	---	---	---

5.3.3 Use. Sodium borate decahydrate is for use as a cleansing and stiffening agent in laundry work. Borax is used in medicine as a mild antiseptic. As a preservative, borax is not permitted in food products. Typical commercial applications include use in the manufacture of borax soaps, detergents, ceramics, borates, dyes, special glasses, inks, jewelry solder, synthetic gems, washing compounds, varnishes, pigments, cosmetics, starches; as a scouring and degumming agent; detergents for wool and woolen fabrics; mordant in printing and dyeing; solvent bleach; preservative for wool and hides; laboratory reagent; as a flux; gold refining; enameling metals; and in fertilizers, photography, and insulation materials.

5.3.4 Safety. Sodium borate is nonflammable and nontoxic. Normal laboratory safety precautions are required when handling sodium borate. Sodium borate is considered a nuisance particulate. The TLVs for borate depend on the number of waters of hydration. The TLV for anhydrous borates is 1 mg/m^3 . The TLV for decahydrate borates is 5 mg/m^3 . The TLV for pentahydrate borates is 1 mg/m^3 . Sodium borate shall be used with adequate ventilation. The LD_{50} orally in rats is 5.66 g/kg . (Refer to 4.3.1)

5.3.5 Storage. Sodium borate shall be stored in the original containers (1-pound and 5-pound cartons and 100-pound sacks) in a cool, dry place. (Refer to 4.3.2)

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

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

5.4 Name. SODIUM CARBONATE, ANHYDROUS Na_2CO_3 FW 105.99
 Calcined Soda
 Soda Ash

5.4.1 Technical description. Sodium carbonate is an odorless, hygroscopic powder with an alkaline taste. It is insoluble in alcohol and decomposes in acid and combines with water with evolution of heat. Sodium carbonate has characteristics shown in Table IX.

TABLE IX. Characteristics of sodium carbonate.

Characteristic	Nominal Value
Melting point, °C	851
Specific gravity, d^{20}	2.533
Refractive index, n_D^{20}	1.535
Solubility (H_2O , g/100 ml)	
0°C	7.1
100°C	45.5
pH (saturated solution)	11.6

5.4.2 Specifications. O-S-571, Sodium Carbonate, Anhydrous, Technical and ASTM E 1099, Specification for Soda Ash, Anhydrous (Sodium Carbonate, Anhydrous).

5.4.2.1 Requirements. Sodium carbonate is furnished in Types as follows: Type I (ordinary or light ash), Type II (medium ash), Type III (dense or heavy ash) and Type IV (briquets).

5.4.2.1.1 Federal. Anhydrous sodium carbonate in 5 lb (2.3 kg) boxes shall be light ash or heavy ash in powder or granular form; in 10 lb (4.5 kg) and 100 lb (45 kg) bags in briquet form; in 25 lb (11.3 kg) and 100 lb (45 kg) bags of light, medium, or heavy ash in powder or granular form; in 100 lb (45 kg) bags of medium ash in granular or powder form; and in 300 lb (135 kg) drums of light ash in powder form. Material of light, medium, or heavy ash shall be a high-grade anhydrous sodium carbonate in powder or granular form, known commercially as 58 percent ash (Na_2O), which corresponds to 99 percent soda ash. Soda ash briquets shall be suitable for use with military water purification equipment. The briquets shall be made by fusing soda ash at approximately 2200°F, and casting the melt into briquets. Twenty-five briquets shall weigh 16 ± 1 ounces. Sodium carbonate is as shown in Tables X and XI.

TABLE X. Chemical properties of sodium carbonate (O-S-571).

All values are percents when sampled at the plant, except those in parenthesis which are percents when sampled elsewhere.	
Loss in heating	1.0 (4.0)
Water insolubles in dried material	0.25 (0.25)
Total alkalinity in dried material	
Powder or granular form	99.2
Briquets	98.0

TABLE XI. Apparent density of sodium carbonate (O-S-571).

Type	Pounds per Cubic Foot	
	Min	Max
Light ash (Type I)	29	37
Medium ash (Type II)	42	62
Heavy ash (Type III)	54	75

5.4.2.1.2 Commercial (ASTM). Commercial sodium carbonate is supplied in two grades, vis. light and heavy, as shown in Table XII.

TABLE XII. Chemical and physical characteristics of sodium carbonate (ASTM E 1099).

Characteristics	Requirements			
	Light		Dense	
	Min	Max	Min	Max
Na ₂ O, % by wt	57.8	---	58.0	---
Na ₂ CO ₃ , % by wt	98.8	---	99.2	---
Na ₂ SO ₄ , % by wt	---	0.20	---	0.20
Iron (Fe), ppm	---	40	---	30
Water insolubles, % by wt	---	0.1	---	0.1
Bulk density				
lb/ft ³	---	54	54	---
g/cm ³	---	0.86	0.86	---
Particle size (Screen Analysis), % by wt				
on U.S. No. 30 (600 μ m)	---	---	---	5
through U.S. No. 200 (75- μ m)	---	---	---	7

5.4.3 Use. Sodium carbonate, anhydrous is for use in various washing, cleaning, and scouring processes, with or without soap, as conditions may require when a moderately strong alkaline material is desired, and for the treatment of water. This standard is not intended to apply to soda ash used in glass making. Typical commercial applications of sodium carbonate include use in the manufacture of sodium salts, pharmaceutical products, soap, rubber, boiler compounds, printing inks, dry colors, perfume preparations, in synthesizing perfumes, glass, ceramics, waterproofing, paper, paints and enamelware. It is also used for softening water and leather, in cleaning compounds, and in metallurgical industries.

5.4.4 Safety. Sodium carbonate is nonflammable and nontoxic. Normal laboratory safety precautions are required when handling Sodium carbonate. Sodium carbonate is considered a nuisance particulate with a TLV of 10 mg/m³ of total dust. Sodium carbonate shall be used with adequate ventilation. The LD₅₀ in mice (i.p.) is 116.6 mg/kg. (Refer to 4.3.1)

Sodium carbonate reacts with acids to evolve carbon dioxide.

5.4.5 Storage. Sodium carbonate shall be stored in a cool, dry place in tightly closed containers away from acids. (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)

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

5.5 Name. SODIUM CARBONATE-SODIUM BICARBONATE FW 190.00
 $\text{Na}_2\text{CO}_3 \cdot \text{NaHCO}_3$

Laundry Soda
 Sodium Sesquicarbonate
 Urao
 Trona

5.5.1 Technical description. Sodium carbonate-sodium bicarbonate may be furnished as a mixture or as a compound of sodium carbonate and sodium bicarbonate. The compound is in the form of monoclinic needles and has properties shown in Table XIII.

TABLE XIII. Physical and chemical properties of sodium carbonate-sodium bicarbonate compound.

Property	Nominal Value
Density, d	2.112
Solubility (g/100 ml H ₂ O)	
at 0°C	13
at 100°C	100
pH (0.1M H ₂ O solution)	10.1
Refractive index, n_D^{20}	1.5073

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5.5.2 Specifications. ASTM D 457, Specification for Modified Soda (Sesquicarbonate Type).

5.5.2.1 Requirements. This material shall be a mixture of equimolar quantities of sodium carbonate and sodium bicarbonate produced by the damp mixing of these chemicals with only sufficient water to provide a finely divided white powder or the compound of sodium sesqui carbonate. The material shall meet the characteristics shown in Table XIV.

TABLE XIV. Chemical characteristics of sodium carbonate-sodium bicarbonate.

Characteristic	Requirements	
	ASTM D 457	
	Min	Max
	<u>% By Wt</u>	<u>% By Wt</u>
Total alkalinity (as Na ₂ O)	39.0	43.0
Sodium bicarbonate (as NaHCO ₃)	35.0	50.0
Sodium carbonate (as Na ₂ CO ₃)	35.0	50.0
Insoluble matter (in H ₂ O)	---	0.1

5.5.3 Use. Sodium carbonate-sodium bicarbonate is intended for industrial and institutional use by the military. It is suitable for various laundry, washing, cleaning, and scouring processes, with or without soap as conditions demand, and where a mildly alkaline material is desired. Typical commercial applications of sodium carbonate-sodium bicarbonate include use in the compounding of cleansers that require powdered, inexpensive, low pH materials. It also has application in the textile and tanning industries where mild alkalies are desired. The bicarbonate buffers or "modifies" the harshness of the carbonate which accounts for the term "modified soda".

5.5.4 Safety. Sodium carbonate-sodium bicarbonate is nonflammable and nontoxic. Normal laboratory safety precautions are required when handling sodium carbonate-sodium bicarbonate. It is considered a nuisance particulate with a TLV of 10 mg/m³ of total dust. Sodium carbonate-sodium bicarbonate shall be used with adequate ventilation. (Refer to 4.3.1)

Sodium carbonate-sodium bicarbonate reacts with acids to evolve carbon dioxide.

5.5.5 Storage. Sodium carbonate-sodium bicarbonate shall be stored in a cool, dry place in tightly closed containers away from acids. (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)

EPA Hazardous Waste Classification is not listed in 40 CFR.

5.6 Name. SODIUM CHLORIDE
Common Salt
Halite
Rock Salt
Sal Culinaris
Salt
Sea Salt
Table Salt

NaCl

FW 58.44

5.6.1 Technical description. Sodium chloride is in the form of white crystals or powder which is colorless and transparent or translucent when in large crystals. It is soluble in glycerol, very slightly soluble in alcohol. Its solubility in water decreases when hydrochloric acid is increased and is almost insoluble in concentrated hydrochloric acid. Sodium chloride has characteristics shown in Table XV.

TABLE XV. Physical and chemical characteristics of sodium chloride.

Characteristic	Nominal Value
Boiling point, °C	1413
Melting point, °C	804
Refractive index, n_D^{20}	1.5422
Specific gravity, d^{20}	2.17
Solubility in water, g/ml	
at 25°C	2.8
at 100°C	2.6
pH (saturated aqueous solution)	6.7 - 7.3
Density (saturated aqueous solution), d^{25}	1.202
Freezing point (23% NaCl in H ₂ O), °C (°F)	-20.5 (5)

5.6.2 Specifications. Federal, O-S-1926, Sodium Chloride, Technical and ASTM D 632, Specification for Sodium Chloride.

5.6.2.1 Requirements.

5.6.2.1.1 Federal. The requirements are as shown in Tables XVI and XVII. The color should be white, grayish pink or brownish white. Sodium chloride should have a pH value of not less than 5.0 nor more than 8.5, except when the sodium chloride contains iron removal compounds, it may have a lower pH value of 2.0 instead of 5.0.

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TABLE XVI. Chemical and physical properties of sodium chloride.

Characteristic	Requirement			
	Rock Type		Evaporated Type	
	Min	Max	Min	Max
	<u>% By Wt</u>	<u>% By Wt</u>	<u>% By Wt</u>	<u>% By Wt</u>
Moisture	---	3.00	---	0.20
Insoluble matter	---	2.00	---	0.05
Calcium and magnesium Sulfate	---	1.50	---	0.15
Grease, fat and oil	---	0.01	---	0.01
Total impurities	---	4.00	---	0.50
Sodium chloride (dry basis)	96.0	---	99.5	---

TABLE XVII. Particle size requirements for sodium chloride.

Particle Size	Requirement	
	Rock Type	Evaporated Type
	<u>%</u>	<u>%</u>
Retained on 19.0 mm (3/4 in) U.S. Sieve	0	---
Retained on 250 μ m (No. 60) U.S. Sieve	95	---
Retained on 150 μ m (No. 100) U.S. Sieve	---	95

5.6.2.1.2 Commercial. Commercial sodium chloride is furnished in two types and grades. Type I is a graded particle size and Type II is as specified by the user. They are defined as shown below.

5.6.2.1.2.1 Type I. The gradation of Type I sodium chloride, when tested by means of laboratory sieves, shall conform to the following requirements for particle size distribution:

Sieve Size	Weight % Passing	
	Grade 1	Grade 2
3/4 inch (19.0 mm)	---	100
1/2 inch (12.5 mm)	100	---
3/8 inch (9.5 mm)	95 - 100	---
No. 4 (4.75 mm)	20 - 90	20 - 100
No. 8 (2.36 mm)	10 - 60	10 - 60
No. 30 (600 μ m)	1 - 15	0 - 15

5.6.2.1.2.2 Type II. The gradation of Type II sodium chloride shall conform to the grading requirements imposed or permitted by the purchaser under conditions of the intended use.

5.6.3 Use. Sodium chloride is for use in the regeneration of water softening units. Typical commercial applications for pure grades of rock salt include use in dairy and pickling industries, and for grinding and sieving to a fineness suitable for table salts. The latter, which often has iodides added, is available in vacuum, common, or fine grades. Less pure forms are used in fish curing, meat packing, refrigeration and curing hides. For curing of foods, it is common to have flavoring agents added for which the salt serves as a carrier. Some concept of the magnitude of the use of salt can be seen from the fact that it is the essential starting material for the manufacture of nearly all sodium compounds, and the source of nearly all chlorine. Chlorine is produced directly; sodium compounds are produced through the intermediate stages of soda ash or caustic soda. Other commercial applications include use in dyes, ceramic glazes, metallurgy, glass, mineral water, soap (salting out), cattle foods, fertilizers, production of sodium light for polariscopic, spectroscopic, and other similar work; medicine, analytical chemistry, photography, paper, butter, and freezing mixtures. Single crystals are used for spectroscopy, ultraviolet, and infrared transmission. Commercial sodium chloride Type I is used primarily as a paving deicer or in aggregates stabilization where Grade 1 is the standard gradation and Grade 2 is a special gradation. Commercial sodium chloride Type II is used in aggregate stabilization or for purposes other than deicing.

5.6.4 Safety. Sodium chloride is nonflammable and nontoxic. Sodium chloride may cause some irritation to the eyes and skin. Reasonable care and cleanliness should be exercised in the handling of sodium chloride. Sodium chloride is considered a nuisance particulate with a TLV of 10 mg/m³ of total dust. Sodium chloride shall be used with adequate ventilation. The LD₅₀ orally in rats is 3.75 g/kg.

5.6.5 Storage. Sodium chloride shall be stored in a dry place in tightly closed containers. (Refer to 4.3.2)

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

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

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5.7 Name. SODIUM CHROMATE

 Na_2CrO_4

FW 161.97

5.7.1 Technical description. Sodium chromate is hygroscopic (somewhat deliquescent rhombic bipyramidal crystals. At high humidity, it will tenderize (attack and weaken) clothing fibers. It is noncombustible and will not support combustion. Sodium chromate has properties as shown in Table XVIII.

TABLE XVIII. Properties of sodium chromate.

Property	Nominal Value
Melting point, °C	792
Specific gravity, d^{20}	2.710 - 2.736
Solubility (aqueous solutions), g/100 ml	
at 0°C	32
at 30°C	87.3
at 100°C	126
pH (8% aqueous solution)	9.2

5.7.2 Specifications. Federal, O-S-588, Sodium Chromate, Anhydrous Technical.

5.7.2.1 Requirements. The requirements for sodium chromate are as shown in Table XIX.

TABLE XIX. Chemical characteristics of sodium chromate.

Characteristic	Requirement	
	Min	Max
	<u>% By Wt</u>	<u>% By Wt</u>
Assay (as Na_2CrO_4)	98.5	---
Sulfates (as SO_4)	---	1.0
Chlorides (as Cl)	---	0.1
Moisture content	---	0.5

5.7.3 Use. Sodium chromate, anhydrous is intended for use as a corrosion inhibitor in aqueous systems. It would not be used in automotive cooling systems. Typical commercial applications include use for corrosion control in cooling water systems, boilers, internal combustion engines, petroleum tankers and pipe lines for petroleum products, and brine refrigeration systems. This salt is often preferred over sodium bichromate in small systems because it requires no adjustment to give optimum performance under alkaline conditions. This salt is also used as a dye mordant and in the manufacture of pigments, in inks, leather tanning, and as a wood preservative.

5.7.4 Safety. Sodium chromate is highly toxic and irritating to eyes, skin and mucous membranes. Inhalation of dust or mists shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Wash thoroughly after handling. Sodium chromate shall be used with adequate ventilation. Sodium chromate

is a human carcinogen. The TLV for chromium compounds as Cr(II) and Cr(III) is 0.5 mg/m³. The TLV for chromium compounds as Cr(VI) is 0.05 mg/m³. (Refer to 4.3.1)

If heated to decomposition, sodium chromate may emit toxic or irritating fumes.

5.7.5 Storage. Sodium chromate shall be stored in a cool, dry, well ventilated place in tightly closed containers. (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)

Sodium chromate has an EPA Hazardous Waste Classification - TCLP Waste Number D007.

5.8 Name. SODIUM CYANIDE NaCN FW 49.01
Cyanogran

5.8.1 Technical description. Sodium cyanide is odorless when perfectly dry but emits a slight odor of hydrogen cyanide in damp air. The aqueous solution is strongly alkaline. Sodium cyanide, technical shall have a minimum assay of 96 percent by weight. It shall be in briquette form. Sodium cyanide has characteristics shown in Table XX and is soluble in ammonia and methyl alcohol.

TABLE XX. Physical constants of sodium cyanide.

Characteristic	Nominal Value
Boiling point, °C	1496
Melting point, °C	563.7
Refractive index, n_D^{20}	1.452
Solubility in water, g/100 ml:	
at 10°C	48
at 35°C	82

5.8.2 Use. Sodium cyanide in the 5 lb (2.25 kg) bottles is for use as a chemical reagent. In the 100 lb (45 kg) drum, it is for use in electroplating. Typical commercial applications of sodium cyanide include use in gold extraction and for fumigation with hydrocyanic acid. Sodium cyanide is reacted with sulfuric acid to liberate hydrocyanic acid. Sodium cyanide is reacted with sulfuric acid to liberate hydrocyanic acid. It is also used in cleaning metals, manufacture of dyes and pigments, nylon intermediates, and chelating compounds.

5.8.3 Safety. Sodium cyanide is highly toxic and irritating to the eyes, skin and mucous membranes. Inhalation of dust or mists shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Wash thoroughly after handling. Sodium cyanide is listed as an acute hazardous material.

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Sodium cyanide shall be used with adequate ventilation. Sodium cyanide shall be kept away from acids. The TLV for sodium cyanide is one mg/m³. (Refer to 4.3.1)

5.8.4 Storage. Sodium cyanide shall be stored in a cool, dry, well ventilated place in tightly closed containers away from acids and acidic materials. When exposed to air over long periods, sodium cyanide decomposes to carbon dioxide and nitrogen. Acids reduce sodium cyanide to sodium salts and hydrogen cyanide an acutely hazardous gas smelling like almonds. Protect containers against physical damage. (Refer to 4.3.2)

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

Sodium cyanide has an EPA Hazardous Waste Classification - Number P106. In accordance with CFR 49, 172.101, sodium cyanide is listed as a poison B with an identification number of UN1689.

5.9 Name. SODIUM DICHROMATE, DIHYDRATE Na₂Cr₂O₇·2H₂O FW 298.00
Bichromate of Soda
Sodium Bichromate

5.9.1 Technical description. Sodium dichromate, dihydrate is noncorrosive to metals but concentrated solutions will attack and weaken clothing fibers. The pH of an 8 percent solution at 25°C is 3.8 to 4.0 making its aqueous solution acid. Sodium dichromate is insoluble in alcohol, and is reddish to bright orange deliquescent monoclinic prisms or granules. Sodium dichromate is as shown in Table XXI.

TABLE XXI. Physical properties of sodium dichromate, dihydrate.

Property	Nominal Value
Boiling point, °C (decomposition)	400
Melting point, °C	356
Refractive indices (of crystal faces), n_D^{20}	1.661, 1.699, 1.751
Solubility in water, g/100 ml):	
at 0°C	238
at 80°C	508
Specific gravity, d^{25}	2.348

5.9.2 Specifications. Federal, O-S-595, Sodium Dichromate, Technical Grade (Sodium Bichromate) Sodium Dichromate Dihydrate.

5.9.2.1 Requirements. Sodium dichromate is as shown in Table XXII.

TABLE XXII. Chemical and physical characteristics of sodium dichromate.

Characteristics	Requirements	
	Min	Max
	<u>% By Wt</u>	<u>% By Wt</u>
Assay ($\text{Na}_2\text{Cr}_2\text{O}_7$)	99.0	---
Chlorides (Cl)	---	0.1
Loss at 120°C	---	12.5
Water-insoluble matter	---	0.2
Sulfates (as SO_4)	---	0.2

5.9.3 Use. Sodium dichromate, dihydrate is for use as a general laboratory reagent. Typical commercial applications of sodium dichromate, dihydrate include use as starting material for the preparation of almost all chromium salts. It is also used in tanning, chrome dyeing, dye manufacture, engraving copper plates, refining precious metals, electroplating, and refining petroleum products, as an oxidizing agent in bleaching oils and fats and dyeing, in waterproofing, and as a corrosion inhibitor.

5.9.4 Safety. Sodium dichromate is highly toxic and irritating to eyes, skin and mucous membranes. Inhalation of dust or mists shall be avoided. Contact with the eyes, skin, and clothing shall be avoided. Wash thoroughly after handling. Sodium chromate shall be used with adequate ventilation. Sodium chromate is a human carcinogen. The TLV for chromium compounds as Cr(II) and Cr(III) is 0.5 mg/m^3 . The TLV for chromium compounds as Cr(VI) is 0.05 mg/m^3 . (Refer to 4.3.1)

If heated to decomposition, sodium dichromate may emit toxic or irritating fumes.

5.9.5 Storage. Sodium dichromate shall be stored in a cool, dry, well ventilated place in tightly closed containers. (Refer to 4.3.2)

5.9.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4) If in solution reduce chromium(VI) to chromium(III) and add alkali to precipitate chromium(II) sludge. Where permitted by governing laws and regulations, the sludge can be encased in concrete for disposal in permitted landfill.

Sodium dichromate has an EPA Hazardous Waste Classification - Number D007. In accordance with CFR 49, 172.101, sodium dichromate is listed as a ORM-A with an identification number of NA1479.

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5.10	<u>Name.</u> SODIUM FLUORIDE	NaF	FW 41.99
	Chemifluor		
	Duraphat		
	Fluoros		
	Luride - SF		
	Florocid		
	Flura-Drops		
	Karidium		
	Lemoflur		
	Ossalin		
	Osteofluor		
	Villiaumite		
	Zymafluor		

5.10.1 Technical description. Sodium fluoride shall be colored blue for purposes of identification. The coloring agent shall be nontoxic and of a type approved by the Federal Food and Drug Administration. This material shall contain no soluble mineral or organic substances in quantities great enough to injure the health of those consuming water than has been properly treated with sodium fluoride. The sodium fluoride covered by this standard shall be a fine, dry powder free from lumps. It shall be free flowing from the shipping container after storage for 30 days in closed hopper bins. It shall be readily wetted by water. Prior to coloring, sodium fluoride is in the form of colorless, cubic or tetragonal crystals, white powder or balls. Technical grades are 90 percent by weight and 95 percent by weight NaF (light weight having a bulking of 37 cubic inch per pound and dense weight having a bulking of 23 cubic inch per pound and 98 percent by weight. The physical properties are as shown in Table XXIII.

TABLE XXIII. Physical properties of sodium fluoride.

Characteristic	Nominal Value
Boiling point, °C	1704
Melting point, °C	992
Refractive index, n_D^{20}	1.326
pH (saturated aqueous solution)	7.4
Solubility (in H ₂ O) g/100 ml	
at 0°C	4
at 100°C	5
Specific gravity, d^{20}	2.78

5.10.2 Specifications. Federal, A-A-0051912, Sodium Fluoride, USP, Powder.

5.10.2.1 Requirements. Requirements are shown in Table XXIV.

TABLE XXIV. Chemical and physical characteristics of sodium fluoride.

Characteristic	Requirement	
	Min	Max
	<u>% By Wt</u>	<u>% By Wt</u>
Assay (F)	44.0	---
Coloring agent	---	0.20
Fluosilicate (as Na ₂ SiF ₆)	---	0.10
Free acid (as HF)	---	0.20
Free alkali (as Na ₂ CO ₃)	---	0.25
Heavy metals (as Pb)	---	0.003
Insoluble matter	---	0.60
Iron (as Fe ₂ O ₃)	---	0.07
Moisture (drying at 150°C)	---	0.30
Sulfate (as SO ₄)	---	0.03
Sulfite (as SO ₃)	---	0.01

5.10.3 Use. Sodium fluoride is for use in the treatment of water supplies. Typical commercial applications of sodium fluoride include use in the fluoridation of water supplies; as an insecticide, rodenticide, and fungicide; in metallurgy; chemical cleaning; electroplating; glass manufacture; vitreous enamels; as a preservative for adhesives and wood; manufacture of coated paper; frosting of glass; for disinfecting fermentation apparatus in breweries and distilleries and in the removal of HF from exhaust gases to reduce air pollution.

5.10.4 Safety. Sodium fluoride is irritating to the eyes, skin and mucous membranes. Short term inhalation may cause difficult breathing, burning of respiratory tract, nausea, vomiting, profuse sweating and thirst. On skin it may cause rash, itching and burning. A 1% solution may cause sores. Contact with eyes may cause severe irritation. Long term exposure to fluoride may increase bone density, stimulate new bone growth or cause calcium deposits in ligaments. Inhalation of dust or mist shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Sodium fluoride shall be used with adequate ventilation. The TLV and PEL for fluoride (as F) is 2.5 mg/m³. The LD₅₀ in rats is 0.18 g/kg. Severe symptoms from ingestion of less than one gram have been known and 5 grams have resulted in death. (Refer to 4.3.1)

If heated to decomposition, sodium fluorides will evolve toxic fluorides. If in contact with acids, it may produce toxic HF gas.

5.10.5 Storage. Sodium fluoride shall be stored in a cool, dry, well ventilated place in tightly closed containers away from acids. Protect container against damage. (Refer to 4.3.2)

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

In accordance with CFR 49, 172.101, sodium fluoride is listed as a corrosive (for solutions) and ORM-B (for solids) with an identification number of UN1690. An EPA Hazardous Waste Classification is not listed in 40 CFR.

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5.11	Name. SODIUM HEXAMETAPHOSPHATE	(NaPO ₃) ₆	FW 611.17
	Glassy Sodium Phosphate		
	Graham's Salt		
	Sodium (1:1) Phosphate Glass		
	Sodium Polyphosphate		
	Sodium Tetrphosphate		

5.11.1 Technical description. Sodium metaphosphate is recognized as existing principally in two forms but there are many forms and varieties. The older form, Na₄P₄O₁₂, has little use because of its water insolubility. Through x-ray crystallography, six different crystalline sodium metaphosphates have been shown to exist. Sodium hexametaphosphate is now considered to be a linear polymer; the degree of association is probably greater than indicated by the subscript 6 in the formula (NaPO₃)₆. The crystals are colorless with a refractive index of 1.482 ± 0.002. It is very soluble in water and insoluble in organic solvents. Sodium hexametaphosphate, technical shall be free from mechanical mixtures of additives. The plate form consists of irregularly shaped particles having an equivalent diameter of approximately 1 to 3 inches (2.5 to 7.6 cm) and 1/8 to 3/4 inch (.3 to 1.9 cm) thickness.

5.11.2 Specifications. O-S-635, Sodium Polyphosphate, Technical, Water Treatment. MIL-S-51078, Sodium Hexametaphosphate, Technical.

5.11.2.1 Requirements. Sodium hexametaphosphate is furnished in three types and forms as follows: Type I - sodium tetrphosphate, Type II - Sodium hexametaphosphate and Type III - Sodium tripolyphosphate and Form 1 - Powder, Form 2 - Granular (crushed) and Form 3 - Plate. The particle size of Forms 1 and 2 are as shown in Table XXV. Form 3 may be irregularly-shaped plates and does not measure greater than 4 inches (10.2 cm) on the edge and 1/4 inch (0.6 cm) in thickness. Characteristics of sodium hexametaphosphate is as shown in Table XXVI.

TABLE XXV. Particle sizes of sodium hexametaphosphate.

Particle Size	Requirement		
	Form 1	Form 2	
	Max	Min	Max
	<u>% By Wt</u>	<u>% By Wt</u>	<u>% By Wt</u>
3.36 mm (No. 6 Sieve)	---	---	10
600 μm (No. 10 Sieve)	5	---	---
150 μm (No. 100 Sieve)	40	80	---

TABLE XXVI. Chemical characteristics of sodium hexametaphosphate.

Characteristic	Requirement by Type					
	I		II		III	
	Min	Max	Min	Max	Min	Max
Total P ₂ O ₅ , % by wt	62.8	---	66.5	---	56.0	---
pH, (1% aqueous solution)	7.2	8.3	6.6	7.3	9.3	10.4
Matter insoluble in water, % by wt	---	0.1	---	0.1	---	0.1

5.11.3 Use. Sodium hexametaphosphate in granular or flake form is for use in the treatment of water, such as boiler feedwaters. In plate form it is used in the treatment of drinking water in concentrations up to 10 parts per million. Typical commercial applications of sodium hexametaphosphate include use in softening water and as a dispersing agent to segregate alkaline earth pipes and to disperse pigments and clays in paper making and oil well drilling.

5.11.3.1 Type I. Sodium tetraphosphate is primarily intended for use in water treatment for laundries.

5.11.3.2 Type II. Sodium hexametaphosphate is primarily intended for use in the treatment of boiler feedwater. This type is commonly used for the threshold treatment of industrial water. In those cases where the use of this type requires the addition of a relatively large quantity of caustic soda or soda ash, Type III might be preferred.

5.11.3.3 Type III. Sodium tripolyphosphate is intended for use as a substitute for Types I and II whenever it is determined to be necessary for performance or economically advantageous.

5.11.4 Safety. Sodium hexametaphosphate is nontoxic and nonflammable. Sodium hexametaphosphate may cause some irritation to the eyes and skin. Reasonable care and cleanliness should be exercised in the handling of sodium hexametaphosphate, tribasic. There is no TLV or PEL referenced for sodium hexametaphosphate. (Refer to 4.3.1)

If heated to decomposition, sodium hexametaphosphate evolves toxic oxides of phosphorous fumes.

5.11.5 Storage. Sodium hexametaphosphate shall be stored in a cool, dry, well ventilated place in tightly closed containers. (Refer to 4.3.2)

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

EPA Hazardous Waste Classification is not listed in 40 CFR.

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5.12 Name. SODIUM HYDROSULFITE, ANHYDROUS $\text{Na}_2\text{S}_2\text{O}_4$ FW 174.10
 Sodium Dithionite
 Sodium Hydrosulfite
 Sodium Sulfoxylate

5.12.1 Technical description. Sodium hydrosulfite is a light lemon-colored solid in powder or flake form or a white to gray crystalline powder. It exists in a dihydrate form as well as in the anhydrous form. Both forms decompose on heating giving off poisonous sulfur dioxide fumes. It is very soluble in cold water or alkalies, decomposes in hot water or acid, and is insoluble in alcohol.

5.12.2 Specifications. MIL-S-13985, Sodium Hydrosulfite, Anhydrous, Technical.

5.12.2.1 Requirements. Sodium hydrosulfite shall have a minimum assay of 90 percent sodium hydrosulfite by weight.

5.12.3 Use. Sodium hydrosulfite is for use in stripping dyes from garments prior to redyeing. Typical commercial applications of sodium hydrosulfite include use as a strong reducing agent; in discharge printing of textiles; and in bleaching such items as sugar, soap, oils, minerals, and straws.

5.12.4 Safety. Sodium hydrosulfite is nontoxic. Reasonable care and cleanliness should be exercised in the handling of sodium hydrosulfite. Sodium hydrosulfite is considered a nuisance particulate with a TLV of 10 mg/m^3 of total dust. Sodium hydrosulfite shall be used with adequate ventilation. (Refer to 4.3.1)

If heated to decomposition, sodium hydrosulfite may emit highly toxic oxides of sulfur fumes.

5.12.5 Storage. Sodium hydrosulfite shall be stored in a dry place in tightly closed containers. (Refer to 4.3.2)

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

In accordance with CFR 49, 172.101, sodium hydrosulfite is listed as a flammable solid with an identification number of UN1384. An EPA Hazardous Waste Classification is not listed in 40 CFR.

5.13 Name. SODIUM HYPOCHLORITE SOLUTION NaOCl FW 74.44
 Bleach Liquor
 Chlorine Bleach
 Dakin's Solution
 Eau de Javelle
 Eau de Labarraque
 Javelle Water
 Labarraque's Solution

5.13.1 Technical description. Sodium hypochlorite is not sold as a solid nor under its chemical name. Aqueous solutions are sold under the names listed above. It is produced by passing chlorine gas into a cool solution of sodium hydroxide. It usually has about 10 percent available chlorine and always contains an excess of sodium hydroxide and therefore gives a strongly alkaline

reaction. A solution diluted to 0.5 percent available chlorine is used as an antiseptic and called Dakin's Solution. This solution has a sweet, disagreeable odor and it decomposes on heating. It is unstable in air. The 10 percent solution is unstable and the 5 percent solution is quite stable.

5.13.2 Specifications. Federal, O-S-602, Sodium Hypochlorite Solution.

5.13.2.1 Requirements. Sodium hypochlorite solution is furnished in two grades, viz. Grade A (5.25 percent NaOCl by weight) and Grade B (12.5 percent NaOCl by weight) and meets the characteristics given in Table XXVII.

TABLE XXVII. Chemical and physical characteristics of sodium hypochlorite solution.

Characteristic	Requirement			
	Grade A		Grade B	
	Min	Max	Min	Max
Specific gravity, d_{25}^{25}	1.075	1.110	1.196	1.243
pH	10.5	12.5	---	---
Free alkali, as NaOH, % by wt	---	---	0.5	1.0
Available chlorine, as NaOCl, % by wt	5.25	7.19	12.5	15.6

5.13.3 Use. Sodium hypochlorite solution is used in bleaching, disinfecting, and water purification. Typical commercial applications of sodium hypochlorite include use in the manufacture of indigo, intermediates, organic chemicals; in bleaching textiles, paper and pulp; disinfectant in laundries; and in medicine.

5.13.3.1 Grade A. Grade A sodium hypochlorite solution is intended for use as a household-type bleach and disinfectant.

5.13.3.2 Grade B. Grade B sodium hypochlorite solution is intended for use in swimming pool chlorination and in sanitizing food processing and dairy equipment. Its use should be in accordance with manufacturer's direction.

5.13.4 Safety. Sodium hypochlorite is an oxidizer. It is irritating to the eyes, skin and mucous membranes. Inhalation of dust or mists shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Sodium hypochlorite shall be used with adequate ventilation. There is no TLV or PEL referenced for sodium hypochlorite. Sodium hypochlorite solution will decompose rapidly when exposed to heat and light. It should be stored in a cool, dark place and used as soon as possible. The user may find it necessary to reorder frequently in order to assure a continuous supply of fresh solution. Sodium hypochlorite solution should never be mixed with ammonia or toilet bowl cleaners. (Refer to 4.3.1)

If heated to decomposition or on contact with acid or acid fumes, sodium hypochlorite emits highly toxic chlorine. It can react vigorously with reducing materials.

5.13.5 Storage. Sodium hypochlorite shall be stored in a cool, well ventilated place in tightly closed containers away from acids and acid fumes and reducing materials. Protect containers against damage. (Refer to 4.3.2)

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

In accordance with CFR 49, 172.101, sodium hypochlorite is listed as a corrosive with an identification number of UN1791. Sodium hypochlorite has an EPA Hazardous Waste Classification - Ignitable; Waste Number D001.

5.14 Name. SODIUM HYDROXIDE NaOH FW 40.01
 Caustic Soda
 Soda Lye
 Sodium Hydrate
 Lye

5.14.1 Technical description. Sodium hydroxide is furnished as lumps, sticks, pellets, chips and coarsely powdered. When kept in tight containers, the usual grades contain 97 to 98 percent by weight NaOH. Sodium hydroxide is very soluble in alcohol and glycerol and insoluble in acetone and ether. It has properties shown in Table XXVIII.

TABLE XXVIII. Chemical and physical properties of sodium hydroxide.

Property	Nominal Value
Melting point, °C	318
Specific gravity, d^{25}	2.18
Refractive index, n_D^{20}	1.3576
Boiling point, °C	1390
Solubility (g/100 ml H ₂ O)	
at 0°C	42
at 100°C	347

5.14.2 Specifications. ASTM D 456, Specification for Caustic Soda (Anhydrous).

5.14.2.1 Requirements. Sodium hydroxide is furnished as flake, coarsely powdered or solid form as specified and meets requirements shown in Table XXIX.

TABLE XXIX. Chemical characteristics of sodium hydroxide.

Characteristic	Requirement	
	Min	Max
	<u>% By Wt</u>	<u>% By Wt</u>
Total alkalinity (as Na ₂ O)	75.5	---
Sodium hydroxide (as NaOH)	96	---
Carbonate (as Na ₂ CO ₃)	---	2.0

5.14.3 Use. Sodium hydroxide as solutions are used to neutralize acids and make sodium salts, for example, in the petroleum refining to remove sulfuric and organic acids, to treat cellulose, in making viscose rayon and cellophane, in reclaiming rubber to dissolve out the fabric and in making plastics to dissolve casein. It is also used in making soaps and to precipitate most metals as hydroxides.

5.14.4 Safety. Sodium hydroxide is nontoxic and noncombustible. Sodium hydroxide is an alkaline irritant to the eyes and mucous membranes. Breathing dust shall be avoided. Contact with the eyes should be avoided. Sodium hydroxide shall be used with adequate ventilation. Sodium hydroxide has a TLV of 5 mg/m³. (Refer to 4.3.1)

5.14.5 Storage. Sodium hydroxide shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of moisture and air. Sodium hydroxide picks up carbon dioxide from air to become sodium carbonate. Protect containers against physical damage. (Refer to 4.3.2)

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

In accordance with CFR 49, 172.101, sodium hydroxide is listed as a corrosive with an identification number of UN1823 (for the solid material) and UN1824 (for the liquid material). An EPA Hazardous Waste Classification is not listed in 40 CFR.

5.15 Name. SODIUM HYPOPHOSPHITE, MONOHYDRATE FW 105.99
 $\text{NaH}_2\text{PO}_2 \cdot \text{H}_2\text{O}$
 Phosphinic Acid, Sodium Salt

5.15.1 Technical description. Sodium hypophosphite monohydrate exists as colorless, deliquescent, monoclinic crystals. At 248°C it decomposes, evolving phosphine gas (PH₃) which is toxic and spontaneously flammable. It is very soluble in water; 100 g dissolve in 100 ml at 25°C and 830 g dissolve in 100 ml at 100°C. It is also very soluble in alcohol, soluble in glycerol, and slightly soluble in ammonia or ammonium hydroxide. This salt has a bittersweet, saline taste. Sodium hypophosphite, monohydrate, technical, shall have a minimum assay of 84 percent as sodium hypophosphite. It shall be in the form of white granular crystals.

5.15.2 Specifications. None.

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5.15.2.1 Requirements. Refer to 5.15.1.

5.15.3 Use. Sodium hypophosphite is for use in a cadmium plating process. It is also used in an electrolysis nickel plating process. Typical commercial applications of sodium hypophosphite include use in pharmaceuticals because of their ability to solubilize and complex many metals. It is used as a reagent to detect arsenic and iodates.

5.15.4 Safety. Sodium hypophosphite is nontoxic and nonflammable. Sodium hypophosphite may cause some irritation to the eyes and skin. Reasonable care and cleanliness should be exercised in the handling of sodium hypophosphite. There is no TLV or PEL referenced for sodium hypophosphite. If heated to decomposition, sodium hypophosphite evolves toxic oxides of phosphorous fumes. (Refer to 4.3.1)

5.15.5 Storage. Sodium hypophosphite shall be stored in a cool, dry, well ventilated place in tightly closed containers. (Refer to 4.3.2)

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

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

5.16 Name. SODIUM METASILICATE NaSiO₃ FW 122.08
Na₂SiO₃·5H₂O 202.14

5.16.1 Technical description. The total Na₂O content of sodium metasilicate, anhydrous is 51.5 percent; the percent of total Na₂O in active form is 48.6 percent. Sodium metasilicate, anhydrous can be precipitated by acids and by alkaline earth and heavy metal ions. Sodium metasilicate is usually obtained as a glass, but also may be had as an orthorhombic crystal, which has properties shown in Table XXX. It is soluble in hot and cold water and insoluble in alcohol acids and salt solutions.

TABLE XXX. Physical properties of sodium metasilicate.

Characteristic	Nominal Value
Specific gravity:	
<i>d</i> (crystals)	2.614
<i>d</i> (glass)	2.4
Melting point, °C	1089
Index of refraction:	
<i>n</i> _D ²⁵ (glass)	1.520
<i>n</i> _D ²⁵ (orthorhombic crystals) faces	1.518 & 1.527
Specific heat (20°)	0.217
Heat of formation, Kcal/mol	-371.2
Heat of solution (crystals), Kcal/mol	-7.45
Heat of hydration (anhydrous), Kcal/mol	-24.15
Heat of fusion, Kcal/mol	10.3
pH (1% aqueous solution)	12.6

5.16.2 Specifications. Federal, O-S-604, Sodium Metasilicate, Technical and ASTM D 537, Specification for Sodium Metasilicate.

5.16.3 Requirements. Sodium metasilicate is white and granular in form and has physical and chemical characteristics shown in Table XXXI. It is furnished in two types, viz. Type I [Pentahydrate ($\text{Na}_2\text{SiO}_3 \cdot 5\text{H}_2\text{O}$)] and Type II [Anhydrous (Na_2SiO_3)].

5.16.4 Use. Sodium metasilicate, anhydrous, technical is for use in various washing, cleaning, and scouring purposes. It may be used with or without soap or other detergents as conditions demand. Typical commercial applications for sodium metasilicate, anhydrous include use in laundry, dairy, and metal cleaning and as a base for detergent formulas. In normal usage 1 pound of Type II, sodium metasilicate is equivalent in washing efficiency to 1.6 pounds of Type I.

5.16.5 Safety. Sodium metasilicate is nontoxic and nonflammable. Sodium metasilicate may cause some irritation to the eyes and skin. Reasonable care and cleanliness should be exercised in the handling of sodium metasilicate. There is no TLV or PEL referenced for sodium metasilicate. (Refer to 4.3.1)

5.16.6 Storage. Sodium metasilicate shall be stored in a cool, dry, well ventilated place in tightly closed containers. (Refer to 4.3.2)

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

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

5.17	<u>Name</u> . SODIUM NITRATE	NaNO_3	FW 84.99
	Chile saltpeter		
	Cubic niter		
	Nitrate of soda		
	Nitratine		
	Soda niter		

5.17.1 Technical description. Sodium nitrate is in the form of colorless, trigonal or rhombohedral crystals or white powder. It is slightly soluble in glycerol and alcohol, very slightly soluble in acetone and methyl alcohol and soluble in ammonia. Sodium nitrate is deliquescent and has physical properties shown in Table XXXII.

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TABLE XXXI. Physical and chemical characteristics of sodium metasilicate.

Characteristic	Requirement									
	0-5-604					ASTM D 537				
	Type I		Type II			Type I		Type II		
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Sodium metasilicate as $\text{Na}_2\text{SiO}_3 \cdot 5\text{H}_2\text{O}$ as Na_2SiO_3	---	---	---	---	---	---	---	---	---	---
Total alkalinity (as Na_2O)	28.5	30.0	49.5	53.5	28.5	30.0	98.0	91.5	50.0	52.0
Total silica (as SiO_2)	27.5	29.0	44.0	49.2	27.5	29.0	---	45.0	---	---
Insoluble matter (in H_2O)	---	0.2	---	0.25	---	0.2	---	---	---	0.31
Carbonates (as CO_2)	---	---	---	---	---	1.2	---	---	---	2.0
Material passing a 149 micron (No. 100) Sieve	---	10.0	---	3.0	---	---	---	---	---	---
Material retained on a 2.00 mm (No. 10) Sieve	---	10.0	---	10.0	---	---	---	---	---	---

TABLE XXXII. Physical properties of sodium nitrate.

Property	Nominal Value
Boiling point (decomposes), °C	380
Melting point, °C	308
Refractive indices (of crystal faces), n_D^{20}	1.587, 1.336
Solubility water (g per 100 ml):	
at 0°C	73
at 100°C	180
Specific gravity, d^{20}	2.257

5.17.2 Specifications. Federal, O-S-634, Sodium Nitrate (Nitrate of Soda): For Fertilizer Purposes, and Military, MIL-S-322, Sodium Nitrate.

5.17.2.1 Requirements.

5.17.2.1.1 Federal. Sodium nitrate conforms to Table XXXIII.

TABLE XXXIII. Chemical and physical characteristics of sodium nitrate (O-S-634).

Characteristics	Requirements	
	Min	Max
	<u>% By Wt</u>	<u>% By Wt</u>
Purity of NaNO_3	97	---
Granule size, % passing through:		
USS Sieve Size No. 4	100	---
USS Sieve Size No. 30	---	10
Moisture content and other volatile matter	---	0.5

5.17.2.1.2 Military. Sodium nitrate conforms to Tables XXXIV and XXXV. Sodium nitrate is furnished in 3 classes by size and 3 grades as shown in the tables hereinafter.

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TABLE XXXIV. Chemical characteristics for sodium nitrate (MIL-S-322).

Property	Requirement					
	Grade A		Grade B ^{1/}		Grade C	
	Min	Max	Min	Max	Min	Max
	<u>% By Wt</u>	<u>% By Wt</u>	<u>% By Wt</u>	<u>% By Wt</u>	<u>% By Wt</u>	<u>% By Wt</u>
Moisture	---	0.75	---	0.5	---	0.75
Insoluble matter	---	0.5	---	0.1	---	0.5
Alkalinity (as Na ₂ O)	---	0.05	---	None	---	0.06
Nitrates (as NaNO ₃)	97.0	---	99.5	---	97.0	---
Chlorates (as KClO ₃)	---	0.06	---	None	---	0.06
Calcium (as CaO)	---	0.3	---	0.1	---	0.3
Magnesium (as MgO)	---	0.15	---	0.06	---	0.15
Sulfates (as Na ₂ SO ₄)	---	0.5	---	0.2	---	0.45
Chlorides (as NaCl)	---	---	---	0.15	---	0.15

^{1/}The percentage indicated, except the percent of moisture, are to be obtained in the sodium nitrate after the sample has been dried to constant weight at 302 ± 5°F (150 ± 3°C).

TABLE XXXV. Granulation size for sodium nitrate (MIL-S-322).

Sieve No. ^{1/}	Class 1	Class 2	Class 3
	Percent Through	Percent Through	Percent Retained On
	Minimum	Minimum	Minimum
20	---	---	80.0
60	98.0	---	---
100	---	98.0	---

^{1/}Use U.S. Standard sieves conforming to Specification RR-S-366.

^{2/}In addition to conforming to the granulation requirements specified herein, the average particle diameter of Class 2 sodium nitrate is 30 ± 15 microns.

5.17.3 Use. Sodium nitrate is for use in a salt bath for the heat treatment of an aluminum alloy and in the manufacture of pyrotechnic compositions and incendiary mixtures. Typical commercial applications of sodium nitrate include use for manufacturing sulfuric acid, nitric acid, potassium nitrate, sodium salts, dyes, and glass; as a reagent in analytical chemistry; food preservative; enamel for pottery; dynamites; flux; matches; medicine; modifying burning properties of tobacco; oxidizing agent; as an oxidizer in solid rocket propellants; and as a fertilizer.

5.17.4 Safety. Sodium nitrate is an oxidizer but is noncombustible. It is slightly irritating to the eyes, skin and respiratory tract. Inhalation of

dust or mists shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Sodium nitrate shall be used with adequate ventilation. There is no TLV or PEL referenced for sodium nitrate. The LD₅₀ orally in rabbits is 1.955 g anion/kg. (Refer to 4.3.1)

If involved in a nearby fire, keep containers cool with copious amounts of water. Sodium nitrate will accelerate burning of combustible materials. If large quantities are involved in fire or associated combustible materials is finely divided, an explosion may result. Avoid prolonged exposure to heat or fire. If heated to decomposition, sodium nitrate can evolve toxic oxides of nitrogen.

5.17.5 Storage. Sodium nitrate shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat, open flame, reducing and combustible materials. (Refer to 4.3.2)

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

In accordance with CFR 49, 172.101, sodium nitrate is listed as an oxidizer with an identification number of UN1498. Sodium nitrate has an EPA Hazardous Waste Classification - Ignitable, Waste Number D001.

5.18	<u>Name</u> . SODIUM NITRITE Diazotizing salts Erinitrit Nitrous acid sodium salt	NaNO ₂	FW 69.00
------	--------------------------------------------------------------------------------------------	-------------------	----------

5.18.1 Technical description. Sodium nitrite is in the form of white or yellow, hygroscopic granules, rods or powder. It oxidizes to sodium nitrate very slowly in air, and decomposes rapidly when exposed to even weak acids with the evolution of toxic brown fumes of N₂O₃. Sodium nitrite is incompatible with acetanilide, antipyrine, chlorate, hypophosphites, iodides, mercury salts, permanganates, sulfites, tannic acid, and vegetable astringent decoctions, infusions or tinctures. Sodium nitrite has properties shown in Table XXXVI.

TABLE XXXVI. Physical properties of sodium nitrite.

Characteristic	Nominal Value
Specific gravity, <i>d</i>	2.17
Melting point, °C	271
Decomposition temperature, °C	320

5.18.2 Specifications. Military, MIL-S-24521, Sodium Nitrite, Technical.

5.18.2.1 Requirements. Sodium nitrite in a one percent aqueous solution has a pH of not less than 7 nor more than 9 and has chemical characteristics shown in Table XXXVII.

TABLE XXXVII. Chemical characteristics of sodium nitrite.

Characteristic	Requirement	
	Min	Max
	<u>% By Wt</u>	<u>% By Wt</u>
Sodium nitrite	97.0	---
Sulfates (as Na ₂ SO ₄)	---	0.2
Chlorides (as NaCl)	---	0.2
Insoluble matter	---	0.5

5.18.3 Use. Sodium nitrite is intended for use as a corrosion inhibitor when preparing a boiler for either wet or dry lay-up. It is also used as a passivator after chemical cleaning of boiler. Commercial uses are dye stuff manufacture, for diazotizing, organic synthesis, preparation of nitric oxide. dyeing and printing textile fabrics, bleaching flax, silk, and linen, rust-proofing, prevention of corrosion, metal cleaner, in cutting oils, and photography, as well as in meal curing, coloring and preserving and in the processing of smoke chub. It is also used as a vasodilator and an antidote for cyanide poisoning.

5.18.4 Safety. Sodium nitrite is an oxidizer but is noncombustible. It is slightly irritating to the eyes, skin and respiratory tract. Inhalation of dust or mists shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Sodium nitrite shall be used with adequate ventilation. There is no TLV or PEL referenced for sodium nitrite. The LD₅₀ orally in rats is 180 mg/kg. (Refer to 4.3.1)

If involved in a nearby fire, keep containers cool with copious amounts of water. Sodium nitrite will accelerate burning of combustible materials. If large quantities are involved in fire or associated combustible materials is finely divided, an explosion may result. Avoid prolonged exposure to heat or fire. If heated to decomposition, sodium nitrite can evolve toxic oxides of nitrogen.

5.18.5 Storage. Sodium nitrite shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat, open flame, reducing and combustible materials and away from acids and aciditic compounds. Store away from acids and aciditic compounds. Contact with these compounds in a moist or damp environment results in the decomposition of sodium nitrite and the evolution of toxic N₂O₃. (Refer to 4.3.2)

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

In accordance with CFR 49, 172.101, sodium nitrite is listed as an oxidizer with an identification number of UN1500. Sodium nitrite has an EPA Hazardous Waste Classification - Ignitable, Waste Number D001.

5.19 Name. SODIUM ORTHOSILICATE
Indeterminate formula
Intimate mixture

FW N/A

5.19.1 Technical description. Sodium orthosilicate is an intimate mixture of sodium hydroxide and sodium metasilicate. The approximate melting point is 1018°C and it is soluble in water.

5.19.2 Specifications. Federal, P-S-651, Sodium Orthosilicate, Technical.

5.19.2.1 Requirements. Sodium orthosilicate is an intimate mixture of caustic soda and sodium metasilicate or an integral chemical compound prepared from caustic soda or sodium oxide and sodium metasilicate or silica. Sodium orthosilicate is in the form of free-flowing white granules or flakes which have been treated with an anti-dusting oil so as to minimize air-borne particles during handling. The anti-dusting oil is a light mineral oil conforming to the National Formulary requirements for Light Mineral Oil except that it has a specific gravity of 0.820 to 0.850 at 77°F and a viscosity of 50 to 100 Saybolt Universal seconds at 100°F.

5.19.2.1.1 Chemical characteristics. Sodium orthosilicate conforms to the chemical characteristics of Table XXXVIII.

TABLE XXXVIII. Chemical characteristics of sodium orthosilicate.

Characteristic	Requirement	
	Min	Max
	<u>% By Wt</u>	<u>% By Wt</u>
Total alkalinity (as Na ₂ O)	60	---
Total silica (as SiO ₂)	27	---
Water insoluble matter	---	0.6
Sodium carbonate (Na ₂ CO ₃)	---	4.5
Anti-dusting oil	0.20	0.30

5.19.2.1.2 Particle size. No less than 99 percent by weight of the sodium orthosilicate shall pass through a 2.38 millimeter (No. 8) sieve and no less than 95 percent by weight shall be retained on a 177 micron (No. 80) sieve.

5.19.3 Use. Sodium orthosilicate is for use in laundry, metal cleaning (except aluminum), and heavy duty cleaning purposes. Typical commercial applications of sodium orthosilicate are the same as military.

5.19.4 Safety. Sodium orthosilicate is nontoxic and nonflammable. Sodium orthosilicate may cause some irritation to the eyes and skin because of the caustic nature of the compound or mixture. Reasonable care and cleanliness should be exercised in the handling of sodium orthosilicate. There is no TLV or PEL referenced for sodium orthosilicate. (Refer to 4.3.1)

5.19.5 Storage. Sodium orthosilicate shall be stored in a cool, dry, well ventilated place in tightly closed containers. (Refer to 4.3.2)

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

EPA Hazardous Waste Classification is not listed in 40 CFR.

5.20 Name. SODIUM PHOSPHATE, MONOBASIC, ANHYDROUS FW 119.98
 NaH_2PO_4

Primary sodium phosphate
 Sodium acid phosphate
 Sodium biphosphate
 Sodium orthophosphate
 Sodium dihydrogen phosphate
 Monosodium phosphate

5.20.1 Technical description. This material is in the form of a slightly hygroscopic, white crystalline powder which is very soluble in water, having an acid reaction. It forms sodium acid pyrophosphate at 225-250°C and sodium metaphosphate at 350-400°C, has a specific gravity, d^{20} , of 1.915 and a melting point of 60°C.

5.20.2 Specifications. Military, MIL-S-13727, Sodium Phosphate, Monobasic, Anhydrous, Technical.

5.20.2.1 Requirements. A one percent solution of monobasic sodium phosphate will have a pH of not less than 4.5 nor more than 4.7. The anhydrous monobasic sodium phosphate conforms to Table XXXIX.

TABLE XXXIX. Chemical characteristics of anhydrous monobasic sodium phosphate.

Characteristic	Requirement	
	Min	Max
	<u>% By Wt</u>	<u>% By Wt</u>
Assay as monobasic sodium phosphate (NaH_2PO_4)	98.0	---
Insoluble matter	---	0.1

5.20.3 Use. Sodium phosphate, monobasic is for use in boiler water treatment or in electroplating processes. Typical commercial applications of sodium phosphate include use in acid cleansers, baking powders, dyeing, and as a cattle food supplement and dry as an acidulant and sequestrant for food.

5.20.4 Safety. Anhydrous monobasic sodium phosphate is nontoxic and nonflammable. Sodium phosphate may cause some irritation to the eyes and skin. Reasonable care and cleanliness should be exercised in the handling of sodium phosphate, monobasic. There is no TLV or PEL referenced for sodium phosphate. (Refer to 4.3.1)

If heated to decomposition, sodium phosphate evolves toxic oxides of phosphorous fumes.

5.20.5 Storage. Anhydrous monobasic sodium phosphate shall be stored in a cool, dry, well ventilated place in tightly closed containers. (Refer to 4.3.2)

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

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

5.21 Name. SODIUM PHOSPHATE, DIBASIC, ANHYDROUS FW 141.97
 Na_2HPO_4

Disodium Orthophosphate
 Disodium Phosphate
 DSP
 Disodium Hydrogen Phosphate
 Sodium Hydrogen Phosphate
 Sodium Orthophosphate, Secondary

5.21.1 Technical description. This material is in the form of a hygroscopic white powder, flakes or granules. It has a cooling saline taste, is soluble in water, and very slightly soluble in alcohol. It converts to sodium pyrophosphate at about 240°C. The solubility of dibasic sodium phosphate in 100 gallons at slightly over 0°C is 14 pounds and increases to 900 pounds at 95°C.

5.21.2 Specifications. Federal, O-S-639, Sodium Phosphate, Dibasic, Anhydrous, Technical.

5.21.2.1 Requirements. The pH of a one percent aqueous solution is not less than 8.7 nor more than 9.3. The chemical characteristics are as shown in Table XL.

TABLE XL. Chemical characteristics of sodium phosphate.

Characteristic	Requirement	
	Min	Max
	<u>% By Wt</u>	<u>% By Wt</u>
Sodium phosphate (Na_2HPO_4)	---	97.5
Water	2.0	---
Chlorides as NaCl	0.2	---
Insoluble matter	0.15	---

5.21.3 Use. Sodium phosphate, dibasic, anhydrous is for use in water softening purposes and as an ingredient in compound metal cleaners. This material is not intended for medicinal purposes. Typical commercial applications of dibasic sodium phosphate include use for chemicals, dyes, fertilizers, pharmaceuticals, medicine, textiles (weighting silk, dyeing and printing, fireproofing), fireproofing wood, paper and other products, ceramic glazes, tanning, paint pigments, baking powder, galvano-plastics, soldering enamels, analytical reagent, cheese, and detergents.

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5.21.4 Safety. Dibasic sodium phosphate is nontoxic and nonflammable. Dibasic sodium phosphate may cause some irritation to the eyes and skin. Reasonable care and cleanliness should be exercised in the handling of sodium phosphate, dibasic. There is no TLV or PEL referenced for sodium phosphate. The LD₅₀ orally in rats is 12.93 g/kg. (Refer to 4.3.1)

If heated to decomposition, sodium phosphate evolves toxic oxides of phosphorous fumes.

5.21.5 Storage. Sodium phosphate shall be stored in a cool, dry, well ventilated place in tightly closed containers. (Refer to 4.3.2)

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

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

5.22 Name. SODIUM PHOSPHATE, TRIBASIC, ANHYDROUS FW 163.94
 Na_3PO_4

Oakite•
 Sodium Orthophosphate, Tertiary
 Tertiary Sodium Phosphate
 Trisodium Orthophosphate
 Trisodium Phosphate
 TSP

5.22.1 Technical description. Tribasic sodium phosphate is in the form of a white, free flowing, homogeneous powder or granule and has properties shown in Table XLI.

TABLE XLI. Properties of tribasic sodium phosphate.

Property	Nominal Value
Melting point, °C	-75
Specific gravity, <i>d</i>	1.6
pH	
0.1% aqueous solution	11.5
0.5% aqueous solution	11.7
1.0% aqueous solution	11.9

5.22.2 Specifications. Federal, O-S-642, Sodium Phosphate, Tribasic (Anhydrous; dodecahydrate; and Monohydrate; Technical and ASTM D 538, Specification for Trisodium Phosphate.

5.22.2.1 Requirements. Tribasic sodium phosphate is furnished in three chemical compositions. The specification and appropriate type and form as shown are as follows:

	O-S-642	ASTM D 538
Na ₃ PO ₄ (Anhydrous powder or granules)	I	I
Na ₃ PO ₄ ·H ₂ O (Granular material)	III	II
Na ₃ PO ₄ ·12H ₂ O (Flake or crystalline material)	II	III

Tribasic sodium phosphate has the chemical compositions shown in Table XLII. The physical properties of tribasic sodium phosphate applies only to O-S-642 and is given in Table XLIII.

TABLE XLII. Chemical characteristics of tribasic sodium phosphate.

Characteristic	Requirement					
	O-S-642, Type I ASTM D 538, Type I		O-S-642, Type II ASTM D 538, Type III		O-S-642, Type III ASTM D 538, Type II	
	Min	Max	Min	Max	Min	Max
Sodium phosphate, tribasic: Calculated as Na ₃ PO ₄ from P ₂ O ₅	% By Wt 97.0	% By Wt ---	% By Wt ---	% By Wt ---	% By Wt ---	% By Wt ---
Calculated as Na ₃ PO ₄ ·12H ₂ O from P ₂ O ₅	---	---	97.0	---	---	---
Calculated as Na ₃ PO ₄ ·H ₂ O, from P ₂ O ₅	---	---	---	---	97.0	---
Total alkalinity to methyl orange, as Na ₂ O	36.0	40.0	16.0	19.0	32.0	37.0
Phosphates as phosphoric anhydride P ₂ O ₅	39.5	---	18.1	---	36.0	---
Matter insoluble in water	---	0.1	---	0.1	---	0.1

TABLE XLIII. Physical characteristics of tribasic sodium phosphate (O-S-642).

Characteristic	O-S-642 Type I		O-S-642 Type II		O-S-642 Type III	
	Min	Max	Min	Max	Min	Max
Particle size: Matter retained on:	% By Wt	% By Wt	% By Wt	% By Wt	% By Wt	% By Wt
U.S. No. 20 sieve (powder)	---	1.0	---	---	---	None
U.S. No. 100 sieve (powder)	---	10.0	---	---	---	10.0
U.S. No. 10 sieve (granular)	---	5.0	---	---	---	5.0
U.S. No. 100 sieve (granular)	80.0	---	---	---	40.0	---
U.S. No. 10 sieve (all forms)	---	---	None	None	---	---
U.S. No. 100 sieve (all forms)	---	---	90.0	---	---	---

5.22.3 Use. Anhydrous sodium phosphate, tribasic is for use in various washing, cleaning, and scouring processes, with or without soap as conditions may require, and where a moderately strong alkaline material is desired. It should be used in most cases dissolved in water (about 2-1/2 ounces of material in 10 gal of water). Typical commercial applications of sodium phosphate include use in water softeners, boiler compounds, metal cleaner, textiles, manufacture of

paper, laundering, tanning industry, sugar purification, photographic developers, medicine, and paint removers.

5.22.4 Safety. Tribasic sodium phosphate is nontoxic and nonflammable. Sodium phosphate may cause some irritation to the eyes and skin. Reasonable care and cleanliness should be exercised in the handling of sodium phosphate, tribasic. There is no TLV or PEL referenced for sodium phosphate. The LD₅₀ orally in rats is 7.40 g/kg. (Refer to 4.3.1)

If heated to decomposition, tribasic sodium phosphate evolves toxic oxides of phosphorous fumes.

5.22.5 Storage. Sodium phosphate, tribasic shall be stored in a cool, dry, well ventilated place in tightly closed containers. (Refer to 4.3.2)

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

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

5.23 Name. SODIUM PYROPHOSPHATE, ANHYDROUS $\text{Na}_4\text{P}_2\text{O}_7$ FW 265.94
Tetrasodium Pyrophosphate
TSPP
Pyro

5.23.1 Technical description. Sodium pyrophosphate is in the form of colorless, transparent crystals or white powder and has properties shown in Table XLIV.

TABLE XLIV. Physical properties of sodium pyrophosphate, anhydrous.

Property	Nominal Value
Melting point, °C	988
Refractive index, n_D^{20}	1.425
Solubility, g/100 ml H ₂ O:	
at 0°C	2.26
at 96°C	45
Specific gravity, d	2.534
pH (1% aqueous solution)	10.2

5.23.2 Specifications. Military, DOD-S-51517, Sodium Pyrophosphate, Anhydrous, Technical and ASTM D 595, Specification for Tetrasodium Pyrophosphate Anhydrous.

5.23.2.1 Requirements. At least 99 percent of the sodium pyrophosphate passes through a USS sieve size No. 16. Sodium pyrophosphate conforms to Table XLV with a maximum iron content of 70 parts per million.

TABLE XLV. Chemical characteristics of sodium pyrophosphate.

Characteristic	Requirement			
	DOD-S-51517		ASTM D 595	
	Min	Max	Min	Max
	<u>% By Wt</u>	<u>% By Wt</u>	<u>% By Wt</u>	<u>% By Wt</u>
Matter insoluble in water	---	0.2	---	0.2
Loss on ignition	---	0.5	---	5.0
Assay (% as Na ₄ P ₂ O ₇)	98.0	---	97.5	---

5.23.3 Use. Sodium pyrophosphate, anhydrous is for use in washing, cleaning, and scouring processes with soap and other detergents where a mildly alkaline material, with appreciable water softening properties, is desired. Typical commercial applications of sodium pyrophosphate include use for pharmaceutical preparations, bleaching of straw, ink eradicator, and in solutions of certain dyes, electroplating, and electrolytic evaporation of metals such as tin and zinc, oil-well drilling, cheese emulsification, and as a sequestering agent to remove rust stains.

5.23.4 Safety. Sodium pyrophosphate is nontoxic and nonflammable. Sodium pyrophosphate may cause some irritation to the eyes and skin. Reasonable care and cleanliness should be exercised in the handling of sodium pyrophosphate. There is no TLV or PEL referenced for sodium pyrophosphate. (Refer to 4.3.1)

If heated to decomposition, sodium pyrophosphate evolves toxic oxides of phosphorous fumes.

5.23.5 Storage. Sodium pyrophosphate shall be stored in a cool, dry, well ventilated place in tightly closed containers. (Refer to 4.3.2)

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

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

5.24 Name. SODIUM SESQUISILICATE Na₆SiO₇·12H₂O FW

5.24.1 Technical description. Sodium sesquisilicate is a strongly alkaline material that has a light-colored uniform appearance and is granular in form.

5.24.2 Specifications. ASTM D 594, Standard for Sodium Sesquisilicate.

5.24.3 Requirements. The chemical characteristics are as shown in Table XLVI.

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TABLE XLVI. Chemical characteristics of sodium sesquisilicate.

Characteristic	Requirement	
	Min	Max
Sodium sesquisilicate (as $\text{Na}_2\text{O} \cdot 2\text{SiO}_2 \cdot 11\text{H}_2\text{O}$)	97.0	---
Total alkalinity (as Na_2O)	35.5	37.5
Total silica (as SiO_2)	22.5	---
Insoluble matter (in H_2O)	---	0.2

5.24.4 Use. Sodium sesquisilicate is used for washing, cleaning and scouring process with or without soap as required.

5.24.5 Safety. Sodium sesquisilicate is nontoxic and noncombustible. It is a strong alkaline irritant of the eyes and mucous membranes. When contact with the skin, eyes or mucous membranes is made, the area of contact should be rinsed with water for at least 20 minutes and medical assistance should be obtained immediately. Sodium sesquisilicate shall be used with adequate ventilation. (Refer to 4.3.1)

5.24.6 Storage. Sodium sesquisilicate shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of moisture and air. Sodium sesquisilicate picks up carbon dioxide from the air to become carbonated. Protect containers against physical damage. (Refer to 4.3.2)

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

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

5.25 Name. SODIUM SILICATE SOLUTION Formula varies in ratio from
Liquid glass $\text{Na}_2\text{O} \cdot 3.7\text{SiO}_2$ to $2\text{Na}_2\text{O} \cdot \text{SiO}_2$
Silicate of soda with various proportions of
Soluble glass hydration
Water glass

5.25.1 Technical description. Sodium silicate solutions shall be colorless to gray-white, homogeneous and clean. Liquids vary in viscosity according to class. The freezing point is slightly lower than water. They are miscible with some polyhydrate alcohols and are partially miscible with primary alcohols and ketones. During use, the sodium silicate solutions may be diluted with water if desired. The solutions are strongly alkaline and are readily decomposed by acids with the separation of silicic acid.

5.25.2 Specifications. ASTM D 3400, Specification for Liquid Sodium Silicates.

5.25.2.1 Requirements.

5.25.2.1.1 Federal. Sodium silicate solutions are furnished in three classes as follows: Class 1 (41.5° Baumé); Class 2 (34° Baumé); and Class 3 (52.0° Baumé). The solutions have characteristics shown in Table XLVII.

TABLE XLVII. Chemical and physical characteristics of sodium silicate solution.

Characteristic	Requirement					
	1 gal (3.8 l) can		5 & 55 gal (19 & 208 l) drum		50 lb (22.5 kg) drum	
	Min	Max	Min	Max	Min	Max
Bubble viscosity at 25°C equivalent to a tube form (approximate strokes)	C	T	E	N	T	Z
Specific gravity (20/20°C) Baumé	0.85	5.50	1.25	3.40	5.50	22.70
H ₂ O standard	40.5	42.5	33.5	35.5	51.5	53.5
Sodium oxide (Na ₂ O), % by wt	1.380	1.415	1.302	1.326	1.552	1.585
Weight ratio of silicon di- oxide to sodium oxide (Parts SiO ₂ to 1 part Na ₂ O)	8.7	9.4	6.3	7.0	13.6	14.3
	3.17	3.27	3.70	3.80	2.35	2.45

5.25.2.1.2 Commercial. The liquid sodium silicates are liquids having a water white color with a slight turbidity and are as shown in Table XLVIII.

TABLE XLVIII. Characteristics of liquid sodium silicates (ASTM D 3400).

Characteristic	Requirement					
	Type I 1:2.0		Type II 1:2.4		Type III 1:3.2	
	Min	Max	Min	Max	Min	Max
Ratio Na ₂ O:SiO ₂ (average)						
Total alkalinity to methyl orange as Na ₂ O, %	14.3	15.1	13.5	14.3	8.5	9.3
Total silica as SiO ₂ , %	28.8	30.0	32.5	33.7	28.4	29.6

5.25.3 Use. Sodium silicate solution in the 1 gal (3.8 l) can is for use as an adhesive (in sealing paper cartons of corrugated or plain fiber and in affixing paper labels to fiber, paper and wood surfaces), as a surface hardener for cement, as a coating for asbestos pipe insulation, and for similar purposes. In the 5 and 55 gal (19 and 208 l) drum size it is intended for use as adherents and as coatings for asbestos cloth pipe lagging and for similar purposes. In the 50 lb (22.5 kg) drum size it is intended for use as a surface coating for impression rubbers on intaglio printing presses to prevent listing of printed sheets. Typical commercial applications of sodium silicate include fireproofing, weighting silk, boiling cotton, mailing tubes, veneer products, concrete hardeners, manufacture of cold water paints, filling for soap, cementing stones, waterproofing in hydraulic and acid proof mortars, dyeing and bleaching, cottonseed oil refining, preserving eggs, in medicine for fastening splints, ore flotation, lining Bessemer converters, boiler compounds, binder, digester linings, acid concentrator linings, ceramic cements, artificial stones, purification of fats and oils, sizing fertilizer bags, drilling mud, and manufacturing silica gel.

5.25.4 Safety. Sodium silicate solution is not considered a hazardous material. It is nonflammable and nontoxic. Normal safety precautions shall be exercised in the handling of sodium silicate. Sodium silicate shall be used with adequate ventilation. (Refer to 4.3.1)

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5.25.5 Storage. Sodium silicate solution shall be stored in a cool, dry place in tightly closed containers. (Refer to 4.3.2)

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

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

5.26 Name. SODIUM SILICOFLUORIDE Na_2SiF_6 FW 188.06
 Salufer
 Sodium Fluosilicate
 Sodium Hexafluorosilicate

5.26.1 Technical description. Sodium silicofluoride is a white amorphous powder or hexagonal crystal which is odorless and tasteless. It has properties shown in Table XLIX and is insoluble in alcohol.

TABLE XLIX. Physical constants of sodium silicofluoride.

Characteristic	Nominal Value
Decomposition temperature, °C	500
Refractive indices (of crystal faces), n_D^{20}	1.32, 1.309
Solubility (g/100 ml H_2O)	
at 0°C	0.43
at 100°C	2.45
Specific gravity, d	2.679

5.26.2 Specifications. AWWA Standard B 702, Sodium Silicofluoride.

5.26.2.1 Requirements. Sodium silicofluoride contains no lumps and is free flowing from the shipping container after 30 days storage in a clean, dry place or when stored in closed hopper bins, and shall be suitable for feeding with a conventional dry-feed machine as used in water treatment. Owing to the difference in types of dry chemical feeders, products characterized as "fine powder" or "fine crystal" on the market should be purchased on a test basis prior to award of a long-term contract. The use of any type of synthetic detergent as an anticaking agent shall not be permitted. The use of anticaking materials other than synthetic or wetting agent detergents shall be permitted, provided they do not produce any interference with normal water treatment processes, such as coagulation. Material in the 100 lb (45 kg) bag may be colored blue for identification when required. The coloring material shall be nontoxic and of a type approved by the Federal Food and Drug Administration and shall not exceed 0.20 percent of the sodium silicofluoride by weight. Material in the 100 lb (45 kg) bag shall contain no other soluble mineral or organic substances in quantities capable of producing deleterious or injurious effect upon the health of those consuming water than has been properly treated with sodium silicofluoride and sedimentation, and does not impart any taste, odor, or toxicity to the water when it is treated with the normal quantity of fluoride. The use of anticaking materials may require the purchaser to revise this section of the standard to correspond with local requirements and suitable materials available. The specific requirements for a material that is of proper screen size for the feeding

equipment being used, and which will remain "free flowing" after a definite period of storage, is a matter that should be agreed upon by both purchaser and supplier prior to shipment. Widely varying methods of feeding, solution, and storage of fluoride compounds at the many water utilities using fluorides exclude the possibility of a firm standard on size to cover all of these characteristics. Feedability appears to depend on the uniformity of size between 40 and 325 mesh (narrow size distribution) and a low moisture content. Sodium silicofluoride meets the characteristics in Table L.

TABLE L. Chemical and physical characteristics of sodium silicofluoride.

Characteristic	Requirement			
	1 lb (.45 kg) Bottle		100 lb (45 kg) Bag	
	Min	Max	Min	Max
	<u>% By Wt</u>	<u>% By Wt</u>	<u>% By Wt</u>	<u>% By Wt</u>
Assay (as Na ₂ SiF ₆)	96.0	---	98.0	---
Chlorides	---	0.005	---	---
Heavy metals (as Pb)	---	0.002	---	0.050
Insoluble matter	---	---	---	0.5
Iron	---	0.005	---	---
Moisture	---	---	---	0.5
Sulfate	---	0.05	---	---

5.26.3 Use. Sodium silicofluoride is for use in the treatment of water supplies. Typical commercial applications of sodium silicofluoride include use in laundry sours, opalescent glass, vitreous enamel frits, latex foam rubber, metallurgy, rodenticides, chemical intermediate, glue, leather, and wood preservation.

5.26.4 Safety. Sodium silicofluoride is irritating to the eyes, skin and mucous membranes. Short term inhalation may cause difficult breathing, burning of respiratory tract, nausea, vomiting, profuse sweating and thirst. On skin, it may cause rash, itching and burning. A 1% solution may cause sores. Contact with eyes may cause severe irritation. Long term exposure to fluoride may increase bone density, stimulate new bone growth or cause calcium deposits in ligaments. Inhalation of dust or mist shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Sodium silicofluoride shall be used with adequate ventilation. The TLV for fluoride (as F) is 2.5 mg/m³. The PEL is the same. The LD₅₀ orally in rats is 125 mg/kg. (Refer to 4.3.1)

If heated to decomposition, sodium silicofluoride will evolve toxic fluorides. If in contact with acids, it may produce toxic HF gas.

5.26.5 Storage. Sodium nitrite shall be stored in a cool, dry, well ventilated place in tightly closed containers away from acids. Protect container against damage. (Refer to 4.3.2)

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

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

5.27 Name. SODIUM STANNATE, TRIHYDRATE $\text{Na}_2\text{SnO}_3 \cdot 3\text{H}_2\text{O}$ FW 266.71
 Preparing salt
 Sodium hydroxostannate

5.27.1 Technical description. Sodium stannate is a white powder, colorless lumps or hexagonal crystals which decomposes in air and an aqueous solution is slightly alkaline. Sodium stannate, trihydrate, technical in a 1 lb (.45 kg) bottle is in crystalline form and has a minimum assay (as sodium stannate) of 91.0 percent by weight. In the 50 lb (22.5 kg) drum, it is in powder form and has a minimum assay (as tin) of 40.0 percent by weight. Sodium stannate has physical properties shown in Table LI. Sodium stannate is insoluble in acetone and alcohol.

TABLE LI. Physical properties of sodium stannate, trihydrate.

Characteristic	Nominal Value
Decomposition point, °C	140
Solubility (g/100 ml H ₂ O)	
at 0°C	50
at 50°C	67

5.27.2 Specifications. None.

5.27.2.1 Requirements. Refer to 5.27.1.

5.27.3 Use. Sodium stannate, trihydrate is for use in electroplating. Typical commercial applications of sodium stannate include use as a mordant in dyeing, for ceramics and glass, as a source of tin for electroplating and immersion plating, and in textile fireproofing.

5.27.4 Safety. Sodium stannate is nonflammable and nontoxic. Sodium stannate may cause some irritation to the eyes and skin. Reasonable care and cleanliness should be exercised in the handling of sodium stannate. Sodium stannate is considered a nuisance particulate with a TLV of 10 mg/m³ of total dust. Sodium stannate shall be used with adequate ventilation. (Refer to 4.3.1)

5.27.5 Storage. Sodium stannate shall be stored in a dry place in tightly closed containers. (Refer to 4.3.2)

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

EPA Hazardous Waste Classification is not listed in 40 CFR.

5.28 Name. SODIUM SULFATE, ANHYDROUS Na_2SO_4 FW 142.05
Sodium sulfate, exsiccated
Salt cake

5.28.1 Technical description. Sodium sulfate occurs as a white powder or orthorhombic bipyramidal crystals. It has properties shown in Table LII.

TABLE LII. Physical properties of sodium sulfate.

Property	Nominal Value
Melting point, °C	884
Specific gravity, d	2.698
Refractive index (faces), n_D^{20}	1.464, 1.474, 1.485
Solubility (g/100 ml H_2O)	
at 0°C	4.76
at 100°C	42.7

5.28.2 Specifications. Military, MIL-S-50004, Sodium Sulfate, Anhydrous, Technical (For Ammunition Use).

5.28.2.1 Requirements. Sodium sulfate has characteristics as shown in Table LIII.

TABLE LIII. Chemical characteristics of sodium sulfate, anhydrous.

Property	Requirement	
	Min	Max
	<u>% By Wt</u>	<u>% By Wt</u>
Assay (as Na_2SO_4)	98.0	---
Halides (as NaCl)	---	0.7
Insoluble matter	---	0.1
Moisture content	---	0.5
Neutrality (as H_2SO_4)	---	0.005
Neutrality (as CaCO_3)	---	0.5

5.28.3 Use. Anhydrous sodium sulfate is intended for use in hardening process of smokeless propellants. Commercial uses are in manufacturing of Kraft paper, paper board, glass, water glass, sodium salts; ceramic glazes, processing soap, tanning, freezing mixtures, detergent compositions, standardizing dyes and in dyeing and printing textiles as well as drying organic liquids, Kjeldahl nitrogen determination and production of ultramarine.

5.28.4 Safety. Sodium sulfate is nonflammable and nontoxic. Sodium sulfate may cause some irritation to the eyes and skin. Reasonable care and cleanliness should be exercised in the handling of sodium sulfate. Sodium sulfate is considered a nuisance particulate with a TLV of 10 mg/m^3 of total dust. Sodium sulfate shall be used with adequate ventilation. (Refer to 4.3.1)

If heated to decomposition, sodium sulfate may emit highly toxic oxides of sulfur fumes.

5.28.5 Storage. Sodium sulfate shall be stored in a dry place in tightly closed containers. (Refer to 4.3.2)

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

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

5.29 Name. SODIUM SULFITE Na_2SO_3 FW 126.06

5.29.1 Technical description. Sodium sulfite occurs as hexagonal prisms or white powder which is slightly soluble in alcohol and insoluble in liquid ammonia and chlorine. It has a saline and sulfurous taste. It has properties shown in Table LIV.

TABLE LIV. Properties of sodium sulfite.

Property	Nominal Value
Specific gravity, $d^{15.4}$	2.633
Refractive index (of crystal faces)	1.565, 1.515
Solubility (g/100 ml H_2O)	
at 0°C	12.54
at 80°C	28.3
pH (one percent aqueous solution)	9.0

5.29.2 Specifications. Military, MIL-S-13943, Sodium Sulfite, Anhydrous, Technical.

5.29.2.1 Requirements. Sodium sulfite meets the characteristics in Table LV.

TABLE LV. Chemical characteristics of sodium sulfite.

Characteristic	Requirement	
	Min	Max
	<u>% By Wt</u>	<u>% By Wt</u>
Assay (as Na_2SO_3)	93.0	---
Insoluble matter	---	0.2
Sodium chloride (NaCl)	---	1.0
Iron (Fe)	---	0.1
Water content	---	0.5

5.29.3 Use. Sodium sulfite is for use in boiler-water treatment. Typical commercial applications of sodium sulfite include use for chemical reducing agents, preservative for foods, engraving and lithography, medicine, silvering

mirrors, treating rubber latex, sterilizing beer kegs, permanent wave solutions, fungicide in lotions, a reducer in the manufacturing of dyes, photographic developer in place of sodium thiosulfate ("hypo"), removing traces of chlorine in bleaching textiles and paper, preserving of meat, egg yolks and the like.

5.29.4 Safety. Sodium sulfite is nonflammable and nontoxic. Sodium sulfite may cause some irritation to the eyes and skin. Reasonable care and cleanliness should be exercised in the handling of sodium sulfite. Sodium sulfite is considered a nuisance particulate with a TLV of 10 mg/m³ of total dust. Sodium sulfite shall be used with adequate ventilation. The LD₅₀ in mice is 175 mg/kg. (Refer to 4.3.1)

If heated to decomposition, sodium sulfite may emit highly toxic oxides of sulfur fumes.

5.29.5 Storage. Sodium sulfite shall be stored in a dry place in tightly closed containers. (Refer to 4.3.2)

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

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

5.30 Name. SODIUM TETRAPHOSPHATE Na₆P₄O₁₃ FW 469.82
Glass sodium phosphate
Sodium polyphosphate

5.30.1 Technical description. Sodium tetrphosphate is a white solid in granular or flake form. It is a sodium phosphate glass similar to sodium hexametaphosphate, but having a higher ratio of sodium oxide (Na₂O) to phosphorus pentoxide (P₂O₅).

5.30.2 Specifications. Federal, O-S-635, Sodium Polyphosphate Technical, Water Treatment.

5.30.2.1 Requirements. The physical and chemical characteristics are as shown in Table LVI.

TABLE LVI. Chemical and physical characteristics of sodium tetrphosphate.

Characteristic	Requirement	
	Min	Max
Assay (as P ₂ O ₅), % by wt	62.5	---
Loss on ignition, % by wt	---	1.0
pH (1 percent aqueous solution)	7.0	8.5
Water insoluble matter	---	0.1
Particle size gradation: USS sieve No. 8, pass through	98.0	---

5.30.3 Use. Sodium tetrphosphate is for use in the treatment of industrial water where its use is economically advantageous. Typical commercial applica-

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tions of sodium tetrphosphate are the same as for sodium hexametaphosphate, 5.11.3.

5.30.4 Safety. Sodium tetrphosphate is nontoxic and nonflammable. Sodium tetrphosphate may cause some irritation to the eyes and skin. Reasonable care and cleanliness should be exercised in the handling of sodium tetrphosphate. There is no TLV or PEL referenced for sodium tetrphosphate. (Refer to 4.3.1)

If heated to decomposition, sodium tetrphosphate evolves toxic oxides of phosphorous fumes.

5.30.5 Storage. Sodium tetrphosphate shall be stored in a cool, dry, well ventilated place in tightly closed containers. (Refer to 4.3.2)

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

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

5.31 Name. SODIUM THIOSULFATE, PENTAHYDRATE $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$ FW 248.18
 Antichlor
 Hypo
 Sodium Hyposulfite
 Sodium Subsulfite
 Sodothiol*
 Sulfothiorine*
 Ametox*

5.31.1 Technical description. Sodium thiosulfate, pentahydrate exists as colorless, odorless monoclinic crystals or coarse crystalline white granules. It is slightly deliquescent in warm moist air and efflorescent in dry air about 33°C. It is soluble in water, liquid ammonia, oil of turpentine, and is very slightly soluble in alcohol. It has a cooling taste with a bitter aftertaste. Sodium thiosulfate is incompatible with iodine, acids, lead, mercury and silver salts and has physical and chemical properties as shown in Table LVII.

TABLE LVII. Physical and chemical properties of sodium thiosulfate.

Property	Nominal Value
Melting point, °C	48
Decomposition temperature, °C	50
Specific gravity, <i>d</i>	1.69
Refractive index (of crystal faces), n_D^{20}	1.489, 1.508, 1.536
Solubility (g/100 ml H ₂ O)	
at 0°C	79.4
at 45°C	291.1
at 60°C	301.1
Insoluble matter, % by wt, max	0.005
Nitrogen compounds (as N), % by wt, max	0.002
Sulfate and sulfide (as SO ₄), % by wt, max	0.1
Sulfide (as S) ppm, max	1.0
pH (5 percent aqueous solution) (25°C)	6.0 to 8.4

5.31.2 Specifications. None.

5.31.2.1 Requirements. Refer to 5.29.1.

5.31.3 Use. Sodium thiosulfate pentahydrate is for use in the dechlorination of water. Typical commercial applications include use in photography; chrome dyeing; removing chlorine in bleaching and paper making; extraction of silver from its ores; and as a mordant in dyeing, manufacture of leather and bleaching bone, straw ivory.

5.31.4 Safety. Sodium thiosulfate is nonflammable and nontoxic. Sodium thiosulfate may cause some irritation to the eyes and skin. Reasonable care and cleanliness should be exercised in the handling of sodium thiosulfate. Sodium thiosulfate is considered a nuisance particulate with a TLV of 10 mg/m³ of total dust. Sodium thiosulfate shall be used with adequate ventilation. (Refer to 4.3.1)

If heated to decomposition, sodium thiosulfate may emit highly toxic oxides of sulfur fumes.

5.31.5 Storage. Sodium thiosulfate shall be stored in a dry place in tightly closed containers. (Refer to 4.3.2)

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

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

5.32	<u>Name</u> . SODIUM TRIPOLYPHOSPHATE	$\text{Na}_5\text{P}_3\text{O}_{10}$	FW 367.91
	Pentasodium Triphosphate		
	Sodium triphosphate		
	STPP		
	Tripolyphosphate		
	Poly		

5.32.1 Technical description. Sodium tripolyphosphate is a white crystalline solid. It is moderately hygroscopic and is found in granular or powder form. This material has a tendency to collect moisture from hydrated metals and has the ability to form soluble complexes with certain metallic ions.

5.32.2 Specifications. Federal, O-S-635, Sodium Polyphosphate Technical, Water Treatment.

5.32.2.1 Requirements. Sodium polyphosphate has characteristics as shown in Table LVIII.

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TABLE LVIII. Chemical characteristics of sodium tripolyphosphate.

Characteristic	Requirement	
	Min	Max
Assay (as P ₂ O ₅), % by wt	56.0	---
Loss on ignition, % by wt	---	1.0
Orthophosphate content (as P ₂ O ₅), % by wt	---	1.0
Particle size gradation:		
USS sieve No. 6, % retained		
powder	---	0.0
granular	---	10.0
pH (1 percent aqueous solution) at 25°C	9.3	10.4
Additives (sudsing agents)	---	None
Water insoluble matter, % by wt	---	0.1

5.32.3 Use. Sodium tripolyphosphate is for use in the softening treatment of water. This material is used to treat boiler feed water, where feed water does not build up to desired alkalinity. This chemical is used also in the treatment of laundry waters. Typical commercial application of sodium tripolyphosphate include use as a soap builder, an ingredient in dishwashing compounds, a dispersing agent for paper, china clays, pitch controllant in paper manufacturing, conditioning agent for oil well drilling muds, textile processing (dye penetrant), and for cement slurries.

5.32.4 Safety. Sodium tripolyphosphate is nontoxic and nonflammable. Sodium tripolyphosphate may cause some irritation to the eyes and skin. Reasonable care and cleanliness should be exercised in the handling of sodium tripolyphosphate. There is no TLV or PEL referenced for sodium tripolyphosphate. The LD₅₀ in rats is 6.50 g/kg. (Refer to 4.3.1)

If heated to decomposition, sodium tripolyphosphate evolves toxic oxides of phosphorous fumes.

5.32.5 Storage. Sodium tripolyphosphate shall be stored in a cool, dry, well ventilated place in tightly closed containers. (Refer to 4.3.2)

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

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

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

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 Inorganic Salts and Compounds, Technical Grade (Sodium Bicarbonate through Sodium Tripolyphosphate preferred for application by the Department of Defense.

6.2 Subject term (key word) listing.

Ametoxo
Antichlor
Baking soda
Bichromate of Soda
Bleach liquor
Borax
Borax decahydrate
Calcined soda
Caustic soda
Chemifluor
Chile saltpeter
Chlorine bleach
Common salt
Cubic niter
Cyanogran
Dakin's solution
Diazotizing salts
Disodium hydrogen phosphate
Disodium orthophosphate
Disodium phosphate
DSP
Duraphat
Eau de Javelle
Eau de Labarraque
Erinitrit
Exposure limits, hazardous chemicals
Florocid
Fluoros
Flura-Drops
Glass sodium phosphate
Glassy sodium phosphate
Graham's salt
Halite
Hazardous wastes, disposal and storage of
Hydrosodic carbonate
Hypo
Indeterminate formula
Information, hazardous chemicals
Intimate mixture
Javelle water

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Karidium
Labarraque's solution
Laundry soda
Lemoflur
Liquid glass
Luride - SF
Lye
Monosodium phosphate
Niter cake
Nitrate of soda
Nitratine
Nitre cake
Nitrous acid sodium salt
Oakite•
Ossalin
Osteofluor
Pentasodium triphosphate
Phosphinic acid, sodium salt
Poly
Preparing salt
Primary sodium phosphate
Pyro
Rasorite
Rock salt
Safety, hazardous chemicals
Sal culinaris
Salt
Salt cake
Salufer
Sea salt
Silicate of soda
Soda ash
Soda lye
Soda niter
Sodium (1:1) phosphate glass
Sodium acid carbonate
Sodium acid phosphate
Sodium acid sulfate
Sodium biborate
SODIUM BICARBONATE
Sodium bichromate
Sodium biphosphate
SODIUM BISULFATE, ANHYDROUS
SODIUM BORATE, DECAHYDRATE
SODIUM CARBONATE, ANHYDROUS
SODIUM CARBONATE-SODIUM BICARBONATE
SODIUM CHLORIDE
SODIUM CHROMATE
SODIUM CYANIDE
SODIUM DICHROMATE, DIHYDRATE
Sodium dihydrogen phosphate
Sodium dithionite
SODIUM FLUORIDE
Sodium fluosilicate

Sodium hexafluorosilicate
SODIUM HEXAMETAPHOSPHATE
Sodium hydrate
Sodium hydrogen carbonate
Sodium hydrogen phosphate
Sodium hydrogen sulfate
Sodium hydrosulfite
SODIUM HYDROSULFITE, ANHYDROUS
SODIUM HYDROXIDE
Sodium hydroxostannate
SODIUM HYPOCHLORITE SOLUTION
SODIUM HYPOPHOSPHITE, MONOHYDRATE
Sodium hyposulfite
SODIUM METASILICATE
SODIUM NITRATE
SODIUM NITRITE
Sodium orthophosphate
Sodium orthophosphate, secondary
Sodium orthophosphate, tertiary
SODIUM ORTHOSILICATE
SODIUM PHOSPHATE, DIBASIC, ANHYDROUS
SODIUM PHOSPHATE, MONOBASIC, ANHYDROUS
SODIUM PHOSPHATE, TRIBASIC, ANHYDROUS
Sodium polyphosphate
Sodium polyphosphate
Sodium pyroborate
SODIUM PYROPHOSPHATE, ANHYDROUS
Sodium pyrosulfate
Sodium sesquicarbonate
SODIUM SESQUISILICATE
SODIUM SILICATE SOLUTION
SODIUM SILICOFLUORIDE
SODIUM STANNATE, TRIHYDRATE
Sodium subsulfite
SODIUM SULFATE, ANHYDROUS
Sodium sulfate, exsiccated
SODIUM SULFITE
Sodium sulfoxylate
Sodium tetraborate
SODIUM TETRAPHOSPHATE
Sodium tetraphosphate
SODIUM THIOSULFATE, PENTAHYDRATE
Sodium triphosphate
SODIUM TRIPOLYPHOSPHATE
Sodolith•
Soluble glass
STPP
Sulfothiorine•
Table salt
Tertiary sodium phosphate
Tetrasodium pyrophosphate
Tincal
Tinkal
Tripolyphosphate

Trisodium orthophosphate
Trisodium phosphate
Trona
TSP
TSPP
Urao
Vichy salts
Villiaumite
Water glass
Zola
Zymafluor

6.3 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes, which include the addition of the chemicals sodium hydroxide and sodium sesquisilicate, new safety, storage and disposal guidance for all materials, Section 6 and an Index.

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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SODIUM HYPOCHLORITE SOLUTION	5.13	32
SODIUM HYPOPHOSPHITE, MONOHYDRATE	5.15	35
Sodium hyposulfite	5.31	58
SODIUM METASILICATE	5.16	36
SODIUM NITRATE	5.17	37
SODIUM NITRITE	5.18	41
Sodium orthophosphate	5.20	44
Sodium orthophosphate, secondary	5.21	45
Sodium orthophosphate, tertiary	5.22	46
SODIUM ORTHOSILICATE	5.19	43
SODIUM PHOSPHATE, DIBASIC, ANHYDROUS	5.21	45
SODIUM PHOSPHATE, MONOBASIC, ANHYDROUS	5.20	44
SODIUM PHOSPHATE, TRIBASIC, ANHYDROUS	5.22	46
Sodium polyphosphate	5.30	57
Sodium polyphosphate	5.11	30
Sodium pyroborate	5.3	15
SODIUM PYROPHOSPHATE, ANHYDROUS	5.23	48
Sodium pyrosulfate	5.2	13
Sodium sesquicarbonate	5.5	19
SODIUM SESQUISILICATE	5.24	49
SODIUM SILICATE SOLUTION	5.25	50
SODIUM SILICOFLUORIDE	5.26	52
SODIUM STANNATE, TRIHYDRATE	5.27	55
Sodium subsulfite	5.31	58
SODIUM SULFATE, ANHYDROUS	5.28	55
Sodium sulfate, exsiccated	5.28	55
SODIUM SULFITE	5.29	56
Sodium sulfoxylate	5.12	32
Sodium tetraborate	5.3	15
SODIUM TETRAPHOSPHATE	5.30	57
Sodium tetraphosphate	5.11	30
SODIUM THIOSULFATE, PENTAHYDRATE	5.31	58
Sodium triphosphate	5.32	59
SODIUM TRIPOLYPHOSPHATE	5.32	59
Sodolithol*	5.31	58
Soluble glass	5.25	50
STPP	5.32	59
Sulfothiorine*	5.31	58
Table salt	5.6	21
Tertiary sodium phosphate	5.22	46

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Tetrasodium pyrophosphate	5.23	48
Tincal	5.3	15
Tinkal	5.3	15
Tripolyphosphate	5.32	59
Trisodium orthophosphate	5.22	46
Trisodium phosphate	5.22	46
Trona	5.5	19
TSP	5.22	46
TSPP	5.23	48
Urao	5.5	19
Vichy salts	5.1	12
Villiaumite	5.10	28
Water glass	5.25	50
Zola	5.3	15
Zymafluor	5.10	28

CONCLUDING MATERIAL

Lead Standardization Activity:

Defense General Supply Center - GS

Preparing Activity:

Army - EA
Project No. 6810-1246

Custodians:

Army - EA
Navy - SH
Air Force - 68

Review Activities:

Army - AR, GL, MD, ME, SM
Navy - OS
Air Force - None

User Activities:

Army - None
Navy - CG
Air Force - None