



AIR LIQUIDE

MATERIAL SAFETY DATA SHEET

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

1. PRODUCT IDENTIFICATION

CHEMICAL NAME; CLASS: NON-FLAMMABLE GAS MIXTURE

Containing < 1% Methyl Chloride, < 23.5% Oxygen in a Nitrogen Balance Gas

SYNONYMS: Not Applicable

CHEMICAL FAMILY NAME: Not Applicable

FORMULA: Not Applicable

Document Number: 50067

Note: The Material Safety Data Sheet is for this gas mixture supplied in cylinders with 33 cubic feet (935 liters) or less gas capacity (DOT - 39 cylinders). This MSDS has been developed for various gas mixtures with the composition of components within the ranges listed in Section 2 (Composition and Information on Ingredients). Refer to the product label for information on the actual composition of the product.

PRODUCT USE:	Calibration of Monitoring and Research Equipment
SUPPLIER/MANUFACTURER'S NAME:	CALGAZ, LLC
ADDRESS:	821 Chesapeake Drive Cambridge, MD 21613
EMERGENCY PHONE:	CHEMTREC: 1-800-424-9300
BUSINESS PHONE:	1-410-228-6400
	General MSDS Information: 1-713/868-0440
	Fax on Demand: 1-800/231-1366

2. COMPOSITION and INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	mole %	EXPOSURE LIMITS IN AIR					
			ACGIH-TLV		OSHA-PEL		NIOSH IDLH ppm	OTHER ppm
			TWA ppm	STEL ppm	TWA ppm	STEL ppm		
Methyl Chloride	74-87-3	< 1%	50 (skin)	100 (skin)	100 50 (Vacated 1989 PEL)	200 (ceiling) 300 (5 minute peak in any 3 hrs) See 29 100 (Vacated 1989 PEL)	2000	NIOSH REL: Reduce to lowest feasible concentration (LOQ 1.6) DFG MAKs: TWA = 50 PEAK = 1•MAK 15 min. average value DFG MAK Pregnancy Risk Classification: B Carcinogen: EPA-D, EPA-CBD, IARC-3, MAK-3B, NIOSH-Ca, TLV-A2
Oxygen	7782-44-7	< 23.5%	There are no specific exposure limits for Oxygen. Oxygen levels should be maintained above 19.5%.					
Nitrogen	7727-37-9	Balance	There are no specific exposure limits for Nitrogen. Nitrogen is a simple asphyxiant (SA). Oxygen levels should be maintained above 19.5%.					

NE = Not Established.

See Section 16 for Definitions of Terms Used.

NOTE (1): ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-1998 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.

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: This is a colorless, gas mixture, which may have a very faint sweet, ethereal odor, due to the presence of Methyl Chloride. The main health hazard presented by exposure to this gas mixture is the danger of producing an oxygen deficient atmosphere if the gas is released (especially in small confined spaces or other poorly-ventilated environments); individuals in such atmospheres may be asphyxiated. Although the Methyl Chloride component causes depression of the central nervous system in pure form, this effect is not normally seen in acute exposure in concentrations below 500 ppm. Chronic inhalation exposure may produce adverse central nervous system effects at levels of 200 ppm or more. Prolonged inhalation exposure, skin or eye contact in the presence of moisture may be irritating, due to formation of hydrochloric acid. The Methyl Chloride component is a suspect carcinogen and reproductive toxin. All contact with this gas mixture should be prevented. This gas mixture is not flammable or reactive. The Methyl Chloride component will slowly hydrolyze in the presence of moisture to form corrosive hydrochloric acid. If involved in a fire this gas mixture may produce toxic hydrogen chloride gas, phosgene and carbon monoxide. Cylinders exposed to high temperatures or direct flame can rupture or burst.

SYMPTOMS OF OVEREXPOSURE BY ROUTE OF EXPOSURE: The most significant route of overexposure for this product is by inhalation.

3. HAZARD IDENTIFICATION(Continued)

INHALATION: Due to the small size of an individual cylinder of this product, no unusual health effects from overexposure to the product are anticipated under routine circumstances of use. Releases of this gas mixture may produce oxygen-deficient atmospheres (especially in small confined spaces or other poorly-ventilated environments); individuals in such atmospheres may be asphyxiated. The Methyl Chloride component of this product begins to produce adverse effects on the central nervous system at 500 ppm. Prolonged inhalation exposure may be irritating due to moisture in the respiratory system and the formation of hydrochloric acid. Chronic inhalation exposure to the Methyl Chloride component (exposures of at least two weeks) to levels of 200-400 ppm have produced central nervous system effects (drowsiness, dizziness, misty vision, mental confusion, staggering, and slurred speech).

SKIN AND EYES: This gas mixture may be irritating to the skin if contact is prolonged and in the presence of moisture, as the Methyl Chloride component slowly hydrolyzes to form hydrochloric acid. The gas mixture may be irritating to the eyes due to possible formation of hydrochloric acid. The Methyl Chloride component of this gas mixture can be absorbed via intact skin. No adverse effects is expected to occur from this gas mixture due to this route of exposure due to the low level of Methyl Chloride in the mixture. If a large area of the skin is involved, some symptoms described under "Inhalation" may occur.

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

ACUTE: Due to the small size of the individual cylinder of this product, no unusual health effects from exposure to the product are anticipated under routine circumstances of use. In the presence of moisture, this gas mixture may be irritating by inhalation, skin or eye contact due to formation of hydrochloric acid, especially if exposure is prolonged.

CHRONIC: Chronic inhalation exposure may cause adverse effects on the central nervous system, due to the presence of Methyl Chloride. Animal tests involving the Methyl Chloride component indicate damage to the liver and kidneys may result after chronic inhalation exposure. The Methyl Chloride component of this product is a suspect human carcinogen and reproductive toxin. See Section 11 (Toxicological Information) for further information.

TARGET ORGANS: ACUTE: Respiratory system, skin, eyes, central nervous system. CHRONIC: Reproductive system, central nervous system, liver and kidneys.

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM			
HEALTH HAZARD	(BLUE)		1
FLAMMABILITY HAZARD	(RED)		0
PHYSICAL HAZARD	(YELLOW)		0
PROTECTIVE EQUIPMENT			B
EYES	RESPIRATORY	HANDS	BODY
See Section 8			
For Routine Industrial Use and Handling Applications			

4. FIRST-AID MEASURES

RESCUERS SHOULD NOT ATTEMPT TO RETRIEVE VICTIMS OF EXPOSURE TO THIS PRODUCT WITHOUT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT. At a minimum, Self-Contained Breathing Apparatus must be worn. Victim(s) who experience any adverse effect after overexposure to this product must be taken for medical attention. Rescuers should be taken for medical attention if necessary. Take a copy of the label and the MSDS to physician or other health professional with victim(s). No unusual health effects are anticipated after exposure to this product, due to the small cylinder size. (continued on following page)

If any adverse symptom develops after overexposure to this product, remove victim(s) to fresh air as quickly as possible. Only trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation if necessary.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing respiratory conditions and other disorders may be aggravated by overexposure to this product.

RECOMMENDATIONS TO PHYSICIANS: Physicians should not administer adrenaline as a stimulant in case of Methyl Chloride poisoning. Administer oxygen, if necessary; treat symptoms; reduce or eliminate exposure.

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.

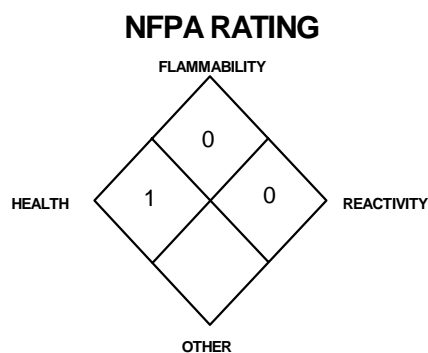
FIRE EXTINGUISHING MATERIALS: Non-flammable gas mixture. Use extinguishing media appropriate for surrounding fire.

UNUSUAL FIRE AND EXPLOSION HAZARDS: This gas mixture is not flammable; however, containers, when involved in fire, may rupture or burst in the heat of the fire. If involved in a fire this gas mixture may produce toxic hydrogen chloride gas, phosgene and carbon monoxide.

Explosion Sensitivity to Mechanical Impact: Not Sensitive.

Explosion Sensitivity to Static Discharge: Not Sensitive.

SPECIAL FIRE-FIGHTING PROCEDURES: The Methyl Chloride component is considered to be is toxic and a suspected human carcinogen and reproductive toxin. Do not enter fire area without wearing specialized protective/equipment suitable for the situation. Firefighter's normal protective clothing (Bunker Gear) will not provide adequate protection. A full-body encapsulating chemical resistant suit with positive pressure Self-Contained Breathing Apparatus (NIOSH-approved or equivalent) may be necessary.



6. ACCIDENTAL RELEASE MEASURES

LEAK RESPONSE: Due to the small size and content of the cylinder, an accidental release of this product presents significantly less risk of an oxygen-deficient environment and other safety hazards than a similar release from a larger cylinder. However, as with any chemical release, extreme caution must be used during emergency response procedures. In the event of a release in which the atmosphere is unknown, and in which other chemicals are potentially involved, evacuate immediate area. Such releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a leak, clear the affected area and protect people. For emergency disposal, secure the cylinder and slowly discharge the gas to the atmosphere in a well-ventilated area or outdoors. Allow the gas mixture to dissipate. If necessary, monitor the surrounding area (and the original area of the release) for oxygen and the level of Methyl Chloride.

6. ACCIDENTAL RELEASE MEASURES(Continued)

Oxygen levels must be above 19.5% and the level of Methyl Chloride must be below the TLV before non-emergency personnel are allowed to re-enter area. If leaking incidentally from the cylinder or its valve, contact your supplier.

7. HANDLING and USE

WORK PRACTICES AND HYGIENE PRACTICES: Be aware of any signs of dizziness or fatigue; exposures to fatal concentrations of this product could occur without any significant warning symptoms, due to oxygen deficiency. Do not attempt to repair, adjust, or in any other way modify the cylinders of this product. If there is a malfunction or another type of operational problem, contact nearest distributor immediately.

STORAGE AND HANDLING PRACTICES: Cylinders should be firmly secured to prevent falling or being knocked-over. Cylinders must be protected from the environment, and preferably kept at room temperature (approximately 21°C [70°F]). Cylinders should be stored in dry, well-ventilated areas, away from sources of heat, ignition, and direct sunlight. Protect cylinders against physical damage. Full and empty cylinders should be segregated. Use a first-in, first-out inventory system to prevent full containers from being stored for long periods of time. These cylinders are not refillable. **WARNING! Do not refill DOT 39 cylinders. To do so may cause personal injury or property damage.**

SPECIAL PRECAUTIONS FOR HANDLING GAS CYLINDERS: WARNING! Compressed gases can present significant safety hazards. During cylinder use, use equipment designed for these specific cylinders. Ensure all lines and equipment are rated for proper service pressure.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain that application equipment is locked and tagged-out safely. Always use product in areas where adequate ventilation is provided.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: Due to the presence of the Methyl Chloride component in this gas mixture, refer to OSHA 29 CFR 1910.1051; 29 CFR 1910.19(1) for specific ventilation requirements. As with all chemicals, use this product in well-ventilated areas. If this product is used in a poorly-ventilated area, install automatic monitoring equipment to detect the levels of Isobutane and oxygen.

RESPIRATORY PROTECTION: No special respiratory protection is required under normal circumstances of use. Use supplied air respiratory protection if the levels of Isobutane exceeds exposure limits presented in Section 2 (Composition and Information of Ingredients) and Oxygen levels are below 19.5%, or unknown, during emergency response to a release of this product. If respiratory protection is needed, use only protection authorized in the U.S. Federal OSHA Standard (29 CFR 1910.134), applicable U.S. State regulations, or the Canadian CSA Standard Z94.4-93 and applicable standards of Canadian Provinces. Oxygen levels below 19.16.33% 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 (1910.134-1998). The following are NIOSH respiratory protection guidelines for Methyl Chloride:

METHYL CHLORIDE

CONCENTRATION RESPIRATORY PROTECTION

At Concentrations Above the NIOSH REL, or Where There is No REL, at Any Detectable Concentration: Any Self-Contained Breathing Apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode, or any Supplied-Air Respirator (SAR) that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary Self-Contained Breathing Apparatus (SCBA) operated in pressure-demand or other positive-pressure mode.

Escape: Any appropriate escape-type, SCBA.

EYE PROTECTION: Safety glasses. If necessary, refer to U.S. OSHA 29 CFR 1910.133 or appropriate Canadian Standards.

HAND PROTECTION: Wear leather gloves when handling cylinders. Chemically resistant gloves should be worn when using this gas mixture. Polyvinyl Alcohol gloves are recommended. Natural rubber and neoprene gloves can be dissolved after contact with Methyl Chloride. If necessary, refer to U.S. OSHA 29 CFR 1910.138 or appropriate Standards of Canada.

BODY PROTECTION: No special protection is needed under normal circumstances of use. 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 U.S. OSHA 29 CFR 1910.136.

9. PHYSICAL and CHEMICAL PROPERTIES

Unless otherwise specified, the following information is for Nitrogen, the main component of this gas mixture.

GAS DENSITY @ 0°C (32°F) and 1 atm: .072 lb./ft³ (1.153 kg/m³)

FREEZING/MELTING POINT @ 10 psig -210°C (-345.8°F)

SPECIFIC GRAVITY (air = 1) @ 21.1°C (70°F): 0.906

SOLUBILITY IN WATER vol/vol @ 0°C (32°F) and 1 atm: 0.023

EVAPORATION RATE (nBuAc = 1): Not applicable.

VAPOR PRESSURE @ 70°F (21.1°C) psig: Not applicable.

COEFFICIENT WATER/OIL DISTRIBUTION: Not applicable.

BOILING POINT: -320.4°F (-195.8°C)

pH: Not applicable.

SPECIFIC VOLUME (ft³/lb): 13.8

MOLECULAR WEIGHT: 28.01

EXPANSION RATIO: Not applicable.

The following information is for this gas mixture.

ODOR THRESHOLD (values for Methyl Chloride): Odor Recognition in Air: 1.00x10+1 ppm (chemically pure).

APPEARANCE, ODOR AND COLOR: This is a colorless gas mixture with a faint sweet, ethereal odor.

HOW TO DETECT THIS SUBSTANCE (warning properties): There are no unusual warning properties associated with a release of this product. The odor of Methyl Chloride is not a good warning property, as the odor threshold is below the TLV.

10. STABILITY and REACTIVITY

STABILITY: Normally stable in gaseous state, under conditions of normal pressure and temperature.

DECOMPOSITION PRODUCTS: The Methyl Chloride component slowly reacts with water to form hydrochloric acid. Products of thermal decomposition for Methyl Chloride include hydrogen chloride, carbon monoxide and phosgene.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: The Methyl Chloride component is incompatible with powdered aluminum, aluminum chloride, magnesium, zinc, sodium and other alkali metals.

HAZARDOUS POLYMERIZATION: Will not occur.

11. TOXICOLOGICAL INFORMATION

CONDITIONS TO AVOID: Contact with incompatible materials. Cylinders exposed to high temperatures or direct flame can rupture or burst.

TOXICITY DATA: The following toxicology data are available for the components of this product:

METHYL CHLORIDE:

LC_{Lo} (Inhalation-Human) 20, 000 ppm/2 hours: Sense Organs and Special Senses (Eye): effect, not otherwise specified; Behavioral: convulsions or effect on seizure threshold; Gastrointestinal: nausea or vomiting

LD₅₀ (Oral-Rat) 1800 mg/kg

LC₅₀ (Inhalation-Rat) 5300 mg/m³/4 hours

LC₅₀ (Inhalation-Mouse) 2200 ppm/6 hours

LC₅₀ (Inhalation-Dog) 14,661 ppm/6 hours: Vascular: BP lowering not characterized in autonomic section; Lungs, Thorax, or Respiration: respiratory depression; Nutritional and Gross Metabolic: body temperature increase

LC_{Lo} (Inhalation-Cat) 129 mg/m³/4 hours: Behavioral: general anesthetic; Lungs, Thorax, or Respiration: respiratory depression

LC_{Lo} (Inhalation-Guinea Pig) 20,000 ppm/2 hours

TCLo (Inhalation-Rat) 3000 ppm/6 hours/5 days-intermittent: Nutritional and Gross Metabolic: weight loss or decreased weight gain; Related to Chronic Data: changes in testicular weight

TCLo (Inhalation-Rat) 41 mg/m³/4 hours/26 weeks-intermittent: Liver: liver function tests impaired; Blood: changes in erythrocyte (RBC) count; Nutritional and Gross Metabolic: weight loss or decreased weight gain

TCLo (Inhalation-Rat) 1473 ppm/6 hours/90 days-intermittent: Liver: other changes; Nutritional and Gross Metabolic: weight loss or decreased weight gain

TCLo (Inhalation-Rat) 997 ppm/6 hours/2 years-intermittent: Tumorigenic: equivocal tumorigenic agent by RTECS criteria; Reproductive: Tumorigenic effects: testicular tumors

TCLo (Inhalation-Rat) 2000 ppm/6 hours: male 5 day(s) pre-mating: Reproductive: Paternal Effects: spermatogenesis (incl. genetic material, sperm morphology, motility, and count)

TCLo (Inhalation-Rat) 1500 ppm/6 hours: male 50 day(s) pre-mating: Reproductive: Paternal Effects: testes, epididymis, sperm duct

METHYL CHLORIDE (continued):

TCLo (Inhalation-Rat) 1500 ppm/6 hours: female 7-19 day(s) after conception: Reproductive: Effects on Embryo or Fetus: fetotoxicity (except death, e.g., stunted fetus); Specific Developmental Abnormalities: musculoskeletal system

TCLo (Inhalation-Rat) 3000 ppm/6 hours: male 5 day(s) pre-mating: Reproductive: Paternal Effects: spermatogenesis (incl. genetic material, sperm morphology, motility, and count), testes, epididymis, sperm duct; Fertility: post-implantation mortality (e.g. dead and/or resorbed implants per total number of implants)

TCLo (Inhalation-Rat) 3000 ppm/6 hours: male 5 day(s) pre-mating: Reproductive: Fertility: male fertility index (e.g. # males impregnating females per # males exposed to fertile non-pregnant females)

TCLo (Inhalation-Rat) 1500 ppm/6 hours: female 7-20 day(s) after conception: Reproductive: Maternal Effects: other effects; Effects on Embryo or Fetus: fetotoxicity (except death, e.g., stunted fetus)

TCLo (Inhalation-Mouse) 150 ppm/22 hours/days-continuous: Behavioral: changes in motor activity (specific assay); Endocrine: changes in thymus weight; Related to Chronic Data: death

TCLo (Inhalation-Mouse) 1473 ppm/6 hours/90 days-intermittent: Liver: liver function tests impaired, changes in liver weight; Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: other transferases

TCLo (Inhalation-Mouse) 997 ppm/6 hours/2 years-intermittent: Tumorigenic: Carcinogenic by RTECS criteria; Kidney, Ureter, Bladder: Kidney tumors

TC (Inhalation-Mouse) 1000 ppm/6 hours/2 years-intermittent: Tumorigenic: equivocal tumorigenic agent by RTECS criteria; Kidney, Ureter, Bladder: tumors

TCLo (Inhalation-Mouse) 750 ppm/6 hours: female 6-17 day(s) after conception: Reproductive: Effects on Embryo or Fetus: fetal death

METHYL CHLORIDE (continued):

TCLo (Inhalation-Mouse) 500 ppm/6 hours: female 6-17 day(s) after conception: Reproductive: Specific Developmental Abnormalities: cardiovascular (circulatory) system

TCLo (Inhalation-Mouse) 500 ppm/6 hours: female 6-18 day(s) after conception: Reproductive: Effects on Embryo or Fetus: fetotoxicity (except death, e.g., stunted fetus); Specific Developmental Abnormalities: cardiovascular (circulatory) system

TCLo (Inhalation-Mouse) 500 ppm/6 hours: female 6-18 day(s) after conception: Reproductive: Specific Developmental Abnormalities: cardiovascular (circulatory) system

TCLo (Inhalation-Dog) 500 ppm/24 hours/3 days-continuous: Brain and Coverings: other degenerative changes; Behavioral: tremor, ataxia

Mutation Test Systems-not otherwise specified (Human-Lymphocyte) 3 pph

Sister Chromatid Exchange (Human-Lymphocyte) 3 pph

Mutation in Mammalian Somatic Cells (Human-Lymphocyte) 5 pph

Mutation in Microorganisms (Bacteria-*Salmonella typhimurium*) 25,000 ppm

Phage Inhibition Capacity (Bacteria-*Escherichia coli*) 5 pph

Unscheduled DNA Synthesis (Rat-Sperm) 30 ppm/3 hours-continuous

Unscheduled DNA Synthesis (Rat-Liver) 1 pph

Dominant Lethal Test (Inhalation-Rat) 3000 ppm/6 hours/5 days-continuous

Morphological Transformation (Hamster-Embryo) 6 mL/plate

NITROGEN:

There are no specific toxicology data for Nitrogen. Nitrogen is a simple asphyxiant.

OXYGEN:

There are toxicity data for oxygen, but are only related to exposure to oxygen in an elevated pressure environment, such as a hyperbaric chamber.

SUSPECTED CANCER AGENT: The components of this gas mixture are listed by agencies that track the cancer potential of chemicals as follows:

METHYL CHLORIDE: ACGIH TLV-A4 (Not Classifiable as a Human Carcinogen); EPA-D (Not Classifiable as to Human Carcinogenicity); EPA-CBD (Cannot Be Determined); IARC-3 (Unclassifiable as to Carcinogenicity in Humans); MAK-3B (Substances that Cause Concern that They Could Be Carcinogenic for Man But Cannot Be Assessed Conclusively Because of Lack of Data. Substances for which *in-vitro* tests or animal studies have yielded evidence of carcinogenic effects that is not sufficient for classification of the substance in one of the other categories. Further studies are required before a final classification can be made. A MAK or BAT value can be established, provided no genotoxic effects have been detected); NIOSH-Ca (Potential Occupational Carcinogen with No Further Categorization);

The remaining components of this gas mixture are not found on the following lists: U.S. FEDERAL OSHA Z LIST, NTP, CAL/OSHA, and IARC; therefore are not considered to be, nor suspected to be, cancer-causing agents by these agencies.

IRRITANCY OF PRODUCT: This gas mixture is not anticipated to be irritating. Contact with rapidly escaping gas from the cylinder can cause frostbite.

SENSITIZATION OF PRODUCT: No component of this gas mixture is known to be a skin or respiratory sensitizer.

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of this gas mixture and its components on the human reproductive system.

Mutagenicity: This gas mixture is not expected to cause mutagenic effects in humans. The mutagenic activity of the Methyl Chloride component has been measured in genotoxicity assays. In an established human lymphoblast line, a 3 hour treatment with 0-5% Methyl Chloride resulted in a dose-related increase in mutant fraction at the thymidine kinase locus and induction of sister-chromatid exchange. No increase in DNA damage, as measured by alkaline elution, was detected in the lymphoblasts at concentrations of Methyl Chloride shown to be mutagenic. Methyl Chloride is a weak, direct-acting mutagen for bacteria and human cells in culture.

Embryotoxicity: This gas mixture is not expected to cause embryotoxic effects in humans.

Teratogenicity: This gas mixture is not expected to cause teratogenic effects in humans. The Methyl Chloride component has caused teratogenic effects (malformed newborns) in animals. Female mice exposed to 500-750 ppm on days 6-18 of pregnancy gave birth to pups with heart defects. Levels of 100-250 ppm had no effect. Maternal toxicity was observed at the 750 ppm level but not at the 500 ppm level.

Reproductive Toxicity: This gas mixture is not expected to cause adverse reproductive effects in humans. In animal tests involving Methyl Chloride, male rats exposed by inhalation to 3000 ppm for 6 hours/day, for 5 days, had significantly reduced fertility. Exposure to 1000 ppm had no effect on fertility. No other paternal toxicity was reported.

In one study, exposure of male rats to 1000 ppm resulted in testicular damage, while, in another study, no testicular damage was seen in rats exposed to 50, 225, or 1000 ppm.

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.

ACGIH BIOLOGICAL EXPOSURE INDICES (BEIs): Currently there are no ACGIH Biological Exposure Indices (BEIs) applicable for this gas mixture's components.

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL STABILITY: The components of this gas mixture occur naturally in the atmosphere. The gas will be dissipated rapidly in well-ventilated areas. The following environmental data are available for the Methyl Chloride component of this gas mixture.

METHYL CHLORIDE:

Terrestrial Fate: Based on a classification scheme, an estimated Koc value of 14, determined from a structure estimation method, indicates that Methyl Chloride is expected to have very high mobility in soil. Volatilization of Methyl Chloride from moist soil surfaces is expected to be an important fate process given a Henry's Law constant of 8.82×10^{-3} atm-cu m/mole. The potential for volatilization of Methyl Chloride from dry soil surfaces may exist based upon a vapor pressure of 4.30×10^{-3} mm Hg. Field and laboratory results demonstrate that several halogenated aliphatics may biodegrade slowly under anaerobic conditions, but not under aerobic conditions.

Aquatic Fate: Based on a classification scheme, an estimated Koc value of 14, determined from an estimation method indicates that Methyl Chloride is not expected to adsorb to suspended solids and sediment. Volatilization from water surfaces is expected based upon a Henry's Law constant of 8.82×10^{-3} atm-cu m/mole. Using this Henry's Law constant and an estimation method, volatilization half-lives for a model river and model lake are 46 min and 3 days, respectively. According to a classification scheme, an estimated BCF of 3, from its log Kow of 0.91 and a regression-derived equation, suggests the potential for bioconcentration in aquatic organisms is low. Field and laboratory results demonstrate that several halogenated aliphatics may biodegrade slowly under anaerobic conditions, but not under aerobic conditions.

Atmospheric Fate: According to a model of gas/particle partitioning of semivolatile organic compounds in the atmosphere, Methyl Chloride, which has a vapor pressure of 4.30×10^{-3} mm Hg at 25°C, is expected to exist solely as a gas in the ambient atmosphere. Gas-phase Methyl Chloride is degraded in the atmosphere by reaction with photochemically-produced hydroxyl radicals; the half-life for this reaction in air is estimated to be 310 days, calculated from its rate constant of 5.3×10^{-14} cu cm/molecule-sec at 25°C. The dominant loss mechanism for Methyl Chloride in the troposphere is upward diffusion although washout by rain may also be important. From the tropopause to about 30 km, both upward diffusion and reaction with hydroxyl radicals will be of approximately equal importance, and above 30 km in the stratosphere diffusion, reaction with hydroxyl radicals, and photo-dissociation will have approximately equal weight. The surface half-life resulting from upward diffusion is 80 days.

Bioconcentration: An estimated BCF of 3 was calculated for Methyl Chloride, using a log Kow of 0.91 and a regression-derived equation. According to a classification scheme, this BCF suggests the potential for bioconcentration in aquatic organisms is low.

NITROGEN:

Water Solubility = 2.4 volumes Nitrogen/100 volumes water at 0°C; 1.6 volumes Nitrogen/100 volumes water at 20°C.

OXYGEN:

Water Solubility = 1 volume Oxygen/32 volumes water at 20°C. Log K_{ow} = -0.65

EFFECT OF MATERIAL ON PLANTS or ANIMALS: No evidence is currently available on the effects of this product on plants or animals.

EFFECT OF CHEMICAL ON AQUATIC LIFE: No evidence is currently available on the effects of this product on aquatic life. The following are aquatic toxicity data for the Methyl Chloride component of this gas mixture:

METHYL CHLORIDE:

EC₀ (*Pseudomonas putida* bacteria) 16 hours = 500 mg/L

EC_{50,S} (*Methanogenic* bacteria) 24 hours = 39 mg/L

EC₀ (*Microcystis aeruginosa* algae) 8 days = 550 mg/L

EC₀ (*Scenedesmus quadricauda* algae) 7 days = 1,450 mg/L

EC₀ (*Entosiphon sulcatum* protozoa) 72 hours = 8,000 mg/L

METHYL CHLORIDE:

LC₅₀ (*Lepomis macrochirus*) 96 hours = 550 ppm (static bioassay in fresh water at 23°C, mild aeration applied after 24 hours)

LC₅₀ (*Menidia beryllina*) 96 hours = 270 ppm (static bioassay in synthetic seawater at 23°C, mild aeration applied after 24 hours)

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate U.S. Federal, State, and local regulations, or the applicable standards of Canada and its Provinces. Cylinders with undesired residual product may be safely vented outdoors with the proper regulator. For further information, refer to Section 16 (Other Information).

14. TRANSPORTATION INFORMATION

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

PROPER SHIPPING NAME: Compressed gases, n.o.s. (Oxygen, Methyl Chloride, Nitrogen)

HAZARD CLASS NUMBER and DESCRIPTION: 2.2 (Non-Flammable Gas)

UN IDENTIFICATION NUMBER: UN 1956

PACKING GROUP: Not Applicable

DOT LABEL(S) REQUIRED: Non-Flammable Gas

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2000): 126

MARINE POLLUTANT: The components of this gas mixture are not classified by the DOT as Marine Pollutants (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 can present serious safety hazards. If transporting these cylinders in vehicles, ensure these cylinders are not exposed to extremely high temperatures (as may occur in an enclosed vehicle on a hot day). Additionally, the vehicle should be well-ventilated during transportation.

Note: DOT 39 Cylinders ship in a strong outer carton (overpack). Pertinent shipping information goes on the outside of the overpack. DOT 39 Cylinders do not have transportation information on the cylinder itself.

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: This gas mixture is considered 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.

PROPER SHIPPING NAME: Compressed gases, n.o.s. (Oxygen, Methyl Chloride, Nitrogen)

HAZARD CLASS NUMBER and DESCRIPTION: Class 2.2 (Non-Flammable Gas)

UN IDENTIFICATION NUMBER: UN 1956

PACKING GROUP: Not Applicable

HAZARD LABEL(S) REQUIRED: Class 2.2 (Non-Flammable Gas)

SPECIAL PROVISIONS: None

EXPLOSIVE LIMIT & LIMITED QUANTITY INDEX: 0.12

ERAP INDEX: 0

PASSENGER CARRYING SHIP INDEX: None

PASSENGER CARRYING ROAD OR RAIL VEHICLE INDEX: 75

MARINE POLLUTANT: Not applicable.

15. REGULATORY INFORMATION

ADDITIONAL U.S. REGULATIONS:

U.S. SARA REPORTING REQUIREMENTS: The components of this product are subject to the reporting requirements of Sections 302, 304, and 313 of Title III of the Superfund Amendments and Reauthorization Act, as follows:

CHEMICAL NAME	SARA 302 (40 CFR 355, Appendix A)	SARA 304 (40 CFR Table 302.4)	SARA 313 (40 CFR 372.65)
Methyl Chloride	No	No	Yes

U.S. SARA THRESHOLD PLANNING QUANTITY: There are no specific Threshold Planning Quantities for this material. The default Federal MSDS submission and inventory requirement filing threshold of 10,000 lb (4,540 kg) may apply, per 40 CFR 370.20.

U.S. CERCLA REPORTABLE QUANTITY (RQ) : Methyl Chloride = 100 lb (45.4 kg)

U.S. TSCA INVENTORY STATUS: The components of this gas mixture are on the U.S. TSCA Inventory.

OTHER U.S. FEDERAL REGULATIONS:

- The Methyl Chloride component of this gas mixture is subject to the reporting requirements of Section 112(r) of the Clean Air Act. The reportable quantity (RQ) of Methyl Chloride under this regulation is 10,000 lb (4550 kg). Methyl Chloride listed as a Hazardous Air Pollutant (HAP) generally known or suspected to cause serious health problems.
- This gas mixture does not contain any Class I or Class II ozone depleting chemicals (40 CFR part 82).

U.S. STATE REGULATORY INFORMATION: The components of this gas mixture are covered under the following specific State regulations:

Alaska - Designated Toxic and Hazardous Substances: Methyl Chloride.

California - Permissible Exposure Limits for Chemical Contaminants: Methyl Chloride, Nitrogen.

Florida - Substance List: Methyl Chloride.

Illinois - Toxic Substance List: Methyl Chloride.

Kansas - Section 302/313 List: Methyl Chloride.

Massachusetts - Substance List: Methyl Chloride.

Michigan - Critical Materials Register: No.

Minnesota - List of Hazardous Substances: Methyl Chloride.

Missouri - Employer Information/Toxic Substance List: Methyl Chloride.

New Jersey - Right to Know Hazardous Substance List: Methyl Chloride, Nitrogen.

North Dakota - List of Hazardous Chemicals, Reportable Quantities: None.

Pennsylvania - Hazardous Substance List: Methyl Chloride, Nitrogen.

Rhode Island - Hazardous Substance List: Methyl Chloride, Nitrogen.

Texas - Hazardous Substance List: Methyl Chloride.

West Virginia - Hazardous Substance List: Methyl Chloride.

Wisconsin - Toxic and Hazardous Substances: Methyl Chloride.

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): The Methyl Chloride component of this gas mixture is on the California Proposition 65 lists. WARNING! This gas mixture contains a compound that is known to the State of California to cause reproductive harm.

ADDITIONAL CANADIAN REGULATIONS:

CANADIAN DSL/NDL INVENTORY STATUS: The components of this product are on the Canadian DSL Inventory.

OTHER CANADIAN REGULATIONS: Not applicable.

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS: The components of this product are not on the CEPA Priorities Substances List.

CANADIAN WHMIS CLASSIFICATION: This gas mixture is categorized as a Controlled Product, Hazard Class A, D2B, as per the Controlled Product Regulations.

16. OTHER INFORMATION

INFORMATION ABOUT DOT-39 NRC (Non-Refillable Cylinder) PRODUCTS

DOT 39 cylinders ship as hazardous materials when full. Once the cylinders are relieved of pressure (empty) they are not considered hazardous material or waste. Residual gas in this type of cylinder is not an issue because toxic gas mixtures are prohibited. Calibration gas mixtures typically packaged in these cylinders are Nonflammable n.o.s., UN 1956. A small percentage of calibration gases packaged in DOT 39 cylinders are flammable or oxidizing gas mixtures.

For disposal of used DOT-39 cylinders, it is acceptable to place them in a landfill if local laws permit. Their disposal is no different than that employed with other DOT containers such as spray paint cans, household aerosols, or disposable cylinders of propane (for camping, torch etc.). When feasible, we recommended recycling for scrap metal content. CALGAZ, LLC will do this for any customer that wishes to return cylinders to us prepaid. All that is required is a phone call to make arrangements so we may anticipate arrival. Scrapping cylinders involves some preparation before the metal dealer may accept them. We perform this operation as a service to valued customers who want to participate.

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 the handling of compressed gases can be found in the following pamphlets published by: Compressed Gas Association Inc. (CGA), 1725 Jefferson Davis Highway, Suite 1004, Arlington, VA 22202-4102. Telephone: (703) 412-0900.

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

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This Material Safety Data Sheet is offered pursuant to OSHA's Hazard Communication Standard, 29 CFR, 1910.1200. Other government regulations must be reviewed for applicability to this product. To the best of CALGAZ, LLC's knowledge, the information contained herein is reliable and accurate as of this date; however, accuracy, suitability or completeness are not guaranteed and no warranties of any type, either express or implied, are provided. The information contained herein relates only to this specific product. If this product is combined with other materials, all component properties must be considered. Data may be changed from time to time. Be sure to consult the latest edition.