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 One or More of the Following Components in Nitrogen Balance Gas: Oxygen: 0-23.5% and Chlorine: 0.0002 - 0.02%

SYNONYMS: Not Applicable
CHEMICAL FAMILY NAME: Not Applicable
FORMULA: Not Applicable
Document Number: 50020

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
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	OTHER
			TWA ppm	STEL ppm	TWA ppm	STEL ppm	IDLH ppm	ppm
Chlorine	7782-50-5	0.0002 - 0.02%	0.5	1	0.5 (Vacated 1989 PEL)	1	30	NIOSH REL: STEL = 0.5, 15 min. (ceiling) DFG MAKs: TWA = 0.5 PEAK = 1•MAK 15 min, average value, 1 hr interval DFG MAK Pregnancy Risk Classification: C Carcinogen: TLV-A4
Oxygen	7782-44-7	0-23.5%	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 gas mixture 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 clear, pungent-smelling, greenish gas mixture may be severely irritating. Persons who respond to releases of this gas mixture must protect themselves from inhalation of Chlorine, the corrosive component of this gas mixture, especially in areas which are downwind of the release. Another significant health hazard associated with this gas mixture is the potential for exposure to oxygen-deficient atmospheres, when the oxygen in the mixture is at a low level (below 19.5%). Extreme caution must be used when responding to spills.

SYMPTOMS OF OVER-EXPOSURE BY ROUTE OF EXPOSURE: The most significant route of over-exposure for this gas mixture is by inhalation.
INHALATION: Due to the small size of an individual cylinder of this gas mixture, no unusual health effects from over-exposure to the product are anticipated under routine circumstances of use. If this gas mixture is released in a small, poorly-ventilated area (i.e. an enclosed or confined space), a Chlorine-enriched or oxygen-deficient environment may occur (when mixture contains less than 19.5%). Due to the presence of Chlorine, inhalation of this gas mixture, may lead to irritation of the nose and throat. Additionally, over-exposures to Chlorine can cause the following health effects: coughing, labored breathing, sore throat, and potentially fatal lung disorders (chemical pneumonitis and pulmonary edema). Repeated chlorine-overexposures by inhalation can result in emphysema and erosion of teeth.

The symptoms associated with specific Chlorine concentrations are as follows:

CONCENTRATION OF CHLORINE	OBSERVED EFFECT
0.06 ppm:	Odor threshold.
3 ppm:	Irritation of the eyes and mucous membranes.
15 ppm:	Immediate irritation of the throat.
50 ppm:	A dangerous health hazard, even for short periods of time. Prolonged exposure may result in death.
1000 ppm:	Potentially fatal after a short exposure.
NOTE:	This gas mixture contains 2-200 ppm Chlorine. Data pertinent to higher concentrations of Chlorine are provided to give complete information on effects observed in humans after over-exposures have occurred.

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM

HEALTH HAZARD	(BLUE)	3
FLAMMABILITY HAZARD	(RED)	0
PHYSICAL HAZARD	(YELLOW)	0

PROTECTIVE EQUIPMENT

EYES	RESPIRATORY	HANDS	BODY
See Section 8			

For Routine Industrial Use and Handling Applications

Additionally, when this mixture contains less than 19.5% oxygen and is released in a confined space or other poorly-ventilated area, an oxygen-deficient environment may occur. Individuals breathing such an atmosphere may experience symptoms which include headaches, ringing in ears, dizziness, drowsiness, unconsciousness, nausea, vomiting, and depression of all the senses. Under some circumstances of over-exposure, death may occur. The effects associated with various levels of oxygen are as follows:

3. HAZARD IDENTIFICATION (Continued)

CONCENTRATION OF OXYGEN	OBSERVED EFFECT
12-16% Oxygen:	Breathing and pulse rate increased, muscular coordination slightly disturbed.
10-14% Oxygen:	Emotional upset, abnormal fatigue, disturbed respiration.
6-10% Oxygen:	Nausea, vomiting, collapse, or loss of consciousness.
Below 6%:	Convulsive movements, possible respiratory collapse, and death.

CONTACT WITH SKIN or EYES: Due to the presence of Chlorine in this gas mixture, skin over-exposures to this gas mixture may lead to burns or dermatitis (red, cracked, irritated skin), depending upon concentration and duration of exposure. Contact of the product with the eyes can cause pain, redness, and prolonged exposure could cause blindness.

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in Lay Terms. Over-exposure to this gas mixture may cause the health effects described below.

ACUTE: Due to the small size of the individual cylinder of this gas mixture, no unusual health effects from exposure to the product are anticipated under routine circumstances of use. This gas mixture may be severely irritating and may redden and damage eyes, skin, mucous membranes, and any other exposed tissue. If this gas mixture is inhaled, irritation of the respiratory system may occur, with coughing, breathing difficulty, and the development of lung disorders. Another significant health hazard associated with this gas mixture, when is contains less than 19.5% oxygen, is the potential for exposure to oxygen-deficient atmospheres. Symptoms of oxygen deficiency include respiratory difficulty, ringing in ears, headaches, shortness of breath, wheezing, headache, dizziness, indigestion, nausea, unconsciousness, and death. The skin of a victim of over-exposure may have a blue color.

CHRONIC: Persistent irritation may result from repeated exposures to this gas mixture. Repeated Chlorine-overexposures by inhalation can result in emphysema and erosion of tooth enamel. Chronic exposure to oxygen-deficient atmospheres (below 18% oxygen in air) may affect the heart and nervous system.

TARGET ORGANS: **Acute:** Respiratory system, skin, and eyes. **Chronic:** Skin, heart, respiratory system.

4. FIRST-AID MEASURES

RESCUERS SHOULD NOT ATTEMPT TO RETRIEVE VICTIMS OF EXPOSURE TO THIS GAS MIXTURE WITHOUT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT. At a minimum, Self-Contained Breathing Apparatus must be worn.

No unusual health effects are anticipated after exposure to this gas mixture, due to the small cylinder size. If any adverse symptom develops after over-exposure to this gas mixture, remove victim(s) to fresh air as quickly as possible. Only trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation if necessary. Victim(s) who experience any adverse effect after over-exposure to this gas mixture 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).

SKIN EXPOSURE: If irritation of the skin develops after exposure to this gas mixture, immediately begin decontamination with 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 irritation of the eye develops after exposure to this gas mixture, open victim's eyes while under gentle running water. Use sufficient force to open eyelids. Have victim "roll" eyes. Minimum flushing is for 15 minutes. Seek medical assistance immediately, preferably an ophthalmologist.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing dermatitis and respiratory conditions may be aggravated by over-exposure to this gas mixture.

RECOMMENDATIONS TO PHYSICIANS: Treat symptoms; eliminate exposure. Be observant for signs of pulmonary edema.

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.

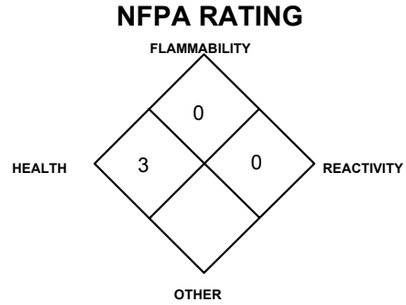
FIRE EXTINGUISHING MATERIALS: Non-flammable gas mixture. Use extinguishing media appropriate for surrounding fire.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Chlorine, a component of this gas mixture, can produce severe irritation and health effects at low concentrations; therefore, this gas mixture presents significant heath hazards to firefighters. This gas mixture is not flammable; however, containers, 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 firefighters must wear Self-Contained Breathing Apparatus and full protective equipment.

NFPA RATING



6. ACCIDENTAL RELEASE MEASURES

LEAK RESPONSE: Due to the small size and content of the cylinder, an accidental release of this gas mixture presents significantly less risk of over-exposure to Chlorine, the toxic component of this gas mixture, and other safety hazards related to the remaining components of this gas mixture, 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, protect people, and respond with trained personnel. Allow the gas mixture to dissipate. If necessary, monitor the surrounding area (and the original area of the release) for levels of Chlorine and Oxygen. The level of Chlorine must be at acceptable levels (see Section 2, Composition on 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.

If leaking incidentally from the cylinder, contact your supplier.

7. HANDLING and USE

WORK PRACTICES AND HYGIENE PRACTICES: All work practices should minimize the release of Chlorine. Eye wash stations/safety showers should be near areas where this gas mixture is used or stored. All work operations should be monitored in such a way that emergency personnel can be immediately contacted in the event of a release. Do not attempt to repair, adjust, or in any other way modify the cylinders containing this gas mixture. 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: No special ventilation systems or engineering controls are needed under normal circumstances of use. As with all chemicals, use this gas mixture in well-ventilated areas. If this gas mixture is used in a poorly-ventilated area, install automatic monitoring equipment to detect the levels of oxygen.

RESPIRATORY PROTECTION: No special respiratory protection is required under normal circumstances of use. Maintain Chlorine level below 1 ppm. Use supplied air respiratory protection if Chlorine level exceeds the exposure limits presented in Section 2 (Composition and Information on Ingredients), or if Chlorine levels are unknown or during emergency response to a release of this gas mixture. 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. 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 (1910.134-1998).

CHLORINE CONCENTRATION	RESPIRATORY EQUIPMENT
Up to 5 ppm:	Use a Chemical Cartridge Respirator or a Supplied Air Respirator (SAR).
Up to 10 ppm:	Use a SAR in the continuous flow mode, or a Powered Air Purifying Respirator (PAPR) with chlorine cartridges, or a gas mask with a chlorine canister, or a Self-Contained Breathing Apparatus (SCBA).

Entry into an Area of Unknown Chlorine Concentration: Use an SCBA or positive pressure, full-faced SAR with an auxiliary SCBA.

Escape from a Chlorine Release: Use a gas mask or mouth-piece respirator with chlorine cartridges or SCBA should be used.

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

HAND PROTECTION: No special protection is needed under normal circumstances of use. 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

The following information is for Nitrogen, the main component of this gas mixture.

GAS DENSITY @ 32°F (0°C) and 1 atm: 0.072 lbs/ ft^3 (1.153 kg/m^3)

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

BOILING POINT: -195.8°C (-320.4°F)

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

pH: Not applicable.

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

MOLECULAR WEIGHT: 28.01

EVAPORATION RATE (nBuAc = 1): Not applicable.

EXPANSION RATIO: Not applicable.

ODOR THRESHOLD: Not applicable.

SPECIFIC VOLUME (ft^3/lb): 13.8

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

COEFFICIENT WATER/OIL DISTRIBUTION: Not applicable.

The following information is for the gas mixture.

APPEARANCE, ODOR AND COLOR: This is a greenish-yellow gas mixture with a pungent odor.

HOW TO DETECT THIS SUBSTANCE (warning properties): The odor and color of this gas mixture are distinctive warning properties associated with this gas mixture.

10. STABILITY and REACTIVITY

STABILITY: Normally stable in gaseous state.

DECOMPOSITION PRODUCTS: The components of this gas mixture do not decompose, per se, but can react with other compounds in the heat of a fire.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Titanium will burn in Nitrogen (the main component of this gas mixture). Lithium reacts slowly with Nitrogen at ambient temperatures. Chlorine is not compatible with most metals (except titanium). The Oxygen component of this gas mixture is not compatible with fuels or strong reducing agents. Though Chlorine is an oxidizer, the concentration of this component in the product is too low for this to be a significant hazard associated with this gas mixture.

HAZARDOUS POLYMERIZATION: Will not occur.

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

11. TOXICOLOGICAL INFORMATION

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

CHLORINE:

TCLo (Inhalation-Human) 500 ppb/2 days-intermittent: Behavioral: tolerance

LCLo (Inhalation-Human) 2530 mg/m^3/30 minutes: Lungs, Thorax, or Respiration: structural or functional change in trachea or bronchi, emphysema, chronic pulmonary edema

LCLo (Inhalation-Human) 500 ppm/5 minutes

TCLo (Inhalation-Human) 66 ppm/1 hour: Behavioral headache; Lungs, Thorax, or Respiration: cough, dyspnea

LC_{50} (Inhalation-Rat) 293 ppm/1 hour

LC_{50} (Inhalation-Mouse) 137 ppm/1 hour

LCLo (Inhalation-Dog) 800 ppm/30 minutes: Behavioral: muscle weakness; Gastrointestinal: nausea or vomiting; Lungs, Thorax, or Respiration: dyspnea

LCLo (Inhalation-Guinea Pig) 3200 ppm/3 hours

LCLo (Inhalation-Mammal-species unspecified)500 ppm/5 minutes

TCLo (Inhalation-Rat) 9 ppm/6 hours/6 weeks-continuous: Kidney, Ureter, Bladder: other changes; Blood: changes in leukocyte (WBC) count; Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: phosphatases

TCLo (Inhalation-Rat) 9100 ppb/6 hours/5 days-intermittent: Sense Organs and Special Senses (Olfaction): effect, not otherwise specified; Lungs, Thorax, or Respiration: structural or functional change in trachea or bronchi; Nutritional and Gross Metabolic: weight loss or decreased weight gain

TCLo (Inhalation-Rat) 400 ppb/6 hours/2 years-intermittent: Sense Organs and Special Senses (Olfaction): effect, not otherwise specified

CHLORINE (continued):

TCLo (Inhalation-Mouse) 9100 ppb/6 hours/5 days-intermittent: Sense Organs and Special Senses (Olfaction): effect, not otherwise specified; Lungs, Thorax, or Respiration: structural or functional change in trachea or bronchi; Nutritional and Gross Metabolic: weight loss or decreased weight gain

TCLo (Inhalation-Mouse) 400 ppb/6 hours/2 years-intermittent: Sense Organs and Special Senses (Olfaction): effect, not otherwise specified

TCLo (Inhalation-Monkey) 2300 ppb/6 hours/1 years-intermittent: Sense Organs and Special Senses (Olfaction): effect, not otherwise specified; Sense Organs and Special Senses (Eye): conjunctive irritation; Lungs, Thorax, or Respiration: other changes

TCLo (Inhalation-Monkey) 2300 ppb/6 hours/1 years-intermittent: Tumorigenic: neoplastic by RTECS criteria; Lungs, Thorax, or Respiration: tumors

TDLo (Oral-Rat) 3312 mg/kg/92 days-continuous: Blood: change in clotting factors

TDLo (Oral-Rat) 109 gm/kg/2 years-continuous: Endocrine: changes in spleen weight; Blood: changes in other cell count (unspecified); Biochemical: Metabolism (Intermediary): Plasma proteins not involving coagulation

TDLo (Oral-Rat) 7568 mg/kg/28 days-continuous: Behavioral: food intake (animal); Liver: changes in liver weight; Kidney, Ureter, Bladder: changes in bladder weight

CHLORINE (continued):

TDLo (Oral-Rat) 42 gm/kg/2 weeks-continuous: Brain and Coverings: changes in brain weight; Liver: changes in liver weight; Kidney, Ureter, Bladder: changes in bladder weight

TDLo (Oral-Mouse) 153 gm/kg/73 weeks-continuous: Cardiac: changes in heart weight; Kidney, Ureter, Bladder: changes in bladder weight; Related to Chronic Data: changes in ovarian weight

TDLo (Oral-Rat) 5096 mg/kg/2 years-continuous: Tumorigenic: equivocal tumorigenic agent by RTECS criteria; Blood: leukemia

TDLo (Oral-Rat) 565 mg/kg: male 8 week(s) pre-mating female 2 week(s) pre-mating-3 week(s) post-birth: Reproductive: Effects on Newborn: biochemical and metabolic

Mutation in Microorganisms (Bacteria-*Salmonella typhimurium*) 1800 μg/L

Cytogenetic Analysis (Human-Lymphocyte) 20 ppm

Sperm Morphology (Oral-Mouse) 20 mg/kg/5 days-continuous

Note: Chlorine produces no known systemic effects. All symptoms and signs result directly or indirectly from the local irritant action of Chlorine.

NITROGEN:

There are no specific toxicology data for Nitrogen. Nitrogen is a simple asphyxiant, which acts to displace oxygen in the environment.

OXYGEN:

The toxicological data for Oxygen are related to exposures at high concentrations and elevated pressures (and are not pertinent to the type of exposures associated with this gas mixture).

SUSPECTED CANCER AGENT: The components of this gas mixture are listed by agencies tracking the carcinogenic potential of chemical compounds, as follows:

CHLORINE: ACGIH TLV-A4 (Not Classifiable as a Human Carcinogen)

The remaining component, Nitrogen, is not found on the following lists: FEDERAL OSHA Z LIST, NTP, CAL/OSHA, and IARC; therefore, they are not considered to be, nor suspected to be, cancer-causing agents by these agencies.

IRRITANCY OF PRODUCT: Due to the presence of Chlorine, this gas mixture is severely irritating to contaminated tissue.

SENSITIZATION TO THE PRODUCT: The components of this gas mixture are not known to cause skin or human sensitization in humans.

11. TOXICOLOGICAL INFORMATION (Continued)

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

Mutagenicity: No mutagenicity effects are expected from this gas mixture. The Chlorine component of this gas mixture has been reported to cause mutagenic effects in specific human tissues during experimental studies with exposures at relatively high doses.

Embryotoxicity: No embryotoxic effects have been described for the components of this gas mixture.

Teratogenicity: No teratogenicity effects have been described for the components of this gas mixture.

Reproductive Toxicity: No reproductive toxicity effects have been described for the components of gas mixture.

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.

BIOLOGICAL EXPOSURE INDICES (BEIs): Currently, Biological Exposure Indices (BEIs) have not been determined for the components of this gas mixture.

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 applicable to the components of this gas mixture.

CHLORINE: Water Solubility = 310 cc/ 100 cc water at 10°C. 1.46 g/ 100 cc water at 0°C. 177 cc/ 100 cc water at 30°C. Chlorine hydrolyzes in water to product hypochlorous acid. There is not potential for bioaccumulation or bioconcentration, due to the toxicity of this substance.

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: Due to the presence of Chlorine in this gas mixture, animals exposed to this gas mixture may be adversely affected. Plants contaminated with this gas mixture may be adversely affected or destroyed.

EFFECT OF CHEMICAL ON AQUATIC LIFE: No evidence is currently available on this gas mixture's effects on aquatic life. The following environmental data are available for the components of this gas mixture.

CHLORINE:

LC_{50} (Daphnia magna/water flea) = 0.097 mg/L 30 minutes
LC_{50} (Daphnia magna/water flea) = 0.063 mg/L 60 minutes
LC_{50} (*Gambusia affinis*/mosquito fish) = 1.59 mg/L 30 minutes
LC_{50} (*Gambusia affinis*/mosquito fish) = 0.84 mg/L 60 minutes
TLm (Grass shrimp) = 22 mg/L/96 hours
TLm (Ocean spot) = 0.14 mg/L/24 hours; stress
TLm (*Daphnia magna*/water flea) = 0.017 mg/L 46 hours
LC_{50} (*Oncorhyncus kisutsh*/Coho salmon) = 208μg/L 60 minutes

CHLORINE (continued):

TL_{50} (*Keratella cochlearis*) = 0.019 mg/L/4 hours
LC_{50} (*Daphnia pulex*) = 0.49 mg/L/96 hours
LC_{50} (*Micropterus salmoides*, largemouth bass) = 0.74 mg/L/24 hours
LC_{50} (*Salmo gardnerii*, rainbow trout) = 0.08 mg/L/ 168 hours
TLm (*Carassium auratus*, goldfish) = 0.17 mg/L/24 hours)
LC_{50} (*Lepomis macrochirus*, bluegill sunfish) = 0.44 mg/L/ 96 hours
LC_{50} (*Pimephales promelas*, fathead minnow) = 0.1 mg/L; 96 hr
LC_{50} (*Lepomis cyanellus*, green sunfish) = 3.0 mg/L/ 24 hours
Carp: 1.5-0.2 mg/L/12-16 days; 25% killed.

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. 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. (Chlorine, 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: Chlorine, a component of this gas mixture, is designated by the Department of Transportation to be a Marine Pollutant (49 CFR 172.101, Appendix B). Refer to 49 CFR 172.322 for regulations regarding markings associated with this gas mixture.

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 is considered as Dangerous Goods, per regulations of Transport Canada.

PROPER SHIPPING NAME: Compressed gases, n.o.s. (Chlorine, Nitrogen)
HAZARD CLASS NUMBER and DESCRIPTION: 2.2 (Non-Flammable Gas)
UN IDENTIFICATION NUMBER: UN 1956
PACKING GROUP: Not Applicable
HAZARD LABEL: Class 2.2 (Non-Flammable Gas)
SPECIAL PROVISIONS: None
EXPLOSIVE LIMIT AND LIMITED QUANTITY INDEX: 0.12
ERAP INDEX: None
PASSENGER CARRYING SHIP INDEX: None
PASSENGER CARRYING ROAD VEHICLE OR PASSENGER CARRYING RAILWAY VEHICLE INDEX: 75
NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2000): 121

NOTE: Shipment of compressed gas cylinders via Public Passenger Road Vehicle is a violation of Canadian law (Transport Canada Transportation of Dangerous Goods Act, 1992).

15. REGULATORY INFORMATION

ADDITIONAL U.S. REGULATIONS:

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

COMPOUND	SARA 302 (40 CFR 355, Appendix A)	SARA 304 (40 CFR Table 302.4)	SARA 313 (40 CFR 372.65)
Chlorine	YES	YES	YES

U.S. SARA SECTION 302 EXTREMELY HAZARDOUS SUBSTANCE THRESHOLD PLANNING QUANTITY: Chlorine = 100 lbs (45.4 kg)
U.S. SARA SECTION 304 EXTREMELY HAZARDOUS SUBSTANCE REPORTABLE QUANTITY: Chlorine = 10 lbs (4.54 kg)
U.S. TSCA INVENTORY STATUS: The components of this gas mixture are listed on the TSCA Inventory.
U.S. CERCLA REPORTABLE QUANTITY (RQ): Chlorine = 10 lbs (4.54 kg)
OTHER U.S. FEDERAL REGULATIONS:

- Chlorine is subject to the reporting requirements of CFR 29 1910.1000. Chlorine is listed on Table Z.1.
- Depending on specific operations involving the use of this gas mixture, the regulations of the Process Safety Management of Highly Hazardous Chemicals may be applicable (29 CFR 1910.119). Under this regulation Chlorine is listed in Appendix A. Under this regulation, the threshold quantity is 1500 lbs. Due to the small size of the cylinder for this mixture, this regulation should not apply.
- Chlorine is subject to the reporting requirements of Section 112(r) of the Clean Air Act. The Threshold Quantity of Chlorine is 2500 lbs (1135 kg). Due to the small size of the cylinder for this mixture, this regulation should not apply.

15. REGULATORY INFORMATION

- This gas mixture does not contain any Class I or Class II ozone depleting chemicals (40 CFR part 82).
- Nitrogen is not listed as a Regulated Substance, per 40 CFR, Part 68, of the Risk Management for Chemical Releases. Chlorine is listed under this regulation in Table 1 as a Regulated Substance (Toxic Substance), in quantities of 2500 lbs or greater. Due to the small size of the cylinder for this mixture, this regulation should not apply.

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

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): No component of this gas mixture is on the California Proposition 65 lists.

ADDITIONAL CANADIAN REGULATIONS:
CANADIAN DSL INVENTORY STATUS: The components of this gas mixture are listed on the DSL Inventory.
CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS: The components of this gas mixture are not on the CEPA Priorities Substances List.
CANADIAN WHMIS INFORMATION: This gas mixture is categorized as a Controlled Product, Hazard Classes A and 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 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"

PREPARED BY: CHEMICAL SAFETY ASSOCIATES, Inc.
PO Box 3519, La Mesa, CA 91944-3519
619/670-0609
Fax on Demand: 1-800/231-1366

AIR LIQUIDE™

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 gas mixture. To the best of CALGAZ 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 gas mixture 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.