SAFETY IN THE LABORATORY

As a junior officer, your basic responsibility is for the safety and well-being of your shipmates. The naval history of the last few years has included carrier fires, explosions in paint lockers and numerous other serious accidents with fatalities. In all of the cases investigated since 1970, the underlying cause was failure to follow prescribed safety practices. A number of Navy careers ended because of bad fitness reports arising from these events.

Working in a laboratory should be a safe experience. This will happen, however, only if certain precautions are followed without exception. The practice of safety requires (1) the desire on the part of the individual to protect himself or herself as well as those around him or her and (2) the need to rigidly follow a well-defined set of laboratory rules. The safety rules to be followed by all midshipmen in the Chemistry Department laboratories will be discussed by your instructor during the first laboratory class period of the semester. These rules are posted in the laboratory spaces and are outlined on the following pages of this manual. While it is the obligation of the instructor to explain these rules, it is the responsibility of everyone in the laboratory to follow the safety regulations. They will be rigidly and impartially enforced, with non-compliance resulting in the dismissal of the guilty party from the laboratory.

A. Safety Equipment

The location and use of the safety equipment in laboratory will be discussed by your instructor the first day that the class meets in the lab space. All midshipmen should become familiar with the proper use of the:

safety shower
eye-wash fountain
fire extinguisher
cut-offs for gas and power

The location of the equipment is important, as well as when to use each piece of equipment.

Safety goggles for eye protection are to be worn by all midshipmen while in the laboratory. The instructor may decide to override this when all hood sashes are down. Goggles will be issued to each midshipman during the fall semester book issue. If a midshipman fails to bring the goggles to class, he or she will be sent back to Bancroft Hall to get the goggles.

Laboratory aprons are provided on the hooks outside each laboratory and are to be worn by all midshipmen while in the lab. A midshipman who is especially small in stature can obtain a shortened apron by seeing their instructor. An apron which is too long and drags on the floor can be as much of a hazard as no apron at all.

B. Laboratory Do's and Don'ts

The following is a list of do's and don'ts which must be adhered to by all midshipmen.

1. If any ventilation hood sash in your laboratory is up, you must wear your approved chemical splash goggles. **Hood up – Googles on!**

2. **The laboratory stools belong to the lab islands.** They are not designed to be used by the hood – the stools are too wide to fit two per hood and though the passageways are wide, they are not wide enough to allow someone to pass easily by a stool that has someone sitting on it. You may only move them away from the island with instructor permission.

3. **The slide-out writing surfaces are to be stowed whenever not in use.** We have orange tape on the front top edge, but they are difficult to see when you have your goggles on and they are at a height that will maximize discomfort if you walk into it (I will not elaborate, but use your imagination.).

4. Bring only the necessary materials into the laboratory: lab manual/notebook, pencil/pen, calculator, computer, goggles and apron. Coats and covers should be left in the hallway on the hooks. Bookbags, books, briefcases, menus, rate books, newspapers, etc., should be left along the walls in the corridor.

5. Do not touch chemicals with your hands. Spatulas and forceps have been provided for handling solid materials.

6. No wet chemicals should be placed on the islands or the pull-out writing surfaces. In addition, no stock solutions bottles are to go to individual lab stations. Midshipmen should take an appropriate container to the stock solution to obtain the needed amount.

7. **Do not eat or drink** in the laboratory. All surfaces in the lab are potentially contaminated with radioactive or chemical residues, which could be transferred and ingested. Leave water bottles outside in the hall. **Do not taste** any chemical. **Do not smell any chemicals directly.** Use your hand to waft the odor to your nose. **Wash your hands** before leaving lab.

8. Do not pipet solutions by mouth. Rubber pipet bulbs are provided at each lab station.

9. Do not put flammable liquids near an open flame.

10. When heating a test tube, make certain that the open end of the tube is directed away from other students. If overheating or superheating causes the contents to bump out, no one in the laboratory will be splashed.

11. When finished with your Bunsen burner for a given portion of an experiment, turn it off. Be careful not to place lit burners under gas hose.

12. Do not sit on the lab benches. We give you nice stools – use them and save your uniform from damage.

13. Do not engage in games or horseplay in the laboratory. Failure to follow this rule will result in immediate dismissal from the lab and subsequent conduct action.

14. Do not pour any chemical into a sink without authorization from the instructor.

16. All broken glassware should be reported to your instructor immediately. In most cases the instructor will deal with it as a minor cut on a Mid requires quite a bit of action, but a minor cut on an instructor can be dealt with at a lower level (See Section E below). If the instructor designates you to clean up, a dust pan and foxtail brush are located in each lab to assist with cleanup. Broken glass should be disposed of in the specially marked receptacles ONLY.

18. Do all reactions, particularly those involving malodorous, noxious or dangerous chemicals, in a ventilation hood.

19. If a chemical gets on your skin, immediately wash the affected area with large quantities of water. The instructor should be notified, no matter how insignificant the incident might seem.

20. When pouring one liquid into another, do so slowly and cautiously. To dilute an acid, pour the acid into the water; never pour water into an acid.

21. No student shall be permitted to work alone in the lab. You may not do unauthorized experiments or variations of any experiment.

22. Exercise good housekeeping practices in the laboratory. Be sure that the lab benches remain free of clutter during the experiment. In the event of a spill, clean the area immediately. Be sure to use a wet sponge to wipe off the work station at the conclusion of the lab. In addition, all midshipmen should help police the shared areas of the lab for debris before dismissal.

23. Know what you are to do before entering the lab. Read the experiment carefully before coming to the lab. Be cautious and think about what you are doing. Use common sense.

C. "Safety Data Sheets (SDS)" and "National Fire Protection Association (NFPA)" Labels

All midshipmen should become familiar with two safety items in particular. These are "Safety Data Sheets (SDS)" and "National Fire Protection Association (NFPA)" labels. A "Safety Data Sheet" is a required document which describes a given, chemically-based material. The SDS format is consistent with a worldwide standard for hazard information communication, and the information included on the sheet is prescribed by law (see Figure 1) and monitored by the Occupational Safety and Health Administration (OSHA).

Figure 1. SDS contents (U.S. Occupational Safety and Health Administration, https://www.osha.gov/Publications/HazComm_QuickCard_SafetyData.html, accessed 15 August 2017.)

Hazard Communication Safety Data Sheets

The Hazard Communication Standard (HCS) requires chemical manufacturers, distributors, or importers to provide Safety Data Sheets (SDSs) (formerly known as Material Safety Data Sheets or MSDSs) to communicate the hazards of hazardous chemical products. As of June 1, 2015, the HCS will require new SDSs to be in a uniform format, and include the section numbers, the headings, and associated information under the headings below:

Section 1, Identification includes product identifier; manufacturer or distributor name, address, phone number; emergency phone number; recommended use; restrictions on use.

Section 2, Hazard(s) identification includes all hazards regarding the chemical; required label elements.

Section 3, Composition/information on ingredients includes information on chemical ingredients; trade secret claims.

Section 4, First-aid measures includes important symptoms/effects, acute, delayed; required treatment.

Section 5, Fire-fighting measures lists suitable extinguishing techniques, equipment; chemical hazards from fire.

Section 6, Accidental release measures lists emergency procedures; protective equipment; proper methods of containment and cleanup.

Section 7, Handling and storage lists precautions for safe handling and storage, including incompatibilities.

Section 8, Exposure controls/personal protection lists OSHA's Permissible Exposure Limits (PELs); ACGIH Threshold Limit Values (TLVs); and any other exposure limit used or recommended by the chemical manufacturer, importer, or employer preparing the SDS where available as well as appropriate engineering controls; personal protective equipment (PPE).

Section 9, Physical and chemical properties lists the chemical's characteristics.

Section 10, Stability and reactivity lists chemical stability and possibility of hazardous reactions.

Section 11, Toxicological information includes routes of exposure; related symptoms, acute and chronic effects; numerical measures of toxicity.

Section 12, Ecological information*
Section 13, Disposal considerations*
Section 14, Transport information*
Section 15, Regulatory information*

Section 16, Other information, includes the date of preparation or last revision.

Chemical manufacturers are required to make available a complete SDS with any chemical purchased. The purchaser is required to maintain a file of these data sheets in an area accessible to those individuals working directly with the chemical. Employees have the right to see the SDS on request. Such forms will be common-place in all working areas throughout Naval installations and as a result, all midshipmen should be aware of their existence and the types of information which they contain. An example is provided in Figure 2.

Figure 2. SDS for H_2SO_4 (Teck Metals, Ltd., http://www.teck.com/media/Products-Sulphuric-Acid-SDS-2015.pdf, accessed 16 August 2017.)

Teck

SULPHURIC ACID
SAFETY DATA SHEET

SECTION 1. IDENTIFICATION

Product Identity: Sulphuric Acid (93 percent).

Trade Names and Synonyms: Oil of vitriol, electrolyte acid, battery acid, matting acid, H_2SO_4.

Manufacturer:	**Supplier:**	**Preparer:**
Teck Metals Ltd.	Teck Metals Ltd.	Teck Metals Ltd.
Trail Operations	Trail Operations	Suite 3300 – 550 Burrard Street
Trail, British Columbia	Trail, British Columbia	Vancouver, British Columbia
V1R 4L8	V1R 4L8	V6C 0B3
Emergency Telephone: 250-364-4214		

Date of Last Revision: May 22, 2015.

Date of Last Edit: May 22, 2015.

Product Use: Used in the manufacture of chlorine dioxide (a pulp and paper bleaching chemical), in the manufacture of phosphate and sulphate fertilizers, in the manufacturing of metal sulphates, as a metal pickling chemical and as a component of lead storage batteries.

SECTION 2. HAZARDS IDENTIFICATION

CLASSIFICATION:

Health		Physical	Environmental
Acute Toxicity (Inhalation)	– Category 2	Corrosive to Metals – Category 1	Aquatic Toxicity – Short Term – Category 3
Skin Corrosion	– Category 1		
Eye Damage	– Category 1		
Specific Target Organ Toxicity			
Acute Exposure	– Category 3		
Chronic Exposure	– Category 2		

LABEL:

Symbols: 

Signal Word: DANGER

Hazard Statements	Precautionary Statements:
DANGER! Causes severe skin burns and serious eye damage. May cause respiratory irritation. May cause damage to teeth through prolonged and repeated exposure to sulphuric acid mists. Fatal if inhaled. May be corrosive to metals. Harmful to aquatic life.	Wear protective gloves, protective clothing, eye and face protection. Wash exposed skin thoroughly after handling. Store and use only in a well-ventilated area. Keep containers tightly closed. In case of inadequate ventilation wear respiratory protection. Do not breathe mist. Avoid release to the environment. Absorb spillage. IF IN EYES: Rinse continuously with water for several minutes. Continue rinsing and immediately call a poison centre/doctor. Specific treatment is urgent. IF ON SKIN: Take off immediately all contaminated clothing. Rinse skin with water or shower. For large area burns, immediately call a poison centre/doctor. Wash contaminated clothing before reuse. IF INHALED: Remove person to fresh air and keep comfortable for breathing. IF SWALLOWED: Rinse mouth. DO NOT induce vomiting. Get medical attention if you feel unwell. Store in corrosion resistant container with a resistant inner liner.

Emergency Overview: A strong mineral acid present as a colourless and odourless oily liquid when pure but may appear yellow to dark brown when impure. Extremely corrosive to all body tissues, causing rapid tissue destruction and serious chemical burns. Skin or eye contact requires immediate first aid. Can decompose at high temperatures, forming toxic gases such as sulphur oxides. Non-flammable but reacts violently with water, generating large amounts of heat with potential for spattering of the acid. Can react with combustible materials to generate heat and ignition. Reacts with most metals, particularly when diluted with water, to form flammable hydrogen gas which may create an explosion hazard. It is highly toxic to aquatic organisms and plant life.

Potential Health Effects: Sulphuric acid is not very volatile and workplace exposures are therefore primarily due to accidental splashes or to processes or actions that generate an acid mist. It is extremely corrosive to all body tissues, causing rapid tissue destruction and serious chemical burns on contact with the skin or eyes. Skin or eye contact requires immediate first aid. Inhalation of sulphuric acid mist or fumes may produce irritation of the nose, throat and respiratory tract. High levels of acid mist are also irritating to the skin and eyes. Chronic inhalation of acid mist may cause pitting and erosion of tooth enamel. Sulphuric acid, per se, is not listed as a carcinogen by OSHA, NTP, IARC, or the ACGIH. However, IARC, the ACGIH and the NTP have concluded there is sufficient evidence that occupational exposure to strong inorganic acid mists containing sulphuric acid is carcinogenic or potentially carcinogenic to humans (see Toxicological Information, Section 11).

Potential Environmental Effects: Sulphuric acid is highly toxic to aquatic organisms and terrestrial plant life; however, it does not bioaccumulate or bioconcentrate through the food chain (see Ecological Information, Section 12).

SECTION 3. COMPOSITION / INFORMATION ON INGREDIENTS

HAZARDOUS COMPONENTS	CAS Registry No.	CONCENTRATION (% wgt/wgt)
Sulphuric Acid	7664-93-9	93%

Note: See Section 8 for Occupational Exposure Guidelines.

SECTION 4. FIRST AID MEASURES

Eye Contact: *Symptoms:* Burning, pain, blurring. Avoid direct contact. Wear chemical protective gloves, if necessary. Quickly and gently blot excess acid off face. Immediately flush the contaminated eye(s) with lukewarm, gently flowing water, for at least 30 minutes, while holding the eyelid(s) open. If a contact lens is present, DO NOT delay irrigation or attempt to remove the lens. Neutral saline solution may be used as soon as it is available. DO NOT INTERRUPT FLUSHING. If necessary, continue flushing

during transport to emergency care facility. Take care not to rinse contaminated water into the unaffected eye or onto the face. Quickly transport victim to an emergency care facility.

Skin Contact: *Symptoms:* Burning, pain, ulceration. Avoid direct contact. Wear chemical protective clothing if necessary. As quickly as possible, remove contaminated clothing, shoes and leather goods (e.g., watchbands, belts), under shower if possible. Flush with lukewarm, gently flowing water for at least 30 minutes. DO NOT INTERRUPT FLUSHING. For acid splashes over large areas of the body transport quickly to an emergency care facility. If necessary, and if it can be done safely, continue flushing during transport to emergency care facility. Completely decontaminate clothing, shoes and leather goods before reuse or discard.

Inhalation: *Symptoms:* Nose throat and lung irritation, coughing, wheezing. Take precautions to ensure your own safety before attempting rescue (e.g., wear appropriate protective equipment, use the buddy system). Remove source of exposure or move person from exposure area to fresh air and keep comfortable for breathing. Call a Poison Centre/doctor or seek medical attention if you feel unwell.

Ingestion: *Symptoms:* Burning pain in mouth and throat. Have victim rinse mouth thoroughly with water. DO NOT INDUCE VOMITING. If vomiting occurs naturally, have person lie on their side in the recovery position. Have victim rinse mouth with water again. Quickly transport victim to an emergency care facility and bring a copy of this SDS.

SECTION 5. FIRE FIGHTING MEASURES

Fire and Explosion Hazards: Sulphuric acid is not flammable or combustible. However, fires may result from the heat generated by contact of concentrated sulphuric acid with combustible materials. Sulphuric acid reacts with most metals, especially when diluted with water, to produce hydrogen gas which can accumulate to explosive concentrations inside confined spaces. It reacts violently with water and organic materials evolving a considerable amount of heat and is very hazardous when in contact with carbides, cyanides, and sulfides.

Extinguishing Media: Use dry chemical or carbon dioxide extinguishers to extinguish small fires in surrounding combustible materials. Use water spray or fog to cool fire-exposed containers and to knock down large fires. Use water streams only if absolutely necessary and DO NOT USE WATER DIRECTLY ON ACID as a violent reaction may occur resulting in spattering of the acid. Do not release runoff from fire control methods to sewers or waterways.

Fire Fighting: Fire fighters must be fully-trained and wear full protective clothing including an approved, self-contained breathing apparatus which supplies a positive air pressure within a full face-piece mask. For fires close to a spill or where vapours are present, use acid-resistant personal protective equipment.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Procedures for Cleanup: Control source of release if possible to do so safely. Contain spill, isolate hazard area, and deny entry to unauthorized personnel. Prevent from entering sewage or drainage systems and bodies of water. Dike area around spill and pump uncontaminated acid back to process if possible. Neutralize spilled material with alkali such as sodium carbonate or sodium bicarbonate, soda ash, lime or limestone granules. If neutralized with lime rock or soda ash, good ventilation is required during neutralization because of the release of carbon dioxide gas. Allow to stand for 1-2 hours to complete neutralization, then absorb any liquid in solid absorbent such as vermiculite or clay absorbents. Place spilled material in suitable (corrosion resistant) labeled containers for final disposal. Treat or dispose of waste spilled material and/or contaminated absorbent material in accordance with all local, regional and national regulations.

Personal Precautions: Acid resistant protective clothing and gloves. Sleeves and pant legs should be worn outside, not tucked into gloves and rubber boots. Use close-fitting safety goggles or a combination of safety goggles and a face shield where splashing is a possibility. Respiratory protection equipment should be worn where exposure to hazardous levels of mist or fume is possible.

Environmental Precautions: This product has the potential to pose ecological risks to organisms in both aquatic and terrestrial environments. Discharge of the product to soil and water should be prevented. Prevent spillage from entering sewers or natural watercourses.

SECTION 7. HANDLING AND STORAGE

Store in a dry, cool, well-ventilated area away from incompatible substances. Keep in tightly closed containers which are appropriately labeled. Do not allow contact with water. Do not store near alkaline substances.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Occupational Exposure Guidelines:

Component	ACGIH TLV	OSHA PEL	NIOSH REL
Sulphuric Acid	0.2 mg/m^3 Thoracic fraction	1 mg/m^3	1 mg/m3

NOTE: OEGs for individual jurisdictions may differ from those given above. Check with local authorities for the applicable OEGs in your jurisdiction.
ACGIH - American Conference of Governmental Industrial Hygienists; OSHA - Occupational Safety and Health Administration; NIOSH - National Institute for Occupational Safety and Health. TLV – Threshold Limit Value, PEL – Permissible Exposure Limit, REL – Recommended Exposure Limit.

NOTE: The selection of the necessary level of engineering controls and personal protective equipment will vary depending upon the conditions of use and the potential for exposure. The following are therefore only general guidelines that may not fit all circumstances. Control measures to consider include:

Ventilation: Use adequate local or general ventilation to maintain the concentration of sulphuric acid aerosol mists below recommended occupational exposure limits.

Protective Clothing: Protective clothing and gloves as well as glasses, goggles or face shield. Appropriate protective clothing and gloves should be worn where any possibility exists that skin contact can occur. Use close-fitting safety goggles or a combination of safety goggles and a face shield where any possibility exists that eye contact can occur. An eyewash and quick drench shower should be provided near the work area. Workers should wash immediately whenever skin becomes contaminated.

Respirators: Where sulphuric acid mists are generated and cannot be controlled to within acceptable levels, use appropriate NIOSH-approved respiratory protection equipment (a combination of a 42CFR84 Class N, R or P-100 particulate filter and an acid gas cartridge). Note: sulphuric acid mist also causes eye irritation at high concentrations and a full face respirator or supplied air respirator may be necessary in some cases.

General Hygiene Considerations: Always practice good personal hygiene. Refrain from eating, drinking, or smoking in work areas. Thoroughly wash hands before eating, drinking, or smoking.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance:
Clear, colourless, oily liquid (may turn yellowish to amber upon aging)

Odour:
Odourless when cold; acrid odour upon heating

Odour Threshold:
> 1 mg/m³ (Acid mist will irritate the nose and may be sensed as a pungent odour)

pH:
Concentration dependant
<0.1 (93% Sol'n),
0.3 (5% or 1N Sol'n)

Vapour Pressure:
<0.04 kPa (<0.3 mm Hg) @ 25°C

Vapour Density:
3.4 (air = 1)

Melting Point/Range:
280°C

Boiling Point/Range:
-35°C

Relative Density (Water = 1):
1.84 (93% H_2SO_4)

Evaporation Rate:
Not Applicable

Coefficient of Water/Oil Distribution:
No Data Available

Solubility:
Completely soluble with generation of significant heat.

Flash Point:
Not Flammable

Flammable Limits (LEL/UEL):
Not Applicable

Auto-ignition Temperature:
None

Decomposition Temperature:
Not Applicable

SECTION 10. STABILITY AND REACTIVITY

Stability & Reactivity: Sulphuric acid is stable and not considered reactive under normal temperatures and pressures. Hazardous polymerization or runaway reactions will not occur. Decomposes at 340ºC into sulphur trioxide and water. Extremely reactive with metals, alkalis, reducing agents and many other organic and inorganic chemicals. Hazardous gases such as hydrogen cyanide, hydrogen sulfide and acetylene are evolved on contact with chemicals such as cyanides, sulfides and carbides respectively. Contact with combustible organic matter may cause fire or explosion. Dilution with water generates excessive heat and spattering or boiling may occur. Always add acid to water, NEVER ADD WATER TO ACID. Corrosive to most metals including mild steel, copper, aluminum, zinc, etc., especially when diluted to below 90%.

Incompatibilities: Combustible materials, organic materials, reducing agents, amines, bases, water, excess heat, and metals.

Hazardous Decomposition Products: Sulphur dioxide, sulphur trioxide and sulphuric acid fumes.

SECTION 11. TOXICOLOGICAL INFORMATION

General: Concentrated sulphuric acid is a direct acting toxicant, producing local effects at the site(s) of contact but no systemic effect. It exerts a strong corrosive action on all tissues due to its severe dehydration action (removing water from tissues). The severity of the chemical burn produced by the concentrated acid is proportional to the strength of the acid and the duration of contact. Burns are deep but typically not severely painful.

Acute:
Skin/Eye: Splashes can cause severe eye burns and may cause irreversible eye injury and possible blindness. Skin contact results in severe burns and may result in permanent scarring. High levels of sulphuric acid mists and aerosols are also irritating to the eyes and skin.

Inhalation: Inhalation may cause severe irritation of the respiratory tract with sore throat, coughing, shortness of breath, laryngeal spasm and delayed lung edema. These symptoms may be aggravated by physical exertion. Asthmatics may be more sensitive to inhaling sulphuric acid mists and asthma may be aggravated by exposure to sulphuric acid.

Ingestion: Ingestion is unlikely in industrial use but would result in severe burns to the mouth, throat, esophagus and stomach which could lead to permanent damage to the digestive tract. Small amounts of acid can also enter the lungs during ingestion or subsequent vomiting and cause serious lung injury.

Chronic: Prolonged exposure to dilute solutions or mists may result in eye irritation (chronic conjunctivitis) and produce skin dermatitis. Exposure to high concentrations of acid mist has caused erosion and discolouration of the anterior teeth. Inhalation of sulphuric acid mist may decrease the ability of the respiratory tract to remove other small particles which may be inhaled. Sulphuric acid, per se, is not listed as a carcinogen by OSHA, the National Toxicology Program (NTP), the International Agency for Research on Cancer (IARC), or the ACGIH. IARC has concluded that there is sufficient evidence that occupational exposure to strong inorganic acid mists containing sulphuric acid is carcinogenic to humans, resulting in an increased incidence of primarily laryngeal cancers. The ACGIH lists strong inorganic acid mists containing sulphuric acid as a suspected human carcinogen (A2) and the NTP have classified strong inorganic acid mists containing sulphuric acid as a known human carcinogen. OSHA does not list sulphuric acid mist as a carcinogen.

Animal Toxicity:

Hazardous Ingredient:	Acute Oral Toxicity:	Acute Dermal Toxicity:	Acute Inhalation Toxicity:
Sulphuric Acid	2140 mg/kg[†]		255 mg/m^3/4Hr[‡]

[†] LD_{50}, Rat, Oral, [‡] LC_{50}, Rat, Inhalation, 4 hour

SECTION 12. ECOLOGICAL INFORMATION

Sulphuric acid is highly toxic to aquatic organisms and terrestrial plant life; however, it does not bioaccumulate or bioconcentrate through the food chain.

SECTION 13. DISPOSAL CONSIDERATIONS

Do not wash down drain or allow to reach natural watercourses. Dispose of neutralized waste consistent with regulatory requirements. If neutralized with lime rock or soda ash, good ventilation is required during neutralization because of the release of carbon dioxide gas.

SECTION 14. TRANSPORT INFORMATION

PROPER SHIPPING NAME TRANSPORT CANADA	Sulphuric Acid
PROPER SHIPPING U.S. DOT	Sulfuric Acid
TRANSPORT CANADA CLASSIFICATION	Class 8 Packing Group II
U.S. DOT CLASSIFICATION	Class 8 Packing Group II (RQ) – 1,000 lbs.
PRODUCT IDENTIFICATION NUMBER	UN1830
MARINE POLLUTANT	No
IMO CLASSIFICATION	Class 8

SECTION 15. REGULATORY INFORMATION

U.S.

INGREDIENTS LISTED ON TSCA INVENTORY	Yes
HAZARDOUS UNDER HAZARD COMMUNICATION STANDARD	Yes
CERCLA SECTION 103 HAZARDOUS SUBSTANCES	Sulfuric Acid....Yes....RQ: 1000 lbs. (454 kg.)
EPCRA SECTION 302 EXTREMELY HAZARDOUS SUBSTANCE	Yes .....RQ: 1000 lbs. (454 kg.) Threshold Planning Quantity: 1000 lbs.
EPCRA SECTION 311/312 HAZARD CATEGORIES	Immediate (Acute) Health Hazard - Corrosive Immediate (Acute) Health Hazard - Highly Toxic
EPCRA SECTION 313 TOXIC RELEASE INVENTORY:	Sulfuric Acid .....CAS NO. 7664-93-9 Percent by Weight: 93%

SECTION 16. OTHER INFORMATION

Date of Original Issue: January 9, 1998 **Version:** 01 *(First edition)*

Date of Latest Revision: May 22, 2015 **Version:** 13

The information in this Safety Data Sheet is based on the following references:

- American Conference of Governmental Industrial Hygienists, 2004, Documentation of the Threshold Limit Values and Biological Exposure Indices, Seventh Edition plus updates.
- American Conference of Governmental Industrial Hygienists, 2015, Guide to Occupational Exposure Values.
- American Conference of Governmental Industrial Hygienists, 2015, Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices.
- Bretherick's Handbook of Reactive Chemical Hazards, 20th Anniversary Edition. (P. G. Urben, Ed.) 1995.
- Canadian Centre for Occupational Health & Safety CHEMINFO Record No. 122 - Sulphuric Acid, 2009-04.
- Commission de la santé et la sécurité du travail, Service du Répertoire toxicologique, Acide Sulfurique, 2006-02-08.
- Industry Canada, SOR/2015-17, 30 January 2015 - Hazardous Products Regulations.
- International Agency for Research on Cancer (IARC), Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, 1972 – present, (multi-volume work), World Health Organization, Geneva.
- International Chemical Safety Cards (WHO/IPCS/ILO), ICSC:0362 – Sulphuric Acid (Revised Oct 2008).
- Merck & Co., Inc., 2001, The Merck Index, An Encyclopedia of Chemicals, Drugs, and Biologicals, Thirteenth Edition.
- National Industrial Chemicals Notification and Assessment Scheme (NICNAS), Sydney, Australia – Existing Chemicals Information Sheet – Sulphuric Acid, 30 June 2003.
- OECD Screening Information Data Base (SIDS) Initial Assessment Report – Sulphuric Acid, January 2001.
- Patty's Toxicology, Fifth Edition, 2001: E. Bingham, B. Cohrssen & C.H. Powell, Ed.
- Toxicology of the Eye, 2nd Ed. W. Morton Grant, MD, Charles C. Thomas, Publishers; Springfield. IL (1974).
- U.S. Dept. of Health and Human Services, National Institute for Occupational Safety and Health. NIOSH Pocket Guide to Chemical Hazards. CD-ROM Edition September 2005.
- U.S. Dept. of Health and Human Services, National Institute for Occupational Safety and Health, Registry of Toxic Effects of Chemical Substances (RTECS) CCOHS Web Access subscription.
- U.S. Dept. of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, Toxicological Profile for Sulfur Trioxide and Sulfuric Acid, December 1998.
- U.S. Occupational Safety and Health Administration, 1989, Code of Federal Regulations, Title 29, Part 1910.

Notice to Reader

In addition to SDS forms, all midshipmen should become conversant with the information encoded on the labels referred to as "NFPA" labels. These are diamond-shaped labels placed on bottles, cylinders, doors, cabinets, etc., in a conspicuous place to identify health, flammability and reactivity associated with the contents of the container. Health hazards are identified by a blue-coded area including a number from zero through four, with "4" indicative of a deadly hazard. In a similar fashion, flammability information is included by number on a red background and reactivity precautions are encoded in a yellow section. For these three sections, "0" indicates a normal or stable material and "4" indicates an extremely hazardous material. A fourth section of the NFPA label is a white section, reserved for designation of a specific hazard such as acid, corrosive or oxidizer. The information included on such labels and how the label is encoded is outlined in Figure 3.

Figure 3. Sample NFPA label (MySafetyLabels.com, http://images.mysafetylabels.com/img/lg/L/Custom-NFPA-Chemical-Hazard-Label-LB-3354.gif , accessed 15 August 2017.)

D. Standard Operating Procedure of the Chemistry Department for Classroom or Laboratory Evacuation due to Fire, Fire Drill or Bomb Threat

In the event of a fire, fire drill or bomb threat during a class period, a quite distinguishable alarm will sound. In response to the alarm, the midshipmen will take the following actions.

1. All students will exit the class in an orderly and safe fashion. All students will form-up, by section, in a pre-designated area. This area will be specified by your instructor on the first day of class, each semester.

2. Section leaders will take a muster of the section as soon as possible after evacuation of the building. The section leaders should promptly report the results of the muster to the instructor.

3. No midshipmen will be allowed to leave the muster area until directed to do so by the instructor.

4. Instructors will advise the department chairman (or designate) of the results of the muster for his or her sections.

5. Fire department personnel will advise the instructors when it is safe to return to the building to resume the normal schedule of classes.

E. Standard Operating Procedure for Student Injuries in Laboratory

1. Students should report *all* injuries, no matter how small, to the instructor.

2. The instructor will use conservative judgment about the severity of the injury. For anything more serious than a paper cut the student will be sent, with escort, to the Medical Clinic.

3. If the injury is a chemical burn, the burned area is to be flushed with water for fifteen minutes before departure to Medical. During this time Medical is to be informed of the situation and given the Prep Room phone number. The SDS for the specific chemical will be obtained by the instructor from the Lab Manager's office and this SDS will be sent to Medical with the injured student and his/her escort.

4. The escort accompanying an injured student to Medical should deliver the Prep Room phone number to medical personnel at the reception desk, along with the SDS, if appropriate. The escort should then report back to the instructor with any pertinent information.

5. The instructor will enter time and date of injury, a detailed description of the injury, and remedial steps taken in the injury log in Prep Room office. Discuss reporting requirements with the Lab Manager.

6. Follow up inquiry should be made by contacting Medical or the injured student.