

MATERIAL SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI and Canadian WHMIS Standards

PART I *What is the material and what do I need to know in an emergency?*

1. PRODUCT IDENTIFICATION

CHEMICAL NAME; CLASS: **SILICON TETRACHLORIDE - SiCl₄**
Document Number: 001075

PRODUCT USE: For general analytical/synthetic chemical uses.

SUPPLIER/MANUFACTURER'S NAME: AIRGAS INC.
ADDRESS: 259 N. Radnor-Chester Road
 Suite 100
 Radnor, PA 19087-5283

BUSINESS PHONE: 1-610-687-5253
EMERGENCY PHONE: CHEMTREC: 1-800-424-9300
 International: 703-527-3887 (Call Collect)

DATE OF PREPARATION: May 18, 1998

2. COMPOSITION and INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	mole %	EXPOSURE LIMITS IN AIR					
			ACGIH		OSHA		IDLH ppm	OTHER
			TLV ppm	STEL ppm	PEL ppm	STEL ppm		
Silicon Tetrachloride There are no specific exposure limits for Silicon Tetrachloride. The following exposure limits are for Hydrogen Chloride, which is a decomposition product of this liquid.	10026-04-7	> 99%	NE	C 5	NE	C 5	50	NIOSH REL: C = 0.5 ppm DFG MAK = 0.5 ppm Carcinogen: IARC-3
Maximum Impurities		< 1%	None of the trace impurities in this mixture contribute significantly to the hazards associated with the product. All hazard information pertinent to this product has been provided in this Material Safety Data Sheet, per the requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200) and State equivalent standards.					

NE = Not Established

C = Ceiling Limit

See Section 16 for Definitions of Terms Used

NOTE: All WHMIS required information is included. It is located in appropriate sections based on the ANSI Z400.1-1993 format.

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: Silicon Tetrachloride is a pungent-smelling, toxic, corrosive, colorless to light-yellow liquid, which has a suffocating odor. Silicon Tetrachloride fumes in moist air, producing a dense, white cloud of hydrochloric acid mist. This gas is not flammable. When Silicon Tetrachloride is in contact with water or moist air, this substance will react vigorously and hydrochloric acid will be generated. Persons who respond to releases of this product must protect themselves from inhalation of the vapors, gases and mists generated from this substance (especially in areas which are downwind of the release). The vapor of this product is heavier than air, and pockets of this gas can accumulate in low-lying areas. Extreme caution must be used when responding to releases.

SYMPTOMS OF OVEREXPOSURE BY ROUTE OF EXPOSURE: The most significant routes of occupational overexposure to this product are inhalation and contact with skin and eyes. The symptoms of overexposure to this product, via route of entry, are as follows:

INHALATION: If the vapors, mists or sprays of Silicon Tetrachloride are inhaled, symptoms of exposure may include breathing difficulty, irritation of the mucus membranes, coughing, nasal congestion, and a sore throat. Damage to the tissues of the respiratory system may also occur, especially after prolonged exposures or exposures to high concentrations of Silicon Tetrachloride. Severe inhalation over-exposures can lead to chemical pneumonitis, pulmonary edema, and death. Chronic inhalation exposures may result in dental erosion and perforation of the nasal septum.

CONTACT WITH SKIN or EYES: Contact with the eyes will cause severe irritation, pain, reddening, watering, and possibly, blindness. Depending on the duration of skin contact, skin overexposures may cause reddening, discomfort, severe irritation, and chemical burns. Chemical burns result in blistering of the skin and possible scarring. Repeated skin-overexposures to low concentrations can result in dermatitis (inflammation and reddening of the skin).

SKIN ABSORPTION: Skin absorption is not a significant route of over-exposure for Silicon Tetrachloride.

INGESTION: Ingestion is not anticipated to be a likely route of occupational exposure to this product. If ingestion does occur, severe irritation and burns of the mouth, throat, esophagus, and other tissues of the digestive system will occur immediately upon contact. Symptoms of such over-exposure can include nausea, vomiting, diarrhea. Ingestion of large volumes of this product may be fatal.




INJECTION: Injection is not anticipated to be a significant route of overexposure for this product. Injection of this product (via puncture with a contaminated object) can cause pain, severe irritation, and burns, in addition to the wound.

HEALTH EFFECTS OR RISKS FROM EXPOSURE (An explanation in lay terms).

ACUTE: Silicon Tetrachloride is corrosive. Depending on the duration of contact, over-exposures can severely irritate or burn the eyes, skin, mucous membranes, and any other exposed tissue. If inhaled, irritation of the respiratory system may occur, with coughing, and difficulty breathing. Skin contact can cause blisters and scars. Eye contact can cause blindness. Severe inhalation, contact, and ingestion over-exposures may be fatal.

CHRONIC: Dermatitis (inflammation and redness of the skin) may occur after chronic, low-level skin contact. Prolonged inhalation of the vapors may lead to dental erosion, nasal perforation, and respiratory disorders (e.g., bronchitis). Refer to Section 11 (Toxicology Information) for additional information on this product's

TARGET ORGANS: Respiratory system, skin, eyes, teeth.

HAZARDOUS MATERIAL INFORMATION SYSTEM			
HEALTH		(BLUE)	3
FLAMMABILITY		(RED)	0
REACTIVITY		(YELLOW)	2
PROTECTIVE EQUIPMENT			X
EYES	RESPIRATORY	HANDS	BODY
	SEE SECTION 8		
For routine industrial applications			

See Section 16 for Definition of Ratings

PART II *What should I do if a hazardous situation occurs?*

4. FIRST-AID MEASURES

RESCUERS SHOULD NOT ATTEMPT TO RETRIEVE VICTIMS OF EXPOSURE TO SILICON TETRACHLORIDE WITHOUT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT. Self-Contained Breathing Apparatus and Personal Protective equipment may be required.

SKIN EXPOSURE: If this product contaminates the skin, immediately begin decontamination with copious amounts of running water running water. Minimum flushing is for 15 minutes. Remove exposed or contaminated clothing, taking care not to contaminate eyes. Victim must seek immediate medical attention.

EYE EXPOSURE: If this product's liquid or vapors enter the eyes, open victim's eyes while under copious amounts of gently running water. Use sufficient force to open eyelids. Have victim "roll" eyes. Minimum flushing is for 15 minutes. Victim must seek immediate medical attention.

INHALATION: If vapors, mists, or sprays of this product are inhaled, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. Remove or cover gross contamination to avoid exposure to rescuers.

INGESTION: If this product is swallowed, CALL PHYSICIAN OR POISON CONTROL CENTER FOR MOST CURRENT INFORMATION. If professional advice is not available, do not induce vomiting. Victim should drink milk, egg whites, or large quantities of water. Never induce vomiting or give diluents (milk or water) to someone who is unconscious, having convulsions, or unable to swallow.

Victims of chemical exposure must be taken for medical attention. Rescuers should be taken for medical attention, if necessary. Take a copy of label and MSDS to health professional with victim.

5. FIRE-FIGHTING MEASURES

FLASH POINT: Not applicable.

AUTOIGNITION TEMPERATURE: Not applicable.

FLAMMABLE LIMITS (in air by volume, %):

Lower (LEL): Not applicable.

Upper (UEL): Not applicable.

FIRE EXTINGUISHING MATERIALS:

Water Spray: YES

Carbon Dioxide: YES

Foam: YES

Dry Chemical: YES

Halon: YES

Other: Any "ABC" Class.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Silicon Tetrachloride is a water-reactive, corrosive liquid which poses a severe health hazard to firefighters. When Silicon Tetrachloride is in contact with water or moist air, a small amount of heat will be released and hydrochloric acid will be generated. Large volume releases which come into contact with metal vigorously generate produce hydrogen gas. Containers of his substance, when involved in fire, may rupture or burst in the heat of the fire.

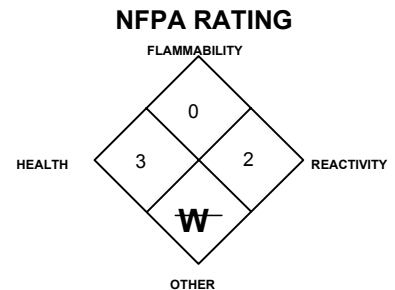
Explosion Sensitivity to Mechanical Impact: Not Sensitive.

Explosion Sensitivity to Static Discharge: Not Sensitive.

SPECIAL FIRE-FIGHTING PROCEDURES: Structural fire-fighters must wear Self-Contained Breathing Apparatus and full protective equipment. Move fire-exposed cylinders if it can be done without risk to firefighters. Withdraw immediately in case of rising sounds from venting safety device or any discoloration of tanks due to the fire. In the event of fire, cool containers of Silicon Tetrachloride with water to prevent failure. Use a water spray or fog to reduce or direct vapors. Do not direct a water spray at the source of a release. If Silicon Tetrachloride is involved in a fire, fire run-off water should be contained to prevent possible environmental damage.

6. ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a large spill, clear the affected area, protect. Minimum Personal Protective Equipment should be **Level B: triple-gloves (rubber gloves and nitrile gloves, over latex gloves), chemically resistant suit and boots, hard-hat, and Self Contained Breathing Apparatus.**



See Section 16 for Definition of Ratings

6. ACCIDENTAL RELEASE MEASURES (Continued)

Releases of Silicon Tetrachloride will be evident by the cloud of hydrochloric acid mist which is formed. Monitor the surrounding area for oxygen and Hydrogen Chloride (the decomposition product of Silicon Tetrachloride) levels. The Hydrogen Chloride level must be below the exposure limits provided in Section 2 (Composition and Information on Ingredients) and the atmosphere must have at least 19.5 percent oxygen before personnel can be allowed in the area without Self-Contained Breathing Apparatus.

Absorb spilled liquid with polypads or other suitable absorbent materials. Neutralize residue with sodium bicarbonate or other neutralizing agent for acids. Decontaminate the area thoroughly. Test area with litmus paper to ensure neutralization. Place all spill residue in a suitable container. Do not store spill residue in glass containers. Dispose of in accordance with applicable U.S. Federal, State, or local procedures, or appropriate Canadian standards (see Section 13, Disposal Considerations).

PART III *How can I prevent hazardous situations from occurring?*

7. HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: As with all chemicals, avoid getting Silicon Tetrachloride IN YOU. Do not eat or drink while handling chemicals. Be aware of any signs of effects of Silicon Tetrachloride exposure indicated in Section 3 (Hazard Identification); exposures to fatal concentrations of Silicon Tetrachloride could occur rapidly.

STORAGE AND HANDLING PRACTICES: All employees who handle this material should be trained to handle it safely. Avoid breathing vapors or mists generated by Silicon Tetrachloride. Use in a well-ventilated location. Cylinders of Silicon Tetrachloride must be properly labeled. If Silicon Tetrachloride is used in other types of containers, only use portable containers and dispensing equipment (faucet, pump, drip can) approved for corrosive liquids.

Store cylinders of Silicon Tetrachloride in a cool, dry location, away from direct sunlight, sources of intense heat, or where freezing is possible. Do not allow area where cylinders are stored to exceed 52°C (125°F). Material should be stored in secondary containers, or in a diked area, as appropriate. Store containers away from incompatible chemicals. Keep container tightly closed when not in use. Storage areas should be made of fire-resistant materials. Inspect all incoming containers before storage, to ensure containers are properly labeled and not damaged.

Empty containers may contain residual corrosive liquid or vapors. Therefore, empty containers should be handled with care.

SPECIAL PRECAUTIONS FOR HANDLING CYLINDERS: Protect cylinders of Silicon Tetrachloride against physical damage. If appropriate, cylinders should be stored in an up-right position. Cylinders should be firmly secured to prevent falling or being knocked over. Cylinders can be stored in the open, but in such cases, should be protected against extremes of weather and from the dampness of the ground to prevent rusting. Never tamper with pressure relief devices in valves and cylinders. The following rules are applicable to situations in which cylinders are being used :

Before Use: If appropriate, move cylinders with a suitable hand-truck. Do not drag, slide or roll cylinders. Do not drop cylinders or permit them to strike each other. Secure cylinders firmly. Leave the valve protection cap in-place until cylinder is ready for use.

During Use: Use designated CGA fittings and other support equipment. Do not use adapters. Do not heat cylinder by any means to increase the discharge rate of the product from the cylinder. Use check valve or trap in discharge line to prevent hazardous backflow into the cylinder. Do not use oils or grease on gas-handling fittings or equipment.

After Use: Close main cylinder valve. Replace valve protection cap. Mark empty cylinders "EMPTY".

NOTE: Use only DOT or ASME code containers. Earth-ground and bond all lines and equipment associated with Silicon Tetrachloride. Close valve after each use and when empty. Cylinders must not be recharged except by or with the consent of owner. For additional information refer to the Compressed Gas Association Bulletin SB-2 "Oxygen Deficient Atmospheres".

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain application equipment is locked and tagged-out safely. Always use Silicon Tetrachloride in areas where adequate ventilation is provided. Decontaminate equipment using soapy water before maintenance begins. Collect all rinsates and dispose of according to applicable Federal, State, or local procedures.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation. Local exhaust ventilation is preferred, because it prevents Silicon Tetrachloride dispersion into the work place by eliminating it at its source. A hood with forced ventilation is preferable. Ductwork should be constructed of non-metallic material, or should be lined to resist corrosion.

RESPIRATORY PROTECTION: Maintain oxygen levels above 19.5% in the workplace. Use supplied air respiratory protection if oxygen levels are below 19.5% or during emergency response to a release of Silicon Tetrachloride. If respiratory protection is required, follow the requirements of the Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), or equivalent U.S. State standards, or the applicable regulations of Canada and its Provinces. The following NIOSH respiratory protection recommendations are for Hydrogen Chloride (a decomposition product of Silicon Tetrachloride).

CONCENTRATION

UP TO 50 ppm:

RESPIRATORY EQUIPMENT

Chemical cartridge respirator with cartridge(s) to protect against hydrogen chloride; or gas mask with canister to protect against hydrogen chloride; or powered air-purifying respirator with cartridge(s) to protect against hydrogen chloride; or SAR; or full-facepiece SCBA.

EMERGENCY OR PLANNED ENTRY INTO UNKNOWN CONCENTRATION OR IDLH CONDITIONS: Positive pressure, full-facepiece SCBA; or positive pressure, full-facepiece SAR with an auxiliary positive pressure SCBA.

ESCAPE: Gas mask with acid gas canister; or escape-type SCBA.

NOTE: The IDLH concentration for hydrogen chloride is 50 ppm.

EYE PROTECTION: Splash goggles or safety glasses and face shield.

HAND PROTECTION: Wear Neoprene Rubber gloves for industrial use. Use triple gloves for spill response (see Section 6, Accidental Release Measures).

BODY PROTECTION: Use body protection appropriate for task. An apron, or other impermeable body protection is suggested. Full-body chemical protective clothing is recommended for emergency response procedures.

9. PHYSICAL and CHEMICAL PROPERTIES

VAPOR DENSITY (air = 1): 5.88

SPECIFIC GRAVITY (water = 1): 1.52

SOLUBILITY IN WATER: Generates hydrochloric acid.

EVAPORATION RATE (nBuAc = 1): Not applicable.

ODOR THRESHOLD: 1-5 ppm (Hydrogen Chloride)

COEFFICIENT WATER/OIL DISTRIBUTION: Not applicable.

pH: < 2

FREEZING POINT: -70°C (-94°F)

BOILING POINT @ 1 atm.: 59°C (138°F)

EXPANSION RATIO: Not applicable

VAPOR PRESSURE (mm Hg): 194

SPECIFIC VOLUME (ft³/lb): Not applicable.

APPEARANCE AND COLOR: Silicon Tetrachloride is a pungent-smelling, colorless to light-yellow liquid having a suffocating odor. This substance fumes strongly in moist air, producing a cloud of hydrochloric acid mist.

HOW TO DETECT THIS SUBSTANCE (warning properties): The odor and dense, white appearance of the hydrochloric acid mist generated from this product are distinctive warning properties associated with releases of Silicon Tetrachloride. The presence of acidic solutions of this product can be detected by using litmus paper, which will turn red when in contact with acidic solutions.

10. STABILITY and REACTIVITY

STABILITY: Relative stable, but Silicon Tetrachloride will react readily in moist air to form hydrochloric acid mist.

CONDITIONS TO AVOID: Silicon Tetrachloride decomposes, but reacts with water to form hydrochloric acid. The substance will also generate silicon compounds.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Silicon Tetrachloride is not compatible with water, moist air, strong acids, strong bases, alcohols, metals, alkali metals, glass.

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Extreme heat and contact with water and incompatible chemicals. Cylinders exposed to high temperatures or direct flame can rupture or burst.

PART IV *Is there any other useful information about this material?*

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: The following information is for Silicon Tetrachloride.

Standard Draize test; skin; rabbit: 500 mg/24 hours: Severe
Standard Draize test; eye; rabbit: 20 mg/24 hours: Moderate
LC50 - Inhalation - rat: 8000 ppm/4 hours
LCLo - Inhalation - mouse: 15 gm/m³

The following information is for Hydrogen Chloride and Hydrochloric Acid Mists (the decomposition products of this substance):

HYDROGEN CHLORIDE:

Eye Irritation (rabbit) 100 mg, mild reaction
DNA Repair System (*E. coli*) 0.025 mg/well
Cytogenetic Analysis System (Grasshopper, via skin) 20 mg
TCLo (Inhalation - rat) 450 mg/m³ Teratogenic effects
LCLo (Inhalation-human) 1300 ppm/30 minutes
LCLo (Inhalation-human) 3000 ppm/5 minutes

HYDROGEN CHLORIDE (Continued):

LDLo (human) 81 mg/kg
LC₅₀ (Inhalation-rat) 3124 ppm/1 hour
LC₅₀ (Inhalation-mouse) 1108 ppm/1 hour
LD₅₀ (Intraperitoneal-mouse) 1449 mg/kg
LD₅₀ (Oral-rabbit) 900 mg/kg
LCLo (Inhalation-rabbit) 4416 ppm/30 minutes

HYDROCHLORIC ACID MIST:

LD₅₀ (oral-rabbit) = 900 mg/kg.
LC₅₀ (inhalation-rat) = 4701 ppm for 30 minutes; 5666 ppm for 30 minutes.
LC₅₀ (inhalation-mouse) = 2644 ppm for 30 minutes; 2142 ppm for 30 minutes.

SUSPECTED CANCER AGENT: Silicon Tetrachloride is not found on the following lists: FEDERAL OSHA Z LIST, NTP, CAL/OSHA, and therefore is not considered to be, nor suspected to be a cancer-causing agent by these agencies. IARC lists Hydrogen Chloride (a decomposition product of this substance) as "Not Classifiable as to Carcinogenicity in Humans" (IARC 3).

IRRITANCY OF PRODUCT: Silicon Tetrachloride is severely irritating and corrosive to contaminated tissue.

SENSITIZATION OF PRODUCT: Silicon Tetrachloride is not a known sensitizer upon prolonged or repeated exposure.

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of Silicon Tetrachloride on the human reproductive system.

Mutagenicity: No human mutation effects have been described for Silicon Tetrachloride.

Embryotoxicity: No human embryotoxic effects have been described for Silicon Tetrachloride.

Teratogenicity: No human teratogenic effects have been described for Silicon Tetrachloride.

Reproductive Toxicity: No human reproductive effects have been described for Silicon Tetrachloride.

*A **mutagen** is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate through generation lines. An **embryotoxin** is a chemical which causes damage to a developing embryo (i.e. within the first eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A **teratogen** is a chemical which causes damage to a developing fetus, but the damage does not propagate across generational lines. A **reproductive toxin** is any substance which interferes in any way with the reproductive process.*

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing dermatitis, respiratory conditions, and involving the Target Organs (see Section 3, Hazard Identification) may be aggravated by overexposure to Silicon Tetrachloride.

RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and eliminate overexposure. Treat symptoms and eliminate overexposure. Provide oxygen, if necessary. Pulmonary function tests, chest X-rays, and nervous system evaluations may prove useful. Consultation with an ophthalmologist is recommended if eye exposure leads to tissue damage.

ACGIH BIOLOGICAL EXPOSURE INDICES (BEIs): Currently, ACGIH Biological Exposure Indices are not applicable to Silicon Tetrachloride.

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL STABILITY: Silicon Tetrachloride is relatively stable, but will decompose when in contact with water or moist air; hydrochloric acid will be generated. All work practices should be aimed at eliminating environmental contamination.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: Due to the corrosive nature of Silicon Tetrachloride, animals exposed to this product will experience tissue damage, burns, and may be killed. Plants contaminated with Silicon Tetrachloride may be adversely affected or destroyed.

12. ECOLOGICAL INFORMATION (Continued)

EFFECT OF CHEMICAL ON AQUATIC LIFE: Silicon Tetrachloride will decompose in water to form Hydrogen Chloride. Hydrogen Chloride is very soluble in water, and even low concentrations of Hydrogen Chloride in water is detrimental to aquatic life. If a release of Silicon Tetrachloride occurs near a river or other body of water, the release has the potential to kill fish and other aquatic life. There are no specific aquatic toxicity data for Silicon Tetrachloride; the following aquatic toxicity data are available for Hydrogen Chloride:

HYDROGEN CHLORIDE:

282 ppm/96 hr/mosquito fish/TLm/fresh water
100-330 ppm/48/hour/shrimp/LC50/salt water.

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate U.S. Federal, State, and local regulations or with regulations of Canada and its Provinces. Return cylinders with residual product to Airgas, Inc. Do not dispose of locally.

14. TRANSPORTATION INFORMATION

THIS MATERIAL IS HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME: Silicon tetrachloride
HAZARD CLASS NUMBER and DESCRIPTION: 8 (Corrosive Material)
UN IDENTIFICATION NUMBER: UN 1818
PACKING GROUP: PG II
DOT LABEL(S) REQUIRED: Corrosive

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (1996): 156

MARINE POLLUTANT: Silicon Tetrachloride is not designated by the Department of Transportation to be a Marine Pollutant (49 CFR 172.101, Appendix B).

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: THIS MATERIAL IS CONSIDERED AS DANGEROUS GOODS. Refer to the above information for Canadian Shipments.

15. REGULATORY INFORMATION

ADDITIONAL U.S. REGULATIONS:

U.S. SARA REPORTING REQUIREMENTS: Silicon Tetrachloride is not subject to the reporting requirements of Sections 302, 304, and 313 of Title III of the Superfund Amendments and Reauthorization Act.

U.S. SARA THRESHOLD PLANNING QUANTITY: Not applicable.

U.S. CERCLA REPORTABLE QUANTITY (RQ): Not applicable.

U.S. TSCA INVENTORY STATUS: Silicon Tetrachloride is listed on the TSCA Inventory.

OTHER U.S. FEDERAL REGULATIONS: Not applicable.

U.S. STATE REGULATORY INFORMATION: Silicon Tetrachloride is covered under specific State regulations, as denoted below:

Alaska - Designated Toxic and Hazardous Substances: No.	Michigan - Critical Materials Register: No.	Pennsylvania - Hazardous Substance List: No.
California - Permissible Exposure Limits for Chemical Contaminants: No.	Minnesota - List of Hazardous Substances: No.	Rhode Island - Hazardous Substance List: No.
Florida - Substance List: No.	Missouri - Employer Information/Toxic Substance List: No.	Texas - Hazardous Substance List: No.
Illinois - Toxic Substance List: No.	New Jersey - Right to Know Hazardous Substance List: Silicon Tetrachloride.	West Virginia - Hazardous Substance List: No.
Kansas - Section 302/313 List: No.	North Dakota - List of Hazardous Chemicals, Reportable Quantities: No.	Wisconsin - Toxic and Hazardous Substances: No.
Massachusetts - Substance List: No.		

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): Silicon Tetrachloride is not on the California Proposition 65 lists.

15. REGULATORY INFORMATION (Continued)

ANSI LABELING (Z129.1): **DANGER!** CORROSIVE. WATER-REACTIVE. MAY BE FATAL IF SWALLOWED. CAUSES SKIN AND EYE BURNS. HARMFUL OR FATAL IF INHALED. REACTS VIGOROUSLY WITH WATER TO GENERATE ACIDIC GAS. Do not taste or swallow. Do not get on skin or in eyes. Avoid breathing vapors or mist. Keep container closed. Use only with adequate ventilation. Wash thoroughly after handling. Wear gloves, goggles, faceshields, suitable body protection, and NIOSH/MSHA-approved respiratory protection, as appropriate. Keep away from water or moisture. Ensure all containers are moisture-free before use. **FIRST-AID:** In case of contact, immediately flush skin or eyes with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. If inhaled, remove to fresh air. If ingested, do not induce vomiting. Get medical attention. **IN CASE OF FIRE:** Use water fog, dry chemical, CO₂, or "alcohol" foam. **IN CASE OF SPILL:** Absorb spill with inert material or neutralizing agent for acids. Place residue in suitable container. Consult Material Safety Data Sheet for additional information.

ADDITIONAL CANADIAN REGULATIONS:

CANADIAN DSL/NDL INVENTORY STATUS: Silicon Tetrachloride is listed on the DSL/NDL Inventory.

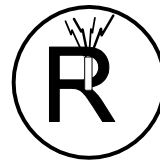
CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS: Silicon Tetrachloride is not on the CEPA Priorities Substances Lists, as follows

OTHER CANADIAN REGULATIONS: Not applicable.

CANADIAN WHMIS SYMBOLS:

Class E: Corrosive Material

Class F: Dangerously Reactive Material



16. OTHER INFORMATION

PREPARED BY:

CHEMICAL SAFETY ASSOCIATES, Inc.
9163 Chesapeake Drive, San Diego, CA 92123-1002
619/565-0302

The information contained herein is based on data considered accurate. However, no warranty is expressed or implied regarding the accuracy of these data or the results to be obtained from the use thereof. AIRGAS, Inc. assumes no responsibility for injury to the vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, AIRGAS, Inc. assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in his use of the material.

DEFINITIONS OF TERMS

A large number of abbreviations and acronyms appear on a MSDS. Some of these which are commonly used include the following:

CAS #: This is the Chemical Abstract Service Number which uniquely identifies each constituent. It is used for computer-related searching.

EXPOSURE LIMITS IN AIR:

ACGIH - American Conference of Governmental Industrial Hygienists, a professional association which establishes exposure limits. **TLV** - Threshold Limit Value - an airborne concentration of a substance which represents conditions under which it is generally believed that nearly all workers may be repeatedly exposed without adverse effect. The duration must be considered, including the 8-hour Time Weighted Average (**TWA**), the 15-minute Short Term Exposure Limit, and the instantaneous Ceiling Level (**C**). Skin absorption effects must also be considered.

OSHA - U.S. Occupational Safety and Health Administration.

PEL - Permissible Exposure Limit - This exposure value means exactly the same as a TLV, except that it is enforceable by OSHA. The OSHA Permissible Exposure Limits are based in the 1989 PELs and the June, 1993 Air Contaminants Rule (**Federal Register**: 58: 35338-35351 and 58: 40191). Both the current PELs and the vacated PELs are indicated. The phrase, "Vacated 1989 PEL," is placed next to the PEL which was vacated by Court Order. **IDLH** - Immediately Dangerous to Life and Health - This level represents a concentration from which one can escape within 30-minutes without suffering escape-preventing or permanent injury. **The DFG - MAK** is the Republic of Germany's Maximum Exposure Level, similar to the U.S. PEL. **NIOSH** is the National Institute of Occupational Safety and Health, which is the research arm of the U.S. Occupational Safety and Health Administration (**OSHA**). NIOSH issues exposure guidelines called Recommended Exposure Levels (**RELs**). When no exposure guidelines are established, an entry of **NE** is made for reference.

HAZARD RATINGS:

HAZARDOUS MATERIALS IDENTIFICATION SYSTEM: **Health Hazard:** **0** (minimal acute or chronic exposure hazard); **1** (slight acute or chronic exposure hazard); **2** (moderate acute or significant chronic exposure hazard); **3** (severe acute exposure hazard; onetime overexposure can result in permanent injury and may be fatal); **4** (extreme acute exposure hazard; onetime overexposure can be fatal). **Flammability Hazard:** **0** (minimal hazard); **1** (materials that require substantial pre-heating before burning); **2** (combustible liquid or solids; liquids with a flash point of 38-93°C [100-200°F]); **3** (Class IB and IC flammable liquids with flash points below 38°C [100°F]); **4** (Class IA flammable liquids with flash points below 23°C [73°F] and boiling points below 38°C [100°F]). **Reactivity Hazard:** **0** (normally stable); **1** (material that can become unstable at elevated temperatures or which can react slightly with water); **2** (materials that are unstable but do not detonate or which can react violently with water); **3** (materials that can detonate when initiated or which can react explosively with water); **4** (materials that can detonate at normal temperatures or pressures).

NATIONAL FIRE PROTECTION ASSOCIATION: **Health Hazard:** **0** (material that on exposure under fire conditions would offer no hazard beyond that of ordinary combustible materials); **1** (materials that on exposure under fire conditions could cause irritation or minor residual injury); **2** (materials that on intense or continued exposure under fire conditions could cause temporary incapacitation or possible residual injury); **3** (materials that can on short exposure could cause serious temporary or residual injury); **4** (materials that under very short exposure causes death or major residual injury). **Flammability Hazard and Reactivity Hazard:** Refer to definitions for "Hazardous Materials Identification System".

FLAMMABILITY LIMITS IN AIR:

Much of the information related to fire and explosion is derived from the National Fire Protection Association (**NFPA**). **Flash Point** - Minimum temperature at which a liquid gives off sufficient vapors to form an ignitable mixture with air. **Autoignition Temperature:** The minimum temperature required to initiate combustion in air with no other source of ignition. **LEL** - the lowest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source. **UEL** - the highest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source.

TOXICOLOGICAL INFORMATION:

Human and Animal Toxicology: Possible health hazards as derived from human data, animal studies, or from the results of studies with similar compounds are presented. Definitions of some terms used in this section are: **LD₅₀** - Lethal Dose (solids & liquids) which kills 50% of the exposed animals; **LC₅₀** - Lethal Concentration (gases) which kills 50% of the exposed animals; **ppm** concentration expressed in parts of material per million parts of air or water; **mg/m³** concentration expressed in weight of substance per volume of air; **mg/kg** quantity of material, by weight, administered to a test subject, based on their body weight in kg. Other measures of toxicity include **TDLo**, the lowest dose to cause a symptom and **TCLo** the lowest concentration to cause a symptom; **TDo**, **LDLo**, and **LDo**, or **TC**, **TCo**, **LCLo**, and **LCo**, the lowest dose (or concentration) to cause lethal or toxic effects. **Cancer Information:** The sources are: **IARC** - the International Agency for Research on Cancer; **NTP** - the National Toxicology Program, **RTECS** - the Registry of Toxic Effects of Chemical Substances, **OSHA** and **CAL/OSHA**. IARC and NTP rate chemicals on a scale of decreasing potential to cause human cancer with rankings from 1 to 4. Subrankings (2A, 2B, etc.) are also used. **Other Information:** **BEI** - ACGIH Biological Exposure Indices, represent the levels of determinants which are most likely to be observed in specimens collected from a healthy worker who has been exposed to chemicals to the same extent as a worker with inhalation exposure to the TLV. **Ecological Information:** **EC** is the effect concentration in water. **BCF** = Bioconcentration Factor, which is used to determine if a substance will concentrate in lifeforms which consume contaminated plant or animal matter. **Tm** = median threshold limit; Coefficient of Oil/Water Distribution is represented by **log K_{ow}** or **log K_{oc}** and is used to assess a substance's behavior in the environment.

REGULATORY INFORMATION:

This section explains the impact of various laws and regulations on the material. **U.S.:** **EPA** is the U.S. Environmental Protection Agency. **DOT** is the U.S. Department of Transportation. **SARA** is the Superfund Amendments and Reauthorization Act. **TSCA** is the U.S. Toxic Substance Control Act. **CERCLA (or Superfund)** refers to the Comprehensive Environmental Response, Compensation, and Liability Act. Labeling is per the American National Standards Institute (**ANSI Z129.1**). **CANADA:** **CEPA** is the Canadian Environmental Protection Act. **WHMIS** is the Canadian Workplace Hazardous Materials Information System. **TC** is Transport Canada. **DSL/NDL** are the Canadian Domestic/Non-Domestic Substances Lists.