SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI, Canadian WHMIS Standards, European Union CLP EC 1272/2008, and the Global Harmonization Standard

1. SECTION 1 – IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

CHEMICAL NAME; CLASS: MONOCHLOROSILANE

SYNONYMS: Chlorosilane; Silane, chloro-; MCS
CHEMICAL FAMILY NAME: Chlorosilane
FORMULA: ClH_3Si *or* $_3$

	Document Number: 80015
PRODUCT USE:	Various
MANUFACTURED/SUPPLIED FOR:	
SUPPLIER/MANUFACTURER'S NAME:	AIR LIQUIDE AMERICA
ADDRESS:	2700 Post Oak Drive Houston, TX 77056-8229
EMAIL ADDRESS FOR PRODUCT INFORMATION:	www.airliquide.com sds@airliquide.com
EMERGENCY PHONE:	CHEMTREC: (U.S., Canada) 1-800-424-9300 (24 hrs) (International) +703-527-3887 (collect-24 hrs)
BUSINESS PHONE:	General MSDS Information: 1-713/896-2896 (8 am to 5 pm U.S. Central Time)

ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-2004 format. This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR. The product is also classified per all applicable European Union CLP EC 1272/2008 and the Global Harmonization Standard.

2. HAZARD IDENTIFICATION

GLOBAL HARMONIZATION AND EU CLP REGULATION (EC) 1272/2208 LABELING AND CLASSIFICATION: This product has been classified per GHS Standards under European regulations. This is a self-classification. For information on EU classification under (67/548/EEC), see below.

Classification: Flammable Gas Cat. 1, Acute Inhalation Toxicity Cat. 1, Acute Dermal Toxicity Cat. 3, Skin Corrosion Cat. 1A, STOT SE Corrosive to the Respiratory Tract
Signal Words: Danger
Hazard Statement Codes: H220, H312, H330, H314, EUH029, EUH071
Precautionary Statement Codes: P210, P233, P260, P262, P264, P270, P271, P280, P284, P304 + P340 + P310, P303 + P361 + P353, P305 + P320, P232, P283, P377, P381, P370 + P378, P410: P403 + P233, P405, P501
Hazard Symbols/Pictograms: GHS02, GHS04, GHS05, GHS06, GHS07

EU LABELING AND CLASSIFICATION: This product meets the classification of hazardous, as defined by the European Union Council Directive 67/548/EEC or subsequent Directives. This is a self-classification.

Classification: Very Toxic, Extremely Flammable, Corrosive Risk Phrase Codes: R14, R12, R15/29, R26/27/28, R34
Safety Phrase Codes: S1/2, S8, S3/9/14, S16, S23, S26, S36/37/39, S33, S45
Hazard Symbols: T+, F+, C

See Section 16 for a full definition of Hazard and Precautionary Statements and Risk and Safety Phrases

EMERGENCY OVERVIEW: **Product Description: DANGER!** Extremely flammable liquefied, toxic, corrosive gas; may cause flash fire. This gas is an extremely flammable, toxic and corrosive gas, which is colorless and has a suffocating, pungent odor. **Health Hazards:** Toxic or fatal if inhaled. Corrosive by all routes of exposure. Symptoms of exposure may be delayed. Eye contact may cause blindness. Burns can cause scars. May be harmful by skin absorption. Rapidly expanding gas can cause frostbite. **Flammability Hazards:** This gas is extremely flammable. Releases of this mixture which have not spontaneously ignited must be considered extremely dangerous, and should not be approached. When involved in a fire, this gas will decompose to produce toxic fumes including chlorine, hydrogen chloride, hydrogen, and oxides/oxanes of silicon. **Reactivity Hazards:** This gas will react violently with water to produce toxic and corrosive fumes of hydrogen chloride and hydrochloric acid; hydrolyzation to acid is very rapid and can begin to attack steel. **Environmental Hazards:** This gas may cause harm to terrestrial and aquatic organisms if accidentally released. **Emergency Response Considerations:** Persons who respond to releases of this product must protect themselves from inhalation of this product, especially in areas which are downwind of the release. Extreme caution must be used when responding to releases.

3. COMPOSITION and INFORMATION ON INGREDIENTS

Chemical Name	CAS #	EINECS or ELNICS #	MOLE %	EU Classification (67/548/EEC) GHS & EU Classification (1272/2008) Risk Phrases/Hazard Statements
Monochlorsilane	13465-78-6	236-705-7	100%	SELF CLASSIFICATION EU 67/548/EEC Classification: Very Toxic, Extremely Flammable, Corrosive Risk Phrases: R14, R12, R26/27/26, R31,R34 Symbols: T+, F+, C GHS & EU CLP: 1272/2008: Classification: Flammable Gas Cat. 1, Acute Oral Toxicity Cat. 1, Acute Inhalation Toxicity Cat. 1, Acute Dermal Toxicity Cat. 1, Skin Corrosion Cat. 1A, STOT SE Corrosive to the Respiratory Tract Hazard Statement Codes: H220, H330, H310, H330, H314, EUH071 Hazard Symbols/Pictograms: GHS02, GHS04, GHS05, GHS06

See Section 16 for full text of Ingredient Risk Phrases and Hazard Statements

4. FIRST-AID MEASURES

PROTECTION OF FIRST AID RESPONDERS: RESCUERS SHOULD NOT ATTEMPT TO RETRIEVE VICTIMS OF EXPOSURE TO THIS PRODUCT WITHOUT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT. At a minimum, Self-Contained Breathing Apparatus and Fire-Retardant clothing must be worn. Adequate fire protection must be provided during rescue situations. Rescuers should be taken for medical attention, if necessary. Victim(s) must be taken for medical attention. Take copy of label and MSDS to physician or other health professional with victim(s).

DESCRIPTION OF FIRST AID MEASURES: Remove victim(s) to fresh air, as quickly as possible. 100% oxygen should be administered to victims of exposure to this gas as soon as possible. Only trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation, if necessary. Remove and isolate contaminated clothing and shoes. Seek immediate medical attention. Take copy of label and MSDS to physician or other health professional with victim(s).

THERMAL BURNS: In the event personnel are burned as a result a release of this product, if burns are first degree or second degree with closed blisters, flush area with cold water until pain subsides. Apply loose, moist, sterile dressings, and bandage. Treat for shock. If burns are second degree with open blisters or third degree, apply loose, dry, sterile dressings and bandage. Treat for shock. Transport victim immediately to hospital or emergency center. Burns over an area of 20% or more of body are life-threatening; medical attention should be immediately sought.

INHALATION: If this material is inhaled, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. If adverse effects continue after removal to fresh air, seek immediate medical attention.

SKIN EXPOSURE: If this gas contaminates the skin, immediately begin decontamination with running water. Minimum flushing is for 20 minutes. Remove exposed or contaminated clothing, taking care not to contaminate eyes. Victim must seek immediate medical attention. Remove any clothing that may restrict circulation to any frozen area. Do not rub frozen parts as tissue damage may occur. As soon as practicable, place any affected area in warm water bath which has a temperature that does not exceed 105°F (40°C). NEVER USE HOT WATER. NEVER USE DRY HEAT. If area of frostbite is extensive, and if possible, remove clothing while showering with warm water. If warm water is not available, or is impractical to use, wrap the affected parts gently in blankets. Alternatively, if the fingers or hands are frostbitten, place the affected area of the body in the armpit. Encourage victim to gently exercise the affected part while being warmed. Frozen tissue is painless and appears waxy, with a possible yellow color. Frozen tissue will become swollen, painful and prone to infection when thawed. If the frozen part of the body has been thawed by the time medical attention has been obtained, cover the area with a dry sterile dressing and a large bulky protective covering.

EYE EXPOSURE: If this gas enters the eyes, open victim's eyes while under gentle running water. Use sufficient force to open eyelids. Have victim "roll" eyes. Minimum flushing is for 20 minutes. Administer anesthetic eye drops after one minute of flushing if victim suffers from spasms to the eyes, in order to facilitate irrigation. Ice compresses should be applied when this is not irritating to the victim. An ophthalmologist should be sought as soon as possible.

IMPORTANT SYMPTOMS AND EFFECTS (Acute and Chronic/Delayed): See Sections 2 (Hazard Identification) and 11 (Toxicological Information).

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE Skin conditions and respiratory disorders may be aggravated by exposures to this product and its decomposition products.

IMMEDIATE MEDICAL ATTENTION AND SPECIAL TREATMENT NEEDED: Treat symptoms and reduce over-exposure.

5. FIRE-FIGHTING MEASURES

FLASH POINT (TAG, closed cup, ASTM D56): -90°C (-130°F)

AUTOIGNITION TEMPERATURE: Extremely flammable gas.

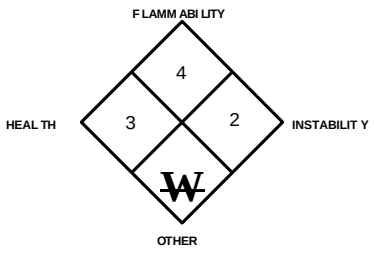
FLAMMABLE LIMITS (in air by volume, %)

Lower (LEL): 4.6-4.8% Upper (UEL): 94-98.0%

FIRE EXTINGUISHING MEDIA: Extinguish fires of this gas by shutting-off the source of the gas. Use a flooding quantity of water as a spray. Cool fire-exposed cylinders with water spray, from the maximum distance possible. Carbon Dioxide and dry chemical can also be used to extinguish fires of gas.

UNSUITABLE FIRE EXTINGUISHING MEDIA: Water should be used to cool cylinders only as this gas reacts violently with water to produce highly toxic, flammable and corrosive compounds.

NFPA RATING



5. FIRE-FIGHTING MEASURES (Continued)

SPECIAL FIRE AND EXPLOSION HAZARDS: This gas is corrosive and highly toxic, and so presents a severe contact hazard to fire-fighters. Contact with water will generate highly corrosive and toxic hydrochloric acid. When heated to decomposition, this gas emits toxic fumes of hydrogen chloride. An extreme explosion hazard exists in areas in which the gas has been released, but has not yet ignited.

DANGER! Fires impinging (direct flame) on the outside surface of unprotected cylinders of this product can be very dangerous. Direct flame exposure on the cylinder wall can cause an explosion. The resulting fire and explosion can result in severe equipment damage and personnel injury or death over a large area around the cylinder. For massive fires in large areas, use unmanned hose holder or monitor nozzles; if this is not possible, withdraw from area and allow fire to burn.

Explosion Sensitivity to Mechanical Impact: Not sensitive.

Explosion Sensitivity to Static Discharge: This gas can readily form explosive mixtures with air, which are easily ignited by an electrostatic discharge.

ADVICE TO FIRE-FIGHTERS: Structural fire-fighters must wear Self-Contained Breathing Apparatus and full protective equipment. Appropriate chemically-protective clothing may be necessary. Keep away from low-lying areas. Stay upwind. Because of the potential for a cylinder rupture during a fire, evacuation of non-emergency personnel is essential. If water is not available for cooling or protection of cylinder exposures, evacuate the area. Follow the guidelines of the North American Emergency Response Guidebook (Guide #119). If possible to do so without endangering personnel, shut off the flow of gas supporting the fire. Immediately cool the cylinders with water spray from a maximum distance. When cool, move cylinders from fire area if this can be done without risk to firefighters. Reverse flow into cylinder may cause rupture. Take care not to block pressure relief valves. Stay away from ends of tanks (but realize that shrapnel may travel in any direction). Withdraw immediately in case of rising sound from venting safety device or any discoloration of tanks due to fire. In an advanced or massive fire, the area should be evacuated; use unmanned hose-holders or monitor nozzles. This gas is an extremely hazardous, flammable, toxic and corrosive gas. Do not enter without wearing specialized protective equipment suitable for the situation. Chemically-resistant clothing may be necessary. If this gas is involved in a fire, run-off water should be contained to prevent possible environmental damage.

6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS AND EMERGENCY PROCEDURES: EVACUATE IMMEDIATE AREA. Uncontrolled releases should be responded to by trained personnel using pre-planned procedures.

PERSONAL PROTECTIVE EQUIPMENT:

All Releases: Minimum Personal Protective Equipment should be **Level A: triple-gloves (rubber gloves and nitrile gloves, over latex gloves), fully-encapsulating chemically resistant suit and boots, hard-hat, and Self Contained Breathing Apparatus.** The atmosphere must have at least less than the PEL for hydrogen chloride (PEL = 2 ppm) of this gas and 19.5 percent oxygen before personnel can be allowed in the area without Self-Contained Breathing Apparatus.

METHODS FOR CLEAN-UP AND CONTAINMENT:

Small Releases: Small leaks can be detected by means of an atomizer or squeeze bottle filled with aqueous ammonia. A white cloud will show the location of the leak. Follow procedures for clean-up given under 'All Spills' below.

All Spills: Attempt to close the main source valve prior to entering the area. If this does not stop the release (or it is not possible to reach the valve), allow the gas to release in place or remove it to a safe area and allow the gas to be released there. Never apply water to a leak of this gas. Monitor the surrounding area for gas and oxygen levels. If necessary, neutralize areas and items contaminated with hydrochloric acid mist with sodium bicarbonate or another neutralizer appropriate for acids.

ENVIRONMENTAL PRECAUTIONS: Avoid release to the environment. Run-off water may be contaminated by other materials and should be contained to prevent possible environmental damage.

REFERENCE TO OTHER SECTIONS: See information in Section 8 (Exposure Controls – Personal Protection) and Section 13 (Disposal Considerations) for additional information.

7. HANDLING and USE

PRECAUTIONS FOR SAFE HANDLING: Non-sparking tools should be used. Do not attempt to repair, adjust, or in any other way modify the cylinders containing this gas. If there is a malfunction, or another type of operational problem, contact nearest distributor immediately. Working alone with this gas should be avoided when possible. All work operations should be monitored in such a way that emergency personnel can be immediately contacted in the event of a release. All areas where this gas is used should be monitored with gas detection instruments. Detection of any release should trigger immediate response and corrective action, with an alarm calling for evacuation of all personnel with the potential to be exposed. Avoid all contact with this gas. All employees who handle this gas should be trained to handle it safely. Avoid breathing gas. Wash hands after handling chemicals. Do not eat or drink while handling chemicals. All work practices should minimize the release of this gas. Be aware of any signs of dizziness or fatigue; exposures to fatal concentrations of this gas could occur without any significant warning symptoms, due to oxygen deficiency. Use a check valve in the discharge line to prevent hazardous backflow. Never tamper with pressure relief devices in valves and cylinders.

WARNING: Hot organic chemical vapors or mists are susceptible to sudden spontaneous combustion when mixed with air. Ignition may occur at temperatures below those published in the literature as "autoignition" or "ignition" temperatures. Ignition temperatures decrease with increasing vapor volume and vapor/air contact time, and are influenced by pressure changes.

7. HANDLING and USE (Continued)

PRECAUTIONS FOR SAFE HANDLING (continued): Ignition may occur at typical elevated-temperature process conditions, especially in processes operating under vacuum if subjected to sudden ingress of air or outside process equipment operating under elevated pressure if sudden escape of vapors or mists to the atmosphere occurs. Any proposed use of this product in elevated-temperature processes should be thoroughly evaluated to ensure that safe operating conditions are established and maintained.

Periodic inspections of process equipment by knowledgeable persons should be made to ensure that the equipment is used appropriately and the system is kept in suitable operating condition. Emergency response equipment should be available near the point of use.

- Workers who handle this gas should wear protective clothing, as given in Section 8 (Exposure Controls and Personal Protection).
- Instant-acting showers should be available in the event of an emergency.
- Special eye-wash fountains or similar equipment should be available for eye irrigation.
- Proper respiratory protection equipment must be provided and workers using such equipment must be carefully trained in its operation and limitations.
- Precautions must always be taken to prevent suck-back of foreign materials into the cylinder by using a check-valve, or vacuum break, since suckback may cause dangerous pressure changes within the cylinder.

SPECIAL PRECAUTIONS FOR HANDLING GAS CYLINDERS: Compressed gases can present significant safety hazards. The following rules are applicable to work situations in which cylinders are being used.

Before Use: 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 (where provided) 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. Do not use oils or grease on gas-handling fittings or equipment. Immediately contact the supplier if there are any difficulties associated with operating cylinder valve. Never insert an object (e.g., wrench, screwdriver, pry bar, etc.) into valve cap openings. Doing so may damage valve, causing a leak to occur. Use an adjustable strap wrench to remove over-tight or rusted caps. Never strike an arc, on a compressed gas cylinder or make a cylinder part of and electric circuit.

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

CONDITIONS FOR SAFE STORAGE: Always store and handle compressed gas cylinders in accordance with Compressed Gas Association, Inc. at www.cganet.com pamphlet CGA P-1, *Safe Handling of Compressed Gases in Containers.* Local regulations may require specific equipment for storage and use. Cylinders should be stored upright and 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. Cylinders should be stored in dry, well-ventilated areas away from sources of heat, ignition and direct sunlight. Keep storage area clear of materials which can burn. Do not allow area where cylinders are stored to exceed 52°C (125°F). Store containers away from heavily trafficked areas and emergency exits. Store away from process and production areas, away from elevators, building and room exits or main aisles leading to exits.

Protect cylinders against physical damage. Cylinders should be separated from oxygen cylinders, or other oxidizers, by a minimum distance of 20 ft., or by a barrier of non-combustible material at least 5 ft. high, having a fire-resistance rating of at least 0.5 hours. Isolate from other incompatible chemicals, such as strong oxidizers, metals, and metal oxides (refer to Section 10, Stability and Reactivity, for more information). Storage areas must meet national electrical codes for Class 1 Hazardous Areas. Post "No Smoking or Open Flames" signs in storage or use areas. Consider installation of leak detection and alarm for storage and use areas. Have appropriate extinguishing equipment in the storage area (i.e. sprinkler system, portable fire extinguishers). Because of the potential for delayed ignition of the Silane, storage and use areas should be designed and constructed to protect workers from possible explosive detonation. Keep the smallest amount on-site as is necessary.

NOTE: Use only DOT or ASME code containers designed for flammable, corrosive gas storage. Close valve after each use and when empty. Earth-ground and bond all lines and equipment associated with this gas.

STANDARD VALVE CONNECTIONS FOR U.S. AND CANADA: Use the proper CGA connections**,** DO NOT USE ADAPTERS:

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. Purge gas handling equipment with inert gas (i.e. argon) before attempting repairs. Always use product in areas where adequate ventilation is provided.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

EXPOSURE LIMITS/CONTROL PARAMETERS:

VENTILATION AND ENGINEERING CONTROLS: This gas should be used in a fume hood or glove box. Because of the high hazard associated with this gas, stringent control measures such as a gas cabinet enclosure or isolation may be necessary. Use a non-sparking, grounded, explosion-proof ventilation system separate from other exhaust ventilation systems. Ductwork should be constructed of non-metallic material, or should be lined to resist corrosion. If appropriate, install automatic monitoring equipment to detect the level of the gas.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION (Continued)

EXPOSURE LIMITS/CONTROL PARAMETERS (continued):

OCCUPATIONAL/WORKPLACE EXPOSURE LIMITS/GUIDELINES:

CHEMICAL NAME	CAS #	EXPOSURE LIMITS IN AIR							
		ACGIH-TLVs		OSHA-PELs		NIOSH-RELs		NIOSH	OTHER
		TWA ppm	STEL ppm	TWA ppm	STEL ppm	TWA ppm	STEL ppm	IDLH ppm	
Monochlorosilane Exposure limits given are for hydrogen chloride	13465-78-6	NE	2 (ceiling)	NE	5 (ceiling)	NE	5 (ceiling)	50	DFG MAKs: TWA = 2 PEAK = 2•MAK 15 min. average value, 1-hr interval, 4 per shift DFG MAK Pregnancy Risk Classification: D Carcinogen: IARC-3, TLV-A4

NE = Not Established

INTERNATIONAL EXPOSURE LIMITS: Currently, there are no international exposure limits in force this material.

PROTECTIVE EQUIPMENT: *The following information on appropriate Personal Protective Equipment is provided to assist employers in complying with OSHA regulations found in 29 CFR Subpart I (beginning at 1910.132, including* U.S. Federal OSHA Respiratory Protection (29 CFR 1910.134), OSHA Eye Protection 29 CFR 1910.133, OSHA Hard Protection 29 CFR 1910.138, OSHA Foot Protection 29 CFR 1910.136 and OSHA Body Protection 29 CFR1910.132)*, equivalent standards of Canada (including CSA Respiratory Standard Z94.4-02,* Z94.3-M1982, *Industrial Eye and Face Protectors and* CSA Standard Z195-02, *Protective Footwear), or standards of EU member states (including EN 529:2005 for respiratory PPE, CEN/TR 15419:2006 for hand protection, and CR 13464:1999 for face/eye protection). Please reference applicable regulations and standards for relevant details.*

RESPIRATORY PROTECTION: Maintain exposure levels of this gas below 50% of the recommended TLV for hydrogen chloride (2 ppm) and oxygen levels above 19.5% in the workplace. The use of supplied air respiratory protection is recommended when changing cylinders or working on systems containing this gas. Use supplied air respiratory protection when gas levels exceed 50% of the TLV or oxygen levels are below 19.5%, or during emergency response to a release of this product. During an emergency situation, before entering the area, check the concentration of this gas and oxygen. If necessary, use only respiratory protection authorized under appropriate regulations. In the U.S., oxygen levels below 19.5% are considered IDLH by OSHA. In such atmospheres, use of a full-facepiece pressure/demand SCBA or a full facepiece, supplied air respirator with auxiliary self-contained air supply is required under OSHA's Respiratory Protection Standard. The following NIOSH respiratory protection recommendations are for the main decomposition compound, hydrogen chloride.

HYDROGEN CHLORIDE

CONCENTRATION RESPIRATORY PROTECTION

Up to 50 ppm: Any Chemical Cartridge Respirator with cartridge(s), or any Air-Purifying, Full-Facepiece Respirator (gas mask) with a chin-style, front- or back-mounted canister, or any Powered, Air-Purifying Respirator (PAPR) with cartridge(s), or any Supplied-Air Respirator (SAR), or any Self-Contained Breathing Apparatus (SCBA) with a full facepiece.

Emergency or Planned Entry into Unknown Concentrations or IDLH Conditions: Any SCBA that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode, or any SAR that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary SCBA operated in pressure-demand or other positive-pressure mode.

Escape: Any Air-Purifying, Full-Facepiece Respirator (gas mask) with a chin-style, front- or back-mounted acid gas canister, or any appropriate escape-type, SCBA.

EYE PROTECTION: Splash goggles or safety glasses, with a face shield for additional protection. If necessary, refer to appropriate regulations for further information.

HAND PROTECTION: Wear leather gloves when handling cylinders of this product. Wear appropriate gloves for industrial use. Use triple gloves for spill response, as stated in Section 6 (Accidental Release Measures) of this MSDS. If necessary, refer to appropriate regulations.

BODY PROTECTION: When chemical contact is possible, use splash apron, work uniform, and shoes or coverlets to prevent skin contact. Full-body chemical protective clothing is recommended for emergency response procedures. For emergency response operations, clothing resistant to the toxic effects of this gas is required. If necessary, refer to the U.S. OSHA Technical Manual (Section VII: Personal Protective Equipment) or other appropriate regulations. If a hazard of injury to the feet exists due to falling objects, rolling objects, where objects may pierce the soles of the feet or where employee's feet may be exposed to electrical hazards, use foot protection, as described in appropriate regulations.

9. PHYSICAL and CHEMICAL PROPERTIES

FORM: Liquefied gas.
COLOR: Colorless.
MOLECULAR FORMULA: ClH_3Si
MOLECULAR WEIGHT: 66.56 g/mol
ODOR: Pungent, strongly irritating.
ODOR THRESHOLD: Not available.
MELTING POINT (sublimes): -118°C (-180.4°F)
BOILING POINT @ 1 atm: -22.8°C (-90.0°F)
SPECIFIC GRAVITY @ 21.1°C and 1 atm: 1.858
SPECIFIC VOLUME (ft^3/lb): Not available.
GAS DENSITY @ 21.1°C: Not available.
VAPOR PRESSURE 25°C: 94.7 psia (653 kPa)
FLASH POINT: -90°C (-130°F)
AUTOIGNITION: Not available.
LOWER FLAMMABILITY LIMIT (LEL): 4.6-4.8%
UPPER FLAMMABILITY LIMIT (UEL): 94-98.0%
PERCENT VOLATILE: 100%
pH: Not available.
EVAPORATION RATE (nBuAc = 1): Not applicable.
EXPANSION RATIO: Not available.

9. PHYSICAL and CHEMICAL PROPERTIES (Continued)

COEFFICIENT WATER/OIL DISTRIBUTION: Log Kow = 0.84. **CRITICAL PRESSURE:** Not available.
SOLUBILITY IN WATER: Reacts violently. 251.33 mg/L (est.) **CRITICAL TEMPERATURE:** Not available.
OTHER SOLUBILITIES: Not available.
HOW TO DETECT THIS SUBSTANCE (identification properties): The odor can be distinctive warning properties. Monitoring systems must be used for detection of this gas. Small leaks may be detected by holding a small, open bottle of concentrated ammonium hydroxide solution near the site of the leak and observing the formation of a small dense white cloud of fumes. Wet blue litmus paper will turn pink upon exposure to a leak.

10. STABILITY and REACTIVITY

REACTIVITY/CHEMICAL STABILITY: Stable at room temperature and atmospheric pressure. May disproportionate over time at room temperature forming silane and dichlorosilane. May decompose to silicon, hydrogen chloride, hydrogen, and chlorine at elevated temperatures (above 500°C [932°F]). Contact with water results in a violent reaction.
DECOMPOSITION PRODUCTS: *Combustion:* Chlorine, hydrogen chloride, hydrogen, and oxides/oxanes of silicon. *Hydrolysis:* Hydrofluoric chloride.
MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: At room temperatures, this product may explode on contact with nitrates; other oxidizing agents may cause similar behavior. It reacts violently with water. It reacts rapidly (exothermically) with alcohols, primary and secondary amines, ammonia, and other compounds containing active hydrogen atoms. It will react violently with the water in aqueous acid solutions. When it reacts with moisture in the air, it produces dense white clouds of silica and large volumes of hydrogen chloride. Hydrogen, which can pose fire and explosion hazards, may also be evolved. The solid hydrolysis products are also reported to be flammable.
Monochlorosilane may redistribute under the influence of heat or catalysts, such as amines, rust, or aluminum chloride, to form mixtures of silane, Monochlorosilane, trichlorosilane, and silicon tetrachloride. These mixtures may be pyrophoric (may spontaneously ignite when exposed to air or oxygen).
POSSIBILITY OF POLYMERIZATION OR OTHER HAZARDOUS REACTION: Fire, explosion, possible spontaneous ignition. Hazardous polymerization may occur. This gas reacts violently with water.
CONDITIONS TO AVOID: Avoid contact with incompatible materials and moisture or water. Cylinders exposed to high temperatures or direct flame can rupture or burst.

11. TOXICOLOGICAL INFORMATION

SYMPTOMS OF OVER-EXPOSURE BY ROUTE OF EXPOSURE: The most significant routes of over-exposure for this product are by inhalation, eye and skin contact. Symptoms of exposure by all routes of exposure may be delayed.
INHALATION: Inhalation of high concentration may be fatal. Inhalation can cause severe health effects, even at relatively low concentrations. This gas causes severe irritation of the nose and throat. Other symptoms of overexposure include coughing, excessive salivary and sputum formation, labored breathing, and sore throat. In some instances, unconsciousness and potentially fatal lung disorders (e.g., chemical pneumonitis and pulmonary edema) may occur. Symptoms of pulmonary edema can be delayed. Prolonged or repeated exposure to vapor may discolor and erode the teeth, ulcerate the nasal mucosa, and cause the nose and gums to bleed.
CONTACT WITH SKIN or EYES: Brief contact will cause itching or discomfort, with the development of local redness and possibly swelling. Sustained contact will cause pain, local redness, swelling, ulceration, and possibly bleeding into the inflamed site. Minor contact with the eyes will cause tearing and irritation. Severe overexposure to the eyes will cause burns, resulting in blindness.
SKIN ABSORPTION: Prolonged or widespread skin contact may result in absorption of potentially harmful amounts of material.

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM

HEALTH HAZARD	(BLUE)	3
FLAMMABILITY HAZARD	(RED)	4
PHYSICAL HAZARD	(YELLOW)	2

PROTECTIVE EQUIPMENT

EYES	RESPIRATORY	HANDS	BODY
	SEE SECTION 8		SEE SECTION 8

For Routine Industrial Use and Handling Applications

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in Lay Terms. Overexposure to this gas may cause the following health effects:

ACUTE: This gas is highly corrosive and may cause severe irritation or burns by all routes of exposure. Serious inhalation exposure may cause pulmonary edema. Eye contact causes burns to eyes or blindness. Can be absorbed via intact skin and cause toxic effect. May be fatal by inhalation and ingestion.

CHRONIC: Persistent irritation may result from repeated exposures to this gas. Repeated low-level inhalation can cause emphysema and erosion of tooth enamel.

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

11. TOXICOLOGICAL INFORMATION (Continued)

TOXICITY DATA: Currently, there are no toxicity data available for this gas.

CARCINOGENIC POTENTIAL: This gas is not found on the following lists: U.S. EPA, U.S. NTP, U.S. OSHA, U.S. NIOSH, IARC, GERMAN MAK, and ACGIH, and is therefore not considered to be, nor suspected to be, a cancer-causing agent by these agencies. The decomposition product hydrogen chloride is listed by agencies tracking the carcinogenic potential of chemical compounds, as follows:

Hydrogen Chloride: ACGIH TLV-A4 (Not Classifiable as a Human Carcinogen); IARC-3 (Unclassifiable as to Carcinogenicity in Humans)

IRRITANCY OF PRODUCT: This gas is severely irritating to contaminated tissue, depending on concentration and duration of exposure.

SENSITIZATION TO THE PRODUCT: This gas is not known to be a human skin or respiratory sensitizer.

REPRODUCTIVE TOXICITY INFORMATION: Currently, there is no information on the potential human mutagenic, embryotoxic, teratogenic or reproductive effects of this gas.

BIOLOGICAL EXPOSURE INDICES (BEIs): Currently, no Biological Exposure Indices (BEIs) have been determined for this gas.

12. ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

MOBILITY: This gas will solubilize and become mobile. The following estimated values are available from the EPA's EPISuite™ database.

Soil Adsorption Coefficient (PCKOCWIN v1.66):
Koc: 14.3 Log Koc: 1.155

PERSISTENCE AND BIODEGRADABILITY: No specific information is available. The following estimated values are available from the EPA's EPISuite™ database.

Probability of Rapid Biodegradation (BIOWIN v4.10):
Biowin1 (Linear Model): 0.7159 Biowin2 (Non-Linear Model): 0.8873
Expert Survey Biodegradation Results:
Biowin3 (Ultimate Survey Model): 3.0521weeks Biowin4 (Primary Survey Model): 3.7517days
MITI Biodegradation Probability:
Biowin5 (MITI Linear Model): 0.5141 Biowin6 (MITI Non-Linear Model): 0.6466
Anaerobic Biodegradation Probability:
Biowin7 (Anaerobic Linear Model): 0.8361
Ready Biodegradability Prediction: NO
Atmospheric Oxidation (25°C) [AopWin v1.92]: Structure incompatible with current estimation method.
Hydroxyl Radicals Reaction:
Overall OH Rate Constant = 0.0000 E-12 cm^3/molecule-sec
Half-Life = Not applicable
Ozone Reaction:
No Ozone Reaction Estimation
Fraction sorbed to airborne particulates (phi) [Junge,Mackay]: 0.788
Note: the sorbed fraction may be resistant to atmospheric oxidation
Volatilization from Water:
Henry LC: 3.26E-014 atm-m^3/mole (estimated by Bond SAR Method)
Half-Life from Model River: 1.465E+010 hours (6.104E+008 days)
Half-Life from Model Lake: 1.598E+011 hours (6.659E+009 days)
Removal in Wastewater Treatment:
Total removal = 1.87%
Total Biodegradation: 0.09%
Total Sludge Adsorption: 1.78%
Total to Air: 0.00%, (using 10000 hr Bio P,A,S)
Level III Fugacity Model:

	Mass Amount (percent)	Half-Life (hr)	Emissions (kg/hr)
Air	3.24e-006	1e+005	1000
Water	35.8	360	1000
Soil	64.2	720	1000
Sediment	0.0697	3.24e+003	0

Persistence Time: 601 hours

BIO-ACCUMULATION POTENTIAL: There is no potential for bioaccumulation or bioconcentration of this gas. The following estimated values are available from the EPA's EPISuite™ database.

Bioaccumulation Estimates from Log Kow (BCFWIN v2.17):
Log BCF from regression-based method = 0.500 (BCF = 3.162)

ECOTOXICITY: All release to terrestrial, atmospheric and aquatic environments should be avoided as this gas can cause harm to terrestrial and aquatic organisms.

OTHER ADVERSE EFFECTS: This gas is not expected to have any ozone depletion potential.

ENVIRONMENTAL EXPOSURE CONTROLS: Controls should be engineered to prevent release to the environment, including procedures to prevent spills, atmospheric release and release to waterways.

12. ECOLOGICAL INFORMATION (Continued)

RESULTS OF PBT and vPvB ASSESSMENT: No data available. PBT and vPvB assessments are part of the chemical safety report required for some substances in European Union Regulation (EC) 1907/2006, Article 14.

13. DISPOSAL CONSIDERATIONS

PRECAUTIONS TO BE FOLLOWED DURING WASTE HANDLING: Wear proper protective equipment when handling waste materials.

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. Return cylinders with any residual product to Air Liquide. Do not dispose of locally. For emergency disposal, secure the cylinder and slowly discharge the gas to the atmosphere in a well-ventilated area or outdoors.

EMERGENCY DISPOSAL: Monochlorosilane can be disposed of by first reacting it with water, and then neutralizing the acid (HCl) that is formed by the reaction. This reaction proceeds rapidly and liberates heat, hydrogen, andhydrogen chloride. Wear suitable protective equipment (Section 8), and observe all other precautions set forth in this MSDS. Use plenty of water to absorb the heat and hydrogen chloride. Monochlorosilane should be discharged below the surface of the water and bubbled into water slowly enough to avoid discharge of vapors to the atmosphere. For more effective scrubbing, the water could contain some soda ash or caustic soda. After neutralization and dilution, the waste solution can be discharged to a biological wastewater treatment system.

U.S. EPA WASTE NUMBER: D001 (Waste Characteristic-Ignitability), D002 (Waste Characteristic-Corrosivity), D003 (Waste Characteristic-Reactivity)

EUROPEAN (EWC) WASTE CODES: 16 05 07: Gases in pressure containers and discarded chemicals; inorganic chemicals consisting of or containing dangerous substances

14. TRANSPORTATION INFORMATION

U.S. DEPARTMENT OF TRANSPORTATION REGULATIONS: This gas is classified as dangerous goods, per U.S. DOT regulations, under 49 CFR 172.101.

UN IDENTIFICATION NUMBER:	UN 3309
PROPER SHIPPING NAME:	Liquefied gas, toxic, flammable, corrosive, n.o.s. (Monochlorosilane)
HAZARD CLASS NUMBER and DESCRIPTION:	2.1 (Flammable Gas); 2.3 (Toxic Gas); 8 (Corrosive)
PACKING GROUP:	Not Applicable.
DOT LABEL(S) REQUIRED:	Class 2.1 (Flammable Gas); Class 2.3 (Toxic Gas), Class 8 (Corrosive)

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2008): 119

SPECIAL PROVISION: This gas is poisonous by inhalation. Shipments must be properly described as "Poison Inhalation Hazard - ZONE B".

MARINE POLLUTANT: This gas is not specifically listed by the DOT as a Marine Pollutant (as defined by 49 CFR 172.101, Appendix B).

SPECIAL SHIPPING INFORMATION: Cylinders should be transported in a secure position, in a well-ventilated vehicle. The transportation of compressed gas cylinders in automobiles or in closed-body vehicles present serious safety hazards and should be discouraged.

NOTE: Shipment of compressed gas cylinders which have not been filled with the owners consent is a violation of Federal law (49 CFR, Part 173.301 (b).

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: This gas is classified as Dangerous Goods, per regulations of Transport Canada. The use of the above U.S. DOT information from the U.S. 49 CFR regulations is allowed for shipments that originate in the U.S. For shipments via ground vehicle or rail that originate in Canada, the following information is applicable.

UN IDENTIFICATION NUMBER:	UN 3309
PROPER SHIPPING NAME:	Liquefied gas, toxic, flammable, corrosive, n.o.s. (Monochlorosilane)
HAZARD CLASS and DESCRIPTION:	2.1 (Flammable Gas); 2.3 (Toxic Gas); 8 (Corrosive)
HAZARD LABEL(S) REQUIRED:	Class 2.1 (Flammable Gas); Class 2.3 (Toxic Gas), Class 8 (Corrosive)
PACKING GROUP:	Not Applicable
SPECIAL PROVISION:	16, 38
EXPLOSIVE LIMIT & LIMITED QUANTITY INDEX:	None
ERAP INDEX:	None
PASSENGER CARRYING SHIP INDEX:	Forbidden
PASSENGER CARRYING ROAD OR RAIL VEHICLE INDEX:	Forbidden
MARINE POLLUTANT:	This gas is not listed as a marine pollutant.

INTERNATIONAL AIR TRANSPORT ASSOCIATION SHIPPING INFORMATION (IATA): This material is classified as dangerous goods, per the International Air Transport Association. This gas is forbidden for air transport.

UN IDENTIFICATION NUMBER:	UN 3309
PROPER SHIPPING NAME:	Liquefied gas, toxic, flammable, corrosive, n.o.s. (Monochlorosilane)
HAZARD CLASS or DIVISION:	2.1 (Flammable Gas); 2.3 (Toxic Gas); 8 (Corrosive)
HAZARD LABEL(S) REQUIRED:	Class 2.1 (Flammable Gas); Class 2.3 (Toxic Gas); 8 (Corrosive)
PACKING GROUP:	None
EXCEPTED QUANTITIES:	E0

PASSENGER and CARGO AIRCRAFT PACKING INSTRUCTION: Forbidden

PASSENGER and CARGO AIRCRAFT MAXIMUM NET QUANTITY PER PKG: Forbidden

14. TRANSPORTATION INFORMATION (Continued)

INTERNATIONAL AIR TRANSPORT ASSOCIATION SHIPPING INFORMATION (IATA) [continued]:

PASSENGER and CARGO AIRCRAFT LIMITED QUANTITY PACKING INSTRUCTION: Forbidden
PASSENGER and CARGO AIRCRAFT LIMITED QUANTITY MAXIMUM NET QUANTITY PER PKG: Forbidden
CARGO AIRCRAFT ONLY PACKING INSTRUCTION: Forbidden
CARGO AIRCRAFT ONLY MAXIMUM NET QUANTITY PER PKG: Forbidden
SPECIAL PROVISIONS: A2
ERG CODE: 2CP

INTERNATIONAL MARITIME ORGANIZATION SHIPPING INFORMATION (IMO): This gas is classified as dangerous goods, per the International Maritime Organization.

UN No.:	3309
PROPER SHIPPING NAME:	Liquefied gas, toxic, flammable, corrosive, n.o.s. (Monochlorosilane)
HAZARD CLASS NUMBER:	2.3 (Flammable Gas)
SUBSIDIARY HAZARD CLASSES:	3 (Flammable), 8 (Corrosive)
LABELS:	Class 2.3 (Toxic Gas), Class 5.1 (Oxidizer)
PACKING GROUP:	None
SPECIAL PROVISIONS:	274
LIMITED QUANTITIES:	LQ0
EXCEPTED QUANTITIES:	E0
PACKING:	Instructions: P200; Provisions: None
IBCs:	Instructions: None; Provisions: None
TANKS:	Instructions: None; Provisions: None
EmS:	F-D, S-U

STOWAGE CATEGORY: Category D. Clear of living quarters. Segregation as for class 2.1 but 'Away' from class 4.3.
MARINE POLLUTANT: This gas is not listed as a Marine Pollutant.

EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY ROAD (ADR): This product is classified by the Economic Commission for Europe to be dangerous goods.

UN NO.:	3309
PROPER SHIPPING NAME:	Liquefied gas, toxic, flammable, corrosive, n.o.s. (Monochlorosilane)
CLASS:	2
CLASSIFICATION CODE:	2TFC
PACKING GROUP:	None
LABELS:	2.3 + 2.1 + 8
SPECIAL PROVISIONS:	None
LIMITED QUANTITIES:	LQ0
EXCEPTED QUANTITIES:	E0
PACKING INSTRUCTIONS:	P200
SPECIAL PACKING INSTRUCTIONS:	None
MIXED PACKING PROVISIONS:	MP9
PORTABLE TANK and BULK CONTAINER:	Instructions: (M); Special Provisions: None
HAZARD IDENTIFICATION No.:	263

TRANSPORT IN BULK ACCORDING TO THE IBC CODE: See the information under the individual jurisdiction listings for IBC information.

ENVIRONMENTAL HAZARDS: This gas does not meet the criteria of environmentally hazardous according to the criteria of the UN Model Regulations (as reflected in the IMDG Code, ADR, RID, and ADN); this gas is not specifically listed in Annex III under MARPOL 73/78.

15. REGULATORY INFORMATION

ADDITIONAL U.S. REGULATIONS:

U.S. SARA REPORTING REQUIREMENTS: This gas 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 SECTION 302 EXTREMELY HAZARDOUS THRESHOLD PLANNING QUANTITY (TPQ): There are no specific Threshold Planning Quantities for this gas. The default Federal MSDS submission and inventory requirement filing threshold of 10,000 lbs (4,540 kg) therefore applies, per 40 CFR 370.20.

U.S. SARA SECTION 304 EXTREMELY HAZARDOUS REPORTABLE QUANTITY (RQ): Not applicable.

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

U.S. TSCA INVENTORY STATUS: This gas is listed on the TSCA Inventory.

U.S. SARA HAZARD CATEGORIES (SECTION 311/312, 40 CFR 370-21): ACUTE: Yes; CHRONIC: Yes; FIRE: Yes; REACTIVE: Yes; SUDDEN RELEASE: Yes

OTHER U.S. FEDERAL REGULATIONS:

- Monochlorosilane is not listed in Appendix A as a highly hazardous chemical. However, any process that involves a flammable liquefied gas on site in one location in quantities of 10,000 lb (4536 kg) or greater is covered under this regulation unless the gas is used as a fuel.

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

15. REGULATORY INFORMATION (Continued)

ADDITIONAL CANADIAN REGULATIONS:

CANADIAN DSL INVENTORY STATUS: This gas is listed on the NDSL Inventory.

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS: This gas is not listed on the CEPA Priority Substances List.

CANADIAN WHMIS REGULATIONS: This gas is classified as a Controlled Product, Hazard Classes A, B1, C, D1A, D2A, E and F, as per the Controlled Product Regulations.

ADDITIONAL EUROPEAN REGULATIONS:

SAFETY, HEALTH, AND ENVIRONMENTAL REGULATIONS/LEGISLATION SPECIFIC FOR THE PRODUCT: Currently, there is no specific legislation pertaining to this product.

CHEMICAL SAFETY ASSESSMENT: No data available. The chemical safety assessment is required for some substances according to European Union Regulation (EC) 1907/2006, Article 14.

16. OTHER INFORMATION

GLOBAL HARMONIZATION AND EU CLP REGULATION (EC) 1272/2208 LABELING AND CLASSIFICATION: Classified in accordance with CLP Regulation (EC) 1272/2008. This is a self-classification. For information on classification under (67/548/EEC), see below.

Classification: Flammable Gas Category 1, Acute Inhalation Toxicity Category 1, Acute Dermal Toxicity Category 1, Skin Corrosion Category 1A, Specific Target Organ Toxicity Single Exposure Corrosive to the Respiratory Tract

Signal Words: Danger

Hazard Statements: H220: Extremely flammable gas. H310: Fatal in contact with skin. H330: Fatal if inhaled. H314: Causes severe skin burns and eye damage. EUH071: Corrosive to the respiratory tract. EUH029: Contact with water liberates toxic gas.

Prevention Statements:

Precautionary: P210: Keep away from heat/sparks/open flames/hot surfaces. — No smoking. P233: Keep container tightly closed. P260: Do not breathe gas/fume. P262: Do not get in eyes, on skin, or on clothing. P264: Wash thoroughly after handling. P270: Do not eat, drink or smoke when using this product. P271: Use only outdoors or in a well-ventilated area. P280: Wear protective gloves/protective clothing/eye protection/face protection. P284: Wear respiratory protection.

Response: P304 + P340 + P310: IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER or doctor/physician. P303 + P361 + P353: IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower. P305 + P320: Specific treatment is urgent. Refer to Safety Data Sheet for information. P232: Protect from moisture. P283: Wear fire/flame resistant/retardant clothing. P377: Leaking gas fire: Do not extinguish, unless leak can be stopped safely. P381: Eliminate all sources of ignition if it is safe to do so. P370 + P378: In case of fire: Use materials appropriate for surrounding fire for extinction. Do not use water.

Storage: P410: P403 + P233: Store in a well-ventilated place. Keep container tightly closed. P405: Store locked up.

Disposal: P501: Dispose of contents/containers in accordance with all local, regional, national and international regulations.

Hazard Symbol: GHS02, GHS04, GHS05, GHS06, GHS07

EU 67/548/EEC LABELING AND CLASSIFICATION: This product is classified as per European Union Council Directive 67/548/EEC or subsequent Directives. This is a published classification.

Classification: Toxic, Corrosive

Risk Phrases: R12: Extremely flammable. R14: Reacts violently with water. R15/29: Contact with water liberates toxic, extremely flammable gases. R26/27/28: Very toxic by inhalation, in contact with skin and if swallowed. R34: Causes burns.

Safety Phrases: S1/2: Keep locked up and out of the reach of children. S8: Keep container dry. S3/9/14: Keep in a cool, well-ventilated place away from. S16: Keep away from sources of ignition - No smoking. S23: Do not breathe gas/fumes. S26: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S36/37/39: Wear suitable protective clothing, gloves and eye/face protection. S33: Take precautionary measures against static discharges. S45: In case of accident or if you feel unwell seek medical advice immediately (show the label where possible).

Hazard Symbol: F+, T, C

MIXTURES: When two or more gases or liquefied gases are mixed, their hazardous properties may combine to create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an Industrial Hygienist or other trained person when you make your safety evaluation of the end product. Remember, gases and liquids have properties which can cause serious injury or death.

Further information about gas mixtures can be found in the following pamphlets published by: Compressed Gas Association Inc. (CGA), 4221 Wainey Road, 5th Floor, Chantilly, VA 20151-2923 Telephone: (703) 788-2700.

P-1 *"Safe Handling of Compressed Gases in Containers"*
AV-1 *"Safe Handling and Storage of Compressed Gases"*
"Handbook of Compressed Gases"

REFERENCES AND DATA SOURCES: Contact the supplier for information.

METHODS OF EVALUATING INFORMATION FOR THE PURPOSE OF CLASSIFICATION: Bridging principles were used to classify this product.

REVISION DETAILS: New

PREPARED BY: CHEMICAL SAFETY ASSOCIATES, Inc.
PO Box 1961, Hilo, HI 96721 • (800) 441-3365 (808) 969-4846
Fax on Demand**:** 1-800/231-1366

AIR LIQUIDE