



SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI, Canadian WHMIS, 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: NON-FLAMMABLE GAS MIXTURE

Containing the Following Components in a Nitrogen Balance Gas:

Oxygen 0.0-23.5%, Methane 0.0-< 5%, Carbon Monoxide 0.0-1.5%, Hydrogen Sulfide 0.001-0.025%, Sulfur Dioxide 0.0-0.025%

SYNONYMS: Not Applicable

CHEMICAL FAMILY NAME: Not Applicable

FORMULA: Not Applicable

U.N. NUMBER: UN 1956

U.N. DANGEROUS GOODS CLASS/SUBSIDIARY RISK: 2.2 (Non-Flammable Gas)

Document Number: 50134

PRODUCT USE:	Calibration of Monitoring and Research Equipment
U.S. SUPPLIER/MANUFACTURER'S NAME:	CALGAZ
ADDRESS:	821 Chesapeake Drive Cambridge, MD 21613
BUSINESS PHONE:	1-410-228-6400 (8 am to 5 pm EST)
General MSDS Information:	1-713/868-0440
Fax on Demand:	1-800/231-1366
EMERGENCY PHONE:	Chemtrec: United States/Canada/Puerto Rico: 1-800/424-9300 [24-hours] Chemtrec International: +1-703-527-3887 [collect 24-hours]

NOTE: ALL United States Occupational Safety and Health Administration Standard (29 CFR 1910.1200), U.S. State equivalent Standards, Canadian WHMIS [Controlled Products Regulations], and European Union [Regulation (EC) 1907/2006 Annex II] required information is included in appropriate sections based on the U.S. ANSI Z400.1-2004 format. This product has been classified in accordance with the hazard criteria of the countries listed above.

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. For information on EU classification under (67/548/EEC), see below.

Classification: Gases Under Pressure, Acute Inhalation Toxicity Cat.4, Eye Irritation Cat. 2, Skin Irritation Cat. 2, STOT Inhalation-Eyes RE Cat. 2, STOT Inhalation-Respiratory System SE Cat. 3, Reproductive Toxicity Cat. 1A

Signal Words: Danger

Hazard Statement Codes: H280, H332, H319, H335, H315, H360D, H372

Precautionary Statement Codes: P201, P202, P261, P264, P271, P280, P304 + P340, 312, P305 + P351 + P338, P337 + P313, P302 + P352, P321, P332, + P313, P362, P308 + P313, P314, P403 + P233, P405, P501

Hazard Symbols/Pictograms:

GHS04, GHS07, GHS08



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: Toxic, Irritant

Risk Phrase Codes: R20, R36/37/38, R61

Safety Phrase Codes: S1/2, S45, S53

Hazard Symbols: T, Xn/Xi



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

EMERGENCY OVERVIEW: Product Description: This gas mixture is colorless and has an odor of rotten eggs or sulfur. **Health Hazards:** This gas mixture may cause adverse health effects due to the presence of Hydrogen Sulfide, Carbon Monoxide and Sulfur Dioxide, which can reach exposure limits at the percentages in this mixture. Releases of this gas mixture may also produce oxygen-deficient atmospheres (especially in confined spaces or other poorly-ventilated environments); individuals in such atmospheres may be asphyxiated. The Carbon Monoxide component is a human reproductive toxin. Rapidly released gas can cause frostbite. **Flammability Hazards:** This gas is non-flammable and will not support combustion. A moderate cylinder rupture hazard exists when this gas mixture, which is under pressure, is subject to heat or flames. **Reactivity Hazards:** This gas mixture is not reactive. **Environmental Hazards:** Release of this gas mixture is not expected to cause harm to the environment or to plants and animals, except for possible frost and freezing from rapid release of a cylinder. **Emergency Response Procedures:** Emergency responders must wear the proper personal protective equipment suitable for the situation to which they are responding. **WARNING** - If rescue personnel need to enter an area suspected of having a low level of Oxygen, they should be equipped with Self-Contained Breathing Apparatus (SCBA).

3. COMPOSITION and INFORMATION ON INGREDIENTS

Chemical Name	Chemical Formula	CAS #	European EINECS #	% Composition	EU Classification (67/548/EEC) GHS & EU Classification (1272/2008) Risk Phrases/Hazard & Precautionary Statements
Oxygen	O ₂	7782-44-7	231-956-9	0.0-23.5%	EU 67/548/EEC Classification: Oxidizer Risk Phrases: R8 Symbols: O GHS & EU CLP: 1272/2008: Classification: Oxidizing Gas Cat. 1, Gas Under Pressure Hazard Statement Codes: H270, H280 Hazard Symbols/Pictograms: GHS03, GHS04
Methane	CH ₄	74-82-8	200-812-7	0.0-< 5%	EU 67/548/EEC Classification: Extremely Flammable Risk Phrases: R12 Symbols: F+ GHS & EU CLP: 1272/2008: Classification: Flammable Gas Cat. 1, Gas Under Pressure Hazard Statement Codes: H220, H280 Hazard Symbols/Pictograms: GHS02, GHS04

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

3. COMPOSITION and INFORMATION ON INGREDIENTS (Continued)

Chemical Name	Chemical Formula	CAS #	European EINECS #	% Composition	EU Classification (67/548/EEC) GHS & EU Classification (1272/2008) Risk Phrases/Hazard & Precautionary Statements
Carbon Monoxide	CO	630-08-0	211-128-3	0.0-1.0%	EU 67/548/EEC Classification: Extremely Flammable, Toxic, Reproductive Toxicity Cat. 1 Risk Phrases: R12, R23, R48/23 Symbols: F+, T GHS & EU CLP: 1272/2008: Classification: Flammable Gas Cat. 1, Gas Under Pressure, Reproductive Toxicity Cat. 1A, Acute Inhalation Toxicity Cat. 3, STOT SE Chemical Asphyxiation Cat. 1 Hazard Statement Codes: H220, H280, H360D, H331, H372 Hazard Symbols/Pictograms: GHS02, GHS04, GHS06, GHS08
Hydrogen Sulfide	H ₂ S	7783-06-4	231-977-3	0.001-0.025%	EU 67/548/EEC Classification: Extremely Flammable, Toxic, Dangerous for the Environment Risk Phrases: R12, R26, R50 Symbols: F+, T, N GHS & EU CLP: 1272/2008: Classification: Flammable Gas Cat. 1, Gas Under Pressure, Acute Inhalation Toxicity Cat. 1, Aquatic Acute Toxicity Cat. 1 Hazard Statement Codes: H220, H280, H330, H400 Hazard Symbols/Pictograms: GHS02, GHS04, GHS06, GHS09
Sulfur Dioxide	SO ₂	7446-09-5	231-195-2	0.0-0.025%	EU 67/548/EEC Classification: Toxic, Corrosive Risk Phrases: R23, R34 Symbols: Xi GHS & EU CLP: 1272/2008: Classification: Gas Under Pressure, Acute Inhalation Toxicity Cat. 3, Skin Corrosion Cat. 1 B Hazard Statement Codes: H280, h331, H314 Hazard Symbols/Pictograms: GHS04, GHS06, GHS05
Nitrogen	N ₂	7727-37-9	23 1-783-9	Balance	EU 67/548/EEC Classification: None Risk Phrases: None Symbols: None GHS & EU CLP: 1272/2008: Classification: Gas Under Pressure Hazard Statement Codes: H280 Hazard Symbols/Pictograms: GHS04

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

4. FIRST-AID MEASURES

PROTECTION OF FIRST AID RESPONDERS: RESCUERS SHOULD NOT ATTEMPT TO RETRIEVE VICTIMS OF EXPOSURE TO WITHOUT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT. At a minimum, Self-Contained Breathing Apparatus and Chemically-Resistant Personal Protective equipment should be worn. Rescuers should be taken for medical attention, if necessary. Only trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation, if necessary.

DESCRIPTION OF FIRST AID MEASURES: Contaminated individuals must be taken for medical attention if any adverse effects occur. Take a copy of label and MSDS to health professional with victim.

Remove victim(s) to fresh air, as quickly as possible. 100% oxygen should be administered to victims of exposure to this gas mixture as soon as possible. Only trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation, if necessary. Victim(s) must be taken for medical attention. Rescuers should be taken for medical attention, if necessary. Take copy of label and MSDS to physician or other health professional with victim(s).

INHALATION EXPOSURE: If inhaled, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. Seek immediate medical attention.

SKIN EXPOSURE: If this gas contaminates the skin, begin decontamination with running water. Minimum flushing is for 20 minutes. Remove exposed or contaminated clothing, taking care not to contaminate eyes. Seek medical attention if adverse effect occurs after flushing.

EYE EXPOSURE: If this gas enters the eyes, or if irritation of the eye develops after exposure, 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.

FROSTBITE EXPOSURE: If frostbite has occurred, 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.

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

INDICATION OF IMMEDIATE MEDICAL ATTENTION AND SPECIAL TREATMENT IF NEEDED: Treat symptoms and eliminate exposure.

5. FIRE-FIGHTING MEASURES

FLASH POINT: Not applicable.

AUTOIGNITION TEMPERATURE: Not applicable.

FLAMMABLE LIMITS (in air by volume, %):

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

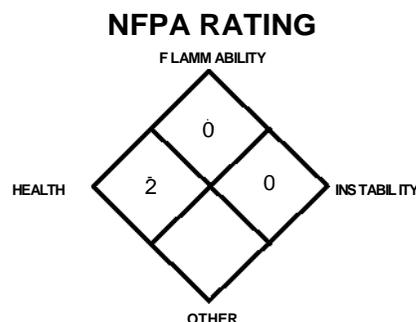
UNSUITABLE FIRE EXTINGUISHING MEDIA: None known.

SPECIAL 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.

Explosion Sensitivity to Mechanical Impact: Not sensitive.

Explosion Sensitivity to Static Discharge: Not sensitive.

ADVICE TO FIRE-FIGHTERS: Structural fire-fighters must wear Self-Contained Breathing Apparatus and full protective equipment. If water is not available for cooling or protection of cylinder exposures, evacuate the area.



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. Release may create an oxygen-deficient atmosphere in low-lying areas or confined spaces.

PERSONAL PROTECTIVE EQUIPMENT: Proper protective equipment should be used.

All Releases: Minimum Personal Protective Equipment should be **Level B: Self-Contained Breathing Apparatus**. Note: chemically protective clothing may provide little or no thermal protection against the hazard of frostbite. The atmosphere must at least 19.5 percent Oxygen before non-emergency personnel can be allowed in the area without Self-Contained Breathing Apparatus and fire protection. If gas is leaking incidentally from the cylinder or its valve, contact your supplier.

6. ACCIDENTAL RELEASE MEASURES (Continued)

METHODS FOR CLEAN-UP AND CONTAINMENT:

All Releases: 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. 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 oxygen. Oxygen levels must be above 19.5% before non-emergency personnel are allowed to re-enter area. If leaking incidentally from the cylinder, contact your supplier.

ENVIRONMENTAL PRECAUTIONS: Avoid accidental release to the environment.

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: Follow all safety and work practices for handling of compressed gases safely. Compressed gases can present significant safety hazards. As with all chemicals, wash hands after handling. Do not smoke or eat in work areas. Use a check valve or other protective device in the discharge line to prevent hazardous backflow. Never tamper with pressure relief valves and cylinders. 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. Be aware that an oxygen-deficient atmosphere can happen rapidly, causing dizziness or asphyxiation without warning.

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 an 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. Do not allow area where cylinders are stored to exceed 52°C (125°F). Store cylinders away from heavily trafficked areas and emergency exits. Isolate from other non compatible chemicals (refer to Section 10, Stability and Reactivity). 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. Full and empty cylinders should be segregated. Use a first-in, first-out inventory systems to prevent full cylinders from being stored for long periods of time.

SPECIFIC END USE(S): This product is for use in various industries. Follow all industry standards for use.

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

EXPOSURE LIMITS/CONTROL PARAMETERS:

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 components and oxygen.

OCCUPATIONAL/WORKPLACE EXPOSURE LIMITS/GUIDELINES:

CHEMICAL NAME	CAS #	EXPOSURE LIMITS IN AIR							
		ACGIH-TLVs		OSHA-PELs		NIOSH-RELS		NIOSH	OTHER ppm
		TWA ppm	STEL ppm	TWA ppm	STEL ppm	TWA ppm	STEL ppm	IDLH ppm	
Carbon Monoxide	630-08-0	25	NE	50 35 (Vacated 1989 PEL)	200 (Vacated 1989 PEL)	35	200 (ceiling)	1200	DFG MAKs: TWA = 0 PEAK = 2 MAK 15 min. average value, 1-hr interval, 4-per shift DFG MAK Pregnancy Risk Classification: B
Hydrogen Sulfide	7783-06-4	1	5	10 (Vacated 1989 PEL)	20 (ceiling); 50 (10 min. peak, once per shift) 15 (Vacated 1989 PEL)	NE	10 (ceiling) 10 min.	100	DFG MAKs: TWA = 5 PEAK = 2 MAK 15 min. average value, 1-hr interval, 4-per shift DFG MAK Pregnancy Risk Classification: C Carcinogen: EPA-I
Oxygen	7782-44-7	There are no specific exposure limits for Oxygen. Oxygen levels should be maintained above 19.5%.							
Methane	74-82-8	1000	NE	NE	NE	NE	NE	NE	NE
Nitrogen	7727-37-9	There are no specific exposure limits for Nitrogen. Nitrogen is a simple asphyxiant (SA). Oxygen levels should be maintained above 19.5%.							
Sulfur Dioxide	7446-09-5	NE	0.25	5 2 (Vacated 1989 PEL)	5 (Vacated 1989 PEL)	2	5	100	DFG MAKs: TWA = 0.5 PEAK = 1 MAK 15 min. average value, 1-hr interval, 4-per shift; 1 (ceiling) DFG MAK Pregnancy Risk Classification: C Carcinogen: IARC-3, TLV-A4

NE = Not Established.

INTERNATIONAL OCCUPATIONAL EXPOSURE LIMITS: Currently, the following additional exposure limits of this gas mixture. Exposure limits are added or change; individual country authorities should be consulted.

current limits.

CARBON MONOXIDE:

ARAB Republic of Egypt: TWA = 50 ppm (55 mg/m³), JAN 1993
Australia: TWA = 30 ppm (34 mg/m³), JUL 2008
Belgium: TWA = 25 ppm (29 mg/m³), MAR 2002
Denmark: TWA = 25 ppm (29 mg/m³), OCT 2002
Finland: TWA = 30 ppm (35 mg/m³), STEL = 75 ppm (87 mg/m³), SEP 2009
France: VME = 50 ppm (55 mg/m³), FEB 2006
Germany: MAK = 35 mg/m³ (30 mL/m³), 2005
Hungary: TWA = 33 mg/m³, STEL 132 mg/m³, SEP 2000

CARBON MONOXIDE (continued):

India: TWA = 50 ppm (55 mg/m³), STEL = 400 ppm (440 mg/m³), JAN1993
Japan: OEL = 50 ppm (57 mg/m³), APR 2007
Korea: TWA = 50 ppm (55 mg/m³), STEL 400 ppm (440 mg/m³), 2006
Mexico: TWA = 50 ppm (55 mg/m³); STEL = 400 ppm (400 mg/m³), 2004
The Netherlands: MAC-TGG = 29 mg/m³, 2003
New Zealand: STEL = 200 ppm (15 min), JAN 2002
New Zealand: STEL = 100 ppm (30 min), JAN2002
New Zealand: STEL = 50 ppm (60 min), JAN2002

CARBON MONOXIDE (continued):

Norway: TWA = 35 ppm (40 mg/m³), JAN1999
The Philippines: TWA = 50 ppm (55 mg/m³), JAN 1993
Poland: MAC(TWA) = 30 mg/m³, MAC(STEL) = 180 mg/m³, JAN 1999
Russia: STEL = 200 mg/m³ (15 minutes), JUN 2003
Russia: STEL = 100 mg/m³ (30 minutes), JUN 2003
Russia: STEL = 50 mg/m³ (1 hour), JUN 2003
Russia: STEL = 20 mg/m³, JUN2003
Sweden: TWA = 35 ppm (40 mg/m³); STEL = 100 ppm (120 mg/m³), JUN 2005

8. EXPOSURE CONTROLS - PERSONAL PROTECTION (Continued)

EXPOSURE LIMITS/CONTROL PARAMETERS (continued):

INTERNATIONAL OCCUPATIONAL EXPOSURE LIMITS (continued):

CARBON MONOXIDE (continued):

Switzerland: MAK-W = 30 ppm (35 mg/m³), KZG-W = 30 ppm (35 mg/m³), DEC 2006
Thailand: TWA = 50 ppm (55 mg/m³), JAN1993
Turkey: TWA = 50 ppm (55 mg/m³), JAN1993
United Kingdom: TWA = 30 ppm (35 mg/m³); STEL = 200 ppm, 2005
In Argentina, Bulgaria, Colombia, Jordan, Singapore, Vietnam check ACGIH TLV

HYDROGEN SULFIDE:

ARAB Republic of Egypt: TWA = 10 ppm (14 mg/m³), JAN 1993
Belgium: TWA = 10 ppm (14 mg/m³), STEL = 15 ppm (21 mg/m³), MAR 2002
Denmark: TWA = 10 ppm (15 mg/m³), OCT 2002
Finland: TWA = 10 ppm (15 ppm), STEL = 15 ppm (20 ppm), blasting and excavation work, SEP 2009
Finland: TWA = 5 ppm (7 ppm), STEL = 10 ppm (14 ppm), SEP 2009
France: VME = 5 ppm (7 mg/m³), VLE = 10 ppm (14 mg/m³), FEB 2006
Germany: MAK = 14 mg/m³ (10 mL/m³), 2005
Hungary: TWA = 14 mg/m³, STEL 14 mg/m³, SEP 2000
Japan: OEL = 5 ppm (7 mg/m³), APR 2007
Korea: TWA = 10 ppm (14 mg/m³), STEL = 15 ppm (21 mg/m³), 2006
Mexico: TWA = 10 ppm (14 mg/m³); STEL = 15 ppm (21 mg/m³), 2004
The Netherlands: MAC-TGG = 15 mg/m³, 2003
New Zealand: TWA = 10 ppm (14 mg/m³); STEL = 15 ppm (21 mg/m³), JAN 2002
Norway: TWA 10 ppm (15 mg/m³), JAN 1999
The Philippines: TWA 10 ppm (15 mg/m³), JAN 1993
Poland: MAC(TWA) = 10 mg/m³, MAC(STEL) = 20 mg/m³, JAN 1999
Russia: STEL = 10 mg/m³, JUN 2003
Sweden: TWA = 10 ppm (14 mg/m³); STEL = 15 ppm (20 mg/m³), JUN 2005
Switzerland: MAK-W = 5 ppm (7.1 mg/m³), KZG-W = 10 ppm (14.2 mg/m³), DEC 2006
Thailand: STEL = 20 ppm, JAN 1993
Turkey: TWA = 10 ppm (15 mg/m³), JAN 1993
United Kingdom: TWA = 5 ppm (7 mg/m³); STEL = 10 ppm (14 mg/m³), 2005
In Argentina, Bulgaria, Colombia, Jordan, Singapore, Vietnam check ACGIH TLV

METHANE:

Australia: Asphyxiant, JUL 2008

METHANE (continued):

Belgium: TWA = 1000 ppm, MAR 2002
Mexico: Simple asphyxiant, 2004
New Zealand: Simple asphyxiant, JAN 2002
Russia: STEL = 7000 mg/m³, JUN 2003
Switzerland: MAK-W = 10,000 ppm (6700 mg/m³), DEC 2006
In Argentina, Bulgaria, Colombia, Jordan, Korea, Singapore, Vietnam check ACGIH TLV

SULFUR DIOXIDE:

ARAB Republic of Egypt: TWA = 5 ppm (13 mg/m³), JAN 1993
Australia: TWA = 2 ppm (5.2 mg/m³), STEL = 5 ppm (13 mg/m³), JUL 2008
Belgium: TWA = 2 ppm (5.3 mg/m³), STEL = 5 ppm (13 mg/m³), MAR 2002
Denmark: TWA = 0.5 ppm (1.3 mg/m³), OCT 2002
Finland: TWA = 1 ppm (2.7 mg/m³), STEL = 4 ppm (11 mg/m³), SEP 2009
Finland: TWA = 2 ppm (5 mg/m³), STEL = 5 ppm (13 mg/m³), blasting and excavation work, SEP 2009
France: VME = 2 ppm (5 mg/m³), VLE = 5 ppm (10 mg/m³), FEB 2006
Germany: MAK = 1.3 mg/m³ (0.5 mL/m³), 2005
Hungary: TWA = 5 mg/m³, STEL = 5 mg/m³, SEP 2000
Korea: TWA = 2 ppm (5 mg/m³), STEL = 5 ppm (10 mg/m³), 2006
Mexico: TWA = 2 ppm (5 mg/m³); STEL = 5 ppm (10 mg/m³), 2004
The Netherlands: MAC-TGG = 5 mg/m³, 2003
New Zealand: TWA = 2 ppm (5.2 mg/m³), STEL = 5 ppm (13 mg/m³), JAN2002
Norway: TWA = 2 ppm (5 mg/m³), JAN 1999
The Philippines: TWA = 5 ppm (13 mg/m³), JAN 1993
Poland: MAC(TWA) = 2 mg/m³, MAC(STEL) = 5 mg/m³, JAN 1999
Russia: STEL = 10 mg/m³, Skin, JUN 2003
Sweden: TWA = 2 ppm (5 mg/m³), CL = 5 ppm (13 mg/m³), JUN 2005
Switzerland: MAK-W = 0.5 ppm (1.3 mg/m³), KZG-W = 0.5 ppm (1.3 mg/m³), DEC 2006
Thailand: TWA = 5 ppm (13 mg/m³), JAN 1993
Turkey: TWA = 5 ppm (13 mg/m³), JAN 1993
In Argentina, Bulgaria, Colombia, Jordan, Singapore, Vietnam check ACGIH TLV

PERSONAL 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, with OSHA's Respiratory Protection Standard (1910.134-1998), for eye PPE OSHA 29 CFR 1910.133, for hand PPE OSHA 29 CFR 1910.138 and for foot PPE OSHA 29 CFR 1910.136), equivalent standards of Canada (including CSA Standard Z94.4-02 and CSA Standard Z94.3-02 and for foot protection Canadian 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: No special respiratory protection is required under normal circumstances of use. Maintain component levels below 50% of the TLVs of components (see previous page) and oxygen levels above 19.5% in the workplace. Use supplied air respiratory protection when component levels exceed 50% of the TLV, oxygen levels are below 19.5%, or during emergency response to a release of this gas mixture. During an emergency situation, before entering the area, check the concentration of components and Oxygen. If necessary, use only respiratory protection authorized in the appropriate country regulations and standards. 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. The following are NIOSH Respiratory Protective Equipment Guidelines for the toxic components of this gas mixture, Hydrogen Sulfide, Sulfur Dioxide and Carbon Monoxide:

CARBON MONOXIDE

<u>CONCENTRATION</u>	<u>RESPIRATORY PROTECTION</u>
Up to 350 ppm:	Any Supplied-Air Respirator (SAR).
Up to 875 ppm:	Any SAR operated in a continuous-flow mode.
Up to 1200 ppm:	Any Air-Purifying, Full-Facepiece Respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern, or any Self-Contained Breathing Apparatus (SCBA) with a full facepiece, or any SAR 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 canister providing protection against Carbon Monoxide, or any appropriate escape-type, SCBA.

HYDROGEN SULFIDE

<u>CONCENTRATION</u>	<u>RESPIRATORY PROTECTION</u>
Up to 100 ppm:	Any Powered, Air-Purifying Respirator (PAPR) with cartridge(s), or any Air-Purifying, Full-Facepiece Respirator (gas mask) with a chin-style, front- or back-mounted canister, or any Supplied-Air Respirator (SAR), Self-Contained Breathing Apparatus 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 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 canister, or any appropriate escape-type, SCBA.

SULFUR DIOXIDE

<u>CONCENTRATION</u>	<u>RESPIRATORY PROTECTION</u>
Up to 20 ppm:	Any Chemical Cartridge Respirator with cartridge(s) providing protection against Sulfur Dioxide, or any Supplied-Air Respirator (SAR).
Up to 50 ppm:	Any SAR operated in a continuous-flow mode, or any Powered, Air-Purifying Respirator (PAPR) with cartridge(s) providing protection against the compound of concern.
Up to 100 ppm:	Any Chemical Cartridge Respirator with a full facepiece and cartridge(s) providing protection against the compound of concern, or any Air-Purifying, Full-Facepiece Respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against Sulfur Dioxide, or any PAPR with a tight-fitting facepiece and cartridge(s) providing protection against Sulfur Dioxide or any SAR that has a tight-fitting facepiece and is operated in a continuous-flow mode, or any Self-Contained Breathing Apparatus (SCBA) with a full facepiece, or any SAR 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 canister providing protection against Sulfur Dioxide, or any appropriate escape-type, SCBA.

EYE PROTECTION: Safety glasses. If necessary, refer to applicable country regulations and standards.

HAND PROTECTION: Wear leather gloves when handling cylinders. Chemically resistant gloves should be worn when using this gas mixture. Use triple gloves for spill response. If necessary, refer to applicable country regulations and standards.

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 appropriate regulations.

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: .072 lbs/ ft³ (1.153 kg/m³)

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

BOILING POINT: -320.4°F (-195.8°C)

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.

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

SPECIFIC VOLUME (ft³/lb): 13.8

COEFFICIENT WATER/OIL DISTRIBUTION: Not applicable.

The following information is for this gas mixture.

FORM: Compressed gas.

COLOR: Colorless.

ODOR: Rotten egg or sulfurous. **ODOR THRESHOLD:** For Hydrogen Sulfide: 0.13 ppm; For Sulfur Dioxide: 0.33-5.0 ppm.

HOW TO DETECT THIS SUBSTANCE (identification/warning properties): The odor cannot be relied upon as a method of identifying release of this gas mixture as continued low-level inhalation can cause olfactory fatigue, due to the presence of Hydrogen Sulfide and the odor threshold of Sulfur Dioxide is of the same magnitude as the TLV. In terms of leak detection, fittings and joints can be painted with a soap solution to detect leaks, which will be indicated by a bubble formation. Wet lead acetate paper can also be used for leak detection. The paper turns black in the presence of Hydrogen Sulfide. Cadmium solutions will turn yellow upon contact with Hydrogen Sulfide.

10. STABILITY and REACTIVITY

REACTIVITY/CHEMICAL STABILITY: Normally stable in gaseous state.

DECOMPOSITION PRODUCTS: *Combustion:* Sulfur oxides, carbon oxides. *Hydrolysis:* None known.

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. Due to the presence of Hydrogen Sulfide, this gas mixture may be incompatible with strong oxidizers. Hydrogen Sulfide is corrosive to most metals due to reaction with metals to form metal sulfides. The Carbon Monoxide component is mildly corrosive to nickel and iron (especially at high temperature and pressure). The trace Sulfur Dioxide component is incompatible with the following materials: chlorates, fluorine, interhalogens, sodium hydride, sodium, bases, silver azide, barium peroxide, diethyl zinc, nitril chloride, powdered metals, potassium, acrolein, lithium nitrate and propene, monolithium acetylide-ammonia (lithium acetylene carbide diammino), cesium azide, metal oxides, metal acetylides, and carbide. Although the Sulfur Dioxide component is in low concentration and significant reaction is not expected, caution should be used if contact with this gas mixture and these materials can occur.

POSSIBILITY OF 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

SYMPTOMS OF OVER-EXPOSURE BY ROUTE OF EXPOSURE: The most significant route of exposure to this gas mixture is via inhalation.

INHALATION: A significant hazard associated with releases of this product is the potential for over-exposure to the Carbon Monoxide, Sulfur Dioxide and Hydrogen Sulfide components of this gas mixture, which can reach exposure limits at the levels present in the mixture. Inhalation of high concentrations of Hydrogen Sulfide can cause dizziness, headache, and nausea. Exposure to higher concentrations can result in respiratory arrest, coma, or unconsciousness. Exposure for more than 30 minutes at concentrations of greater than 600 ppm has been fatal. Continuous inhalation of low concentrations may cause olfactory fatigue, so that the odor is no longer an effective warning of the presence of Hydrogen Sulfide. Severe exposures which do not result in death may cause long-term symptoms such as memory loss, paralysis of facial muscles, or nerve tissue damage. In addition, inhalation exposure containing at or more than the Threshold Limit Value (TLV) of Carbon Monoxide (25 ppm) can result in serious health consequences. Carbon Monoxide is classified as a chemical asphyxiant, producing a toxic action by combining with the hemoglobin of the blood and replacing available oxygen; through this replacement the body is deprived of required oxygen and asphyxiation can occur. Since the affinity of Carbon Monoxide to hemoglobin is 200-300 times greater than that of oxygen, exposure to only a small amount can cause a toxic effect. Carbon Monoxide exposures in excess of 50 ppm can produce a toxic effect if breathed for a sufficient period of time. Inhalation of high concentrations of Sulfur Dioxide can cause moderate to severe irritation to the respiratory tract or burns. Effects may be delayed. A severe, short-term exposure may cause long-lasting respiratory effects, e.g. Reactive Airways Dysfunction (RADS).

Another significant health hazard associated with this gas mixture is when this gas mixture contains less than 19.5% Oxygen and is released in a small, poorly-ventilated area (i.e. an enclosed or confined space). Under this circumstance, 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:

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.

WARNING: Exposure to atmospheres containing 8-10% or less oxygen will bring about unconsciousness without warning and so quickly that individuals cannot help or protect themselves. Lack of sufficient oxygen may cause serious injury or death.

CONTACT WITH SKIN or EYES: The gas may be irritating to the skin. Contact with rapidly expanding gases (which are released under high pressure) may cause frostbite. Due to presence Hydrogen Sulfide inflammation and irritation of the eyes can occur at very low airborne concentration (less than 10 ppm). Exposure over several hours may result in "gas eyes" or "sore eyes" with symptoms of scratchiness, irritation, tearing and burning. Above 50 ppm, there is an intense tearing, blurring of vision, and pain when looking at light. Exposed individuals may see rings around bright lights. Most symptoms disappear when exposure ceases. However, in serious cases, the eye can be permanently damaged. Due to presence Sulfur Dioxide inflammation and irritation of the eyes can occur at very low airborne concentration (less than 10 ppm). Most symptoms disappear when exposure ceases. However, in serious cases, the eye can be permanently damaged.

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

ACUTE: If inhalation occurs, toxic effects from Hydrogen Sulfide and Sulfur Dioxide may occur. Inhalation of high concentrations of the mixture, as may occur in a confined space, may result in an oxygen-deficient atmosphere and asphyxiation. Contact with the skin and eyes may be irritating. A sudden release of pressure from the cylinder may cause frostbite to exposed tissues.

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM			
HEALTH HAZARD	(BLUE)	2	
FLAMMABILITY HAZARD	(RED)	0	
PHYSICAL HAZARD	(YELLOW)	0	
PROTECTIVE EQUIPMENT			
EYES	RESPIRATORY	HANDS	BODY
See Section 8			
For Routine Industrial Use and Handling Applications			

11. TOXICOLOGICAL INFORMATION (Continued)

HEALTH EFFECTS OR RISKS FROM EXPOSURE (continued):

CHRONIC: Chronic low-level exposure to the eyes may result in damage to eyes from contact with Hydrogen Sulfide. Chronic low-level exposure to the skin may cause dermatitis. Chronic exposure to oxygen-deficient atmospheres (below 18% oxygen in air) may affect the heart and nervous system.

TARGET ORGANS: ACUTE: Respiratory system, central nervous system. CHRONIC: Skin, heart, nervous system, eyes.

TOXICITY DATA: Data are available for the Oxygen component, but since these data are from hyperbaric exposure to oxygen, which is an unlikely exposure to this gas mixture, the data are not presented in these MSDS. No data are applicable to the main component, Nitrogen, as it is a simple asphyxiant. The following are toxicological data available for the remaining components in 1% concentration or greater. Due to the great amount of data available, only human data, LD50 Oral-Rat, Oral-Mouse, Skin-Rabbit, Skin-Rat, LC50 Inhalation-Rat, Inhalation-Mouse and irritation data are given. Contact Calgas for information on additional toxicity data.

CARBON MONOXIDE:

LCLo (Inhalation-Human) 4 mg/m³/12 hours: Behavioral: coma; Vascular: BP lowering not characterized in autonomic section; Blood: methemoglobinemia-carboxyhemoglobin
LCLo (Inhalation-Human) 5000 ppm/5 minutes
LCLo (Inhalation-Human) 3520 mg/m³/5 minutes: Behavioral: headache
LCLo (Inhalation-Human) 3400 mg/m³/20 minutes: Cardiac: pulse rate; Lungs, Thorax, or Respiration: respiratory depression
LCLo (Inhalation-Human) 5700 mg/m³/2
LCLo (Inhalation-Human) 14,080 mg/m³/1 minute: Gastrointestinal: nausea or vomiting; Behavioral: general anesthetic
LCLo (Inhalation-Man) 4000 ppm/30 minutes
TCLo (Inhalation-Human) 600 mg/m³/10 minutes: Behavioral: headache
TCLo (Inhalation-Human) 6 mg/m³/2 minutes: Sense Organs and Special Senses (Eye): effect, not otherwise specified
TCLo (Inhalation-Human) 11 mg/m³/5 hours: Behavioral: alteration of classical conditioning
TCLo (Inhalation-Human) 31 mg/m³/3 hours: Sense Organs and Special Senses (Eye): visual field changes
TCLo (Inhalation-Human) 33 mg/m³/6 hours: Blood: changes in serum composition (e.g. TP, bilirubin, cholesterol)
TCLo (Inhalation-Human) 50 mg/m³/2 hours: Sense Organs and Special Senses (Ear): change in acuity; Brain and Coverings: changes in surface EEG
TCLo (Inhalation-Human) 50 mg/m³/5 hours: Behavioral: changes in psychophysiological tests
TCLo (Inhalation-Human) 55 mg/m³/8 hours: Sense Organs and Special Senses (Eye): effect, not otherwise specified
TCLo (Inhalation-Human) 60 mg/m³/6 hours: Cardiac: pulse rate Brain and Coverings: changes in surface EEG
TCLo (Inhalation-Human) 80 mg/m³/3 hours: Sense Organs and Special Senses (Eye): effect, not otherwise specified; Behavioral: changes in psychophysiological tests; Behavioral: ataxia
TCLo (Inhalation-Human) 220 mg/m³/1 hour: Behavioral: headache
TCLo (Inhalation-Human) 220 mg/m³/3 hours: Behavioral: somnolence (general depressed activity)
TCLo (Inhalation-Human) 230 mg/m³/6 hours: Brain and Coverings: increased intracranial pressure; Behavioral: somnolence (general depressed activity)
TCLo (Inhalation-Human) 440 mg/m³/4 hours: Behavioral: headache; Gastrointestinal: nausea or vomiting
TCLo (Inhalation-Human) 440 mg/m³/1 hour: Behavioral: headache; Cardiac: pulse rate increase, without fall in BP
TCLo (Inhalation-Human) 460 mg/m³/4 hours: Behavioral: headache, somnolence (general depressed activity); Vascular: BP lowering not characterized in autonomic section
TCLo (Inhalation-Human) 660 mg/m³/2 hours: Gastrointestinal: nausea or vomiting

CARBON MONOXIDE (continued):

TCLo (Inhalation-Human) 660 mg/m³/4 hours: Behavioral: general anesthetic
TCLo (Inhalation-Human) 800 mg/m³/5 minutes: Behavioral: headache, somnolence (general depressed activity)
TCLo (Inhalation-Human) 800 mg/m³/20 minutes: Gastrointestinal: nausea or vomiting; Behavioral: muscle weakness
TCLo (Inhalation-Human) 800 mg/m³/3 hours: Cardiac: pulse rate increase, without fall in BP; Vascular: BP lowering not characterized in autonomic section
TCLo (Inhalation-Human) 880 mg/m³/2 hours: Behavioral: somnolence (general depressed activity), general anesthetic; Vascular: BP lowering not characterized in autonomic section
TCLo (Inhalation-Human) 880 mg/m³/4 hours: Behavioral: tetany, coma
TCLo (Inhalation-Human) 1260 mg/m³/90 minutes: Cardiac: pulse rate increase, without fall in BP; Behavioral: coma, tetany
TCLo (Inhalation-Human) 1300 mg/m³/2 hours: Gastrointestinal: nausea or vomiting; Cardiac: pulse rate increase, without fall in BP; Behavioral: headache
TCLo (Inhalation-Human) 1350 mg/m³/33 minutes: Cardiac: pulse rate increase, without fall in BP; Sense Organs and Special Senses (Eye): effect, not otherwise specified; Behavioral: alteration of classical conditioning
TCLo (Inhalation-Human) 1760 mg/m³/20 minutes: Behavioral: headache; Gastrointestinal: nausea or vomiting
TCLo (Inhalation-Human) 1760 mg/m³/2 hours: Behavioral: general anesthetic; Vascular: BP lowering not characterized in autonomic section
TCLo (Inhalation-Human) 1800 mg/m³/1 hour: Lungs, Thorax, or Respiration: respiratory depression; Cardiac: change in force of contraction
TCLo (Inhalation-Human) 2000 mg/m³/12 minutes: Behavioral: tetany, coma
TCLo (Inhalation-Human) 3000 mg/m³/1 hour
TCLo (Inhalation-Human) 2300 mg/m³/30 minutes: Behavioral: general anesthetic; Vascular: BP lowering not characterized in autonomic section
TCLo (Inhalation-Human) 3520 mg/m³/30 minutes: Behavioral: general anesthetic; Gastrointestinal: nausea or vomiting
TCLo (Inhalation-Human) 5000 mg/m³/17 minutes: Behavioral: general anesthetic, tetany
TCLo (Inhalation-Man) 650 ppm/45 minutes: Blood: methemoglobinemia-carboxyhemoglobin; Behavioral: changes in psychophysiological tests
TCLo (Inhalation-Rat) 2 pph/30 days-intermittent: Behavioral: somnolence (general depressed activity)
LC₅₀ (Inhalation-Rat) 1807 ppm/4 hours
LC₅₀ (Inhalation-Rat) 1900 mg/m³/4 hours
LC₅₀ (Inhalation-Rat) 13,500 mg/m³/15 minutes
LC₅₀ (Inhalation-Rat) 6600 ppm/30 minutes
LC₅₀ (Inhalation-Rat) 24,000 ppm/5 minutes: Lungs, Thorax, or Respiration: respiratory obstruction; Blood: other changes; Nutritional and Gross Metabolic: metabolic acidosis
LC₅₀ (Inhalation-Mouse) 2444 ppm/4 hours
LC₅₀ (Inhalation-Mouse) 2230 mg/m³/2 hours
METHANE:
LC₅₀ (Inhalation-Mouse) 326 gm/m³/2 hours
LC₅₀ (Inhalation-Mouse) 500,000 ppm/2 hours

CARCINOGENIC POTENTIAL OF COMPONENTS: The components of this gas mixture are listed by agencies tracking the carcinogenic potential of chemical compounds, as follows:

Hydrogen Sulfide: EPA-I (Data are Inadequate for an Assessment of Human Carcinogenic Potential);

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

The remaining components of this gas mixture are not found on the following lists: U.S. EPA, U.S. NTP, U.S. OSHA, U.S. NIOSH, GERMAN MAK, IARC, or ACGIH; 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 Hydrogen Sulfide, skin contact may cause irritation. Due to the presence of Sulfur Dioxide, eye contact may cause irritation. Contact with rapidly expanding gases can be irritating to exposed skin and eyes.

SENSITIZATION TO THE PRODUCT: No component of this product is known to cause human skin or respiratory sensitization.

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

Mutagenicity: The components of this gas mixture are not reported to cause mutagenic effects in humans. In the one animal study available, Carbon Monoxide gas increased chromosomal damage in blood cells of mice. The Sulfur Dioxide component is a mutagen based on animal information. Positive results have also been reported in limited studies in humans. In animals, dose-related significant increases in bone marrow micronuclei, chromosome aberrations and DNA damage were obtained in well-conducted studies in mice exposed by inhalation. Positive results have also been obtained in cultured mammalian cells, bacteria and yeast. Positive results (chromosome aberrations, sister chromatid exchanges, micronuclei) have been reported in cultured human lymphocytes (white blood cells) taken from workers exposed to sulfur dioxide over several years. In the one animal study available, Carbon Monoxide gas increased chromosomal damage in blood cells of mice.

Embryotoxicity: Severe acute exposures to the Carbon Monoxide component during pregnancy have caused adverse effects and death of the fetus. In general, maternal symptoms are an indicator of the potential risk to the fetus since Carbon Monoxide is toxic to the mother before it becomes toxic to the fetus. No specific human information on effects of chronic exposure to Carbon Monoxide during pregnancy. Animal studies suggest that repeated exposure to relatively high levels of Carbon Monoxide during pregnancy may cause developmental effects without causing maternal toxicity.

Teratogenicity: Severe acute exposures to the Carbon Monoxide component during pregnancy have caused adverse effects and death of the fetus. See above 'Embryotoxicity' for more information.

Reproductive Toxicity: The components of this gas mixture are not reported to cause reproductive effects in humans.

In addition, the following animal reproductive data are available for some components.

CARBON MONOXIDE:

TCLo (Inhalation-Rat) 75 ppm/24 hours: female 0-20 day(s) after conception: Reproductive: Maternal Effects: other effects; Effects on Newborn: behavioral
TCLo (Inhalation-Rat) 150 ppm/24 hours: female 1-22 day(s) after conception: Reproductive: Specific Developmental Abnormalities: cardiovascular (circulatory) system
TCLo (Inhalation-Rat) 1 mg/m³/24 hours: female 72 day(s) pre-mating: Reproductive: Maternal Effects: menstrual cycle changes or disorders, parturition; Fertility: female fertility index (e.g. # females pregnant per # sperm positive females; # females pregnant per # females mated)
TCLo (Inhalation-Rat) 150 ppm/24 hours: female 1-22 day(s) after conception: Reproductive: Effects on Newborn: growth statistics (e.g.%, reduced weight gain), behavioral
TCLo (Inhalation-Rat) 150 ppm/24 hours: female 0-20 day(s) after conception: Reproductive: Effects on Newborn: behavioral

CARBON MONOXIDE (continued):

TCLo (Inhalation-Rat) 75 ppm/24 hours: female 0-20 day(s) after conception: Reproductive: Specific Developmental Abnormalities: immune and reticuloendothelial system
TCLo (Inhalation-Rat) 150 ppm: female 0-20 day(s) after conception: Reproductive: Maternal Effects: other effects; Effects on Newborn: biochemical and metabolic, physical
TCLo (Inhalation-Rat) 103 mg/m³: female 1-22 day(s) after conception: Reproductive: Fertility: litter size (e.g. # fetuses per litter; measured before birth); Specific Developmental Abnormalities: cardiovascular (circulatory) system; Effects on Newborn: growth statistics (e.g.%, reduced weight gain)
TCLo (Inhalation-Rat) 150 ppm: female 1-20 day(s) after conception: Reproductive: Specific Developmental Abnormalities: Central Nervous System
TCLo (Inhalation-Mouse) 65 ppm: female 1-14 day(s) after conception: Reproductive: Effects on Newborn: viability index (e.g., # alive at day 4 per # born alive)

11. TOXICOLOGICAL INFORMATION (Continued)

REPRODUCTIVE TOXICITY INFORMATION (continued):

CARBON MONOXIDE (continued):

TCLo (Inhalation-Mouse) 500 ppm: female 7-18 day(s) after conception: Reproductive: Effects on Embryo or Fetus: fetotoxicity (except death, e.g., stunted fetus), fetal death
 TCLo (Inhalation-Mouse) 125 ppm: female 1-7 day(s) after conception: Reproductive: Effects on Newborn: live birth index (measured after birth), viability index (e.g., # alive at day 4 per # born alive)
 TCLo (Inhalation-Mouse) 65 ppm/24 hours: female 7-18 day(s) after conception: Reproductive: Effects on Newborn: behavioral
 TCLo (Inhalation-Mouse) 250 ppm/7 hours: female 6-15 day(s) after conception: Reproductive: Fertility: post-implantation mortality (e.g. dead and/or resorbed implants per total number of implants); Specific Developmental Abnormalities: musculoskeletal system

CARBON MONOXIDE (continued):

TCLo (Inhalation-Mouse) 125 ppm/24 hours: female 7-18 day(s) after conception: Reproductive: Effects on Embryo or Fetus: fetotoxicity (except death, e.g., stunted fetus)
 TCLo (Inhalation-Mouse) 8 pph/1 hour: female 8 day(s) after conception: Reproductive: Fertility: litter size (e.g. # fetuses per litter; measured before birth); Effects on Embryo or Fetus: fetotoxicity (except death, e.g., stunted fetus), fetal death
 TCLo (Inhalation-Mouse) 8 pph/1 hour: female 8 day(s) after conception: Reproductive: Specific Developmental Abnormalities: Central Nervous System
 TCLo (Inhalation-Mouse) 103 mg/m³: female 1-21 day(s) after conception: Reproductive: Fertility: litter size (e.g. # fetuses per litter; measured before birth); Specific Developmental Abnormalities: cardiovascular (circulatory) system; Effects on Newborn: growth statistics (e.g.%, reduced weight gain)

BIOLOGICAL EXPOSURE INDICES (BEIs): Currently, the following Biological Exposure Indices (BEIs) have been determined for the Carbon Monoxide component of this gas mixture.

CHEMICAL: DETERMINANT	SAMPLING TIME	BEI
Carbon Monoxide Carboxyhemoglobin in blood Carboxyhemoglobin in end-exhaled air	End of shift End of shift	3.5% of Hemoglobin 20 ppm

12. ECOLOGICAL INFORMATION

MOBILITY: Nitrogen is inert and does not present a hazard of mobility. Anhydrous Hydrogen Sulfide has a boiling point of 60.3°C at 1 atm. Consequently, when it is spilled onto soil, much will evaporate. However, since it is very soluble in water, the presence of water in soil or falling as precipitation at the time of the spill may contribute to movement in the soil. If the soil surface is saturated with moisture at the time of the spill as might be the case after a rainfall, the spill chemical will runoff and/or evaporate away. If released to soil, methane is expected to volatilize from soil (both moist and dry) based upon its vapor pressure and an estimated Henry's Law constant of 0.66 atm-cu m/mole. Methane will have high mobility based upon an estimated Koc of 90. Utilization of methane by soil microorganisms has been detected from soil samples. Sulfur dioxide uptake is dependent upon soil pH and moisture content.

POTENTIAL TO BIOACCUMULATE: The Nitrogen component of this gas mixture will not bioaccumulate. The Hydrogen Sulfide component does not have bioaccumulation or food chain contamination potential. An estimated BCF of 1 was calculated for Methane, using a log Kow of 1.09 and a regression-derived equation. According to a classification scheme, this BCF suggests the potential for bioconcentration in aquatic organisms is low.

PERSISTENCE AND BIODEGRADABILITY:

Persistence: Nitrogen is a natural element and presents no hazard of persistence. Methane, when released to air, a vapor pressure of 4.7X10⁵ mm Hg at 25°C indicates Methane will exist solely in the gas phase in the ambient atmosphere. Gas-phase Methane will be very slowly degraded in the atmosphere by reaction with photochemically-produced hydroxyl radicals; the half-life for this reaction in air is estimated to be about 6 years. If released into water, volatilization from water surfaces is expected to be the dominant fate process based upon this compound's estimated Henry's Law constant. Estimated volatilization half-lives for a model river and model lake are both 2 hrs. Methane is not expected to adsorb to suspended solids and sediment based upon the estimated Koc. The lifetime of the Hydrogen Sulfide component is affected by ambient temperature and other atmospheric variables including humidity, sunshine, and presence of other pollutants. Once released into the atmosphere, Hydrogen Sulfide will behave like many other gaseous pollutants and be dispersed and eventually removed. Residence times in the atmosphere range from about one day to more than 40 days, depending upon season, latitude, and atmospheric conditions. The oxidation of Sulfur Dioxide to sulfuric acid and sulfates in the atmosphere is important with regard to air pollution studies. Radicals, e.g. hydrogen monoxide, water, and carboxylic acid, appear to be the principal species responsible for the homogeneous oxidation of Sulfur Dioxide in the atmosphere, which occurs at rates as high as 4.0%/hr.

Biodegradation: Nitrogen does not biodegrade. Microorganisms in soil and water are involved in oxidation-reduction reactions which oxidize the Hydrogen Sulfide component to elemental sulfur. Members of the genera Beggiatoa, Thioploca, and Thiotrix function in transition zones between aerobic and anaerobic conditions where both molecular oxygen and Hydrogen Sulfide are found. Also some photosynthetic bacteria oxidize Hydrogen Sulfide to elemental sulfur. Members of the families Chlorobiaceae and Chromatiaceae (purple sulfur bacteria) are obligate aerobes and are phototropic, and are found in waters with high H₂S concentrations. The interactions of these organisms form part of the global sulfur cycle. The biodegradation half life of Methane was estimated to range from 70 days to infinity based on gas exchange biodegradation experiments conducted in model estuarine ecosystems. Hydrolysis is not expected to be an important environmental fate process since methane lacks functional groups that hydrolyze under environmental conditions.

OZONE-DEPLETION POTENTIAL: Components are not Class I or Class II ozone depleting chemicals (40 CFR Part 82). A photochemical model was used to quantify the sensitivity of the tropospheric oxidants Ozone (O₃) and Hydroxide Ion (OH⁻) to changes in Methane (CH₄), Carbon Monoxide (CO), and Nitric Oxide (NO) emissions and to perturbations in climate and stratospheric chemistry. In most cases, increased CH₄ and CO emissions will suppress OH⁻ (negative coefficients) in increased O₃ (positive coefficients) except in areas where NO and O₃ influenced by pollution are sufficient to increase OH⁻. In most regions, NO, CO, and CH₄ emission increase will suppress OH⁻ and increase O₃, but these trends may be opposed by stratospheric O₃ depletion and climate change.

ECOTOXICITY: Due to the presence of Hydrogen Sulfide in this mixture, release near an aquatic environment may cause harm. The following aquatic toxicity data are currently available for Hydrogen Sulfide:

HYDROGEN SULFIDE:

LC₅₀ (Fly inhalation) > 960 minutes = 380 mg/cu m
 LC₅₀ (Fly inhalation) 7 minutes = 1500 mg/cum
 TLM (*Asellus sp*) 96 hours = 0.111 mg/L/Conditions of bioassay not specified
 TLM (*Crangonyx sp*) 96 hours = 1.07 mg/L/Conditions of bioassay not specified
 TLM (*Gammarus sp*) 96 hours = 0.84 mg/L/Conditions of bioassay not specified
 TLM (*Lepomis macrochirus* bluegill sunfish eggs) 72 hours = 0.0190 mg/L at 21-22°C in a flow through bioassay
 TLM (*Lepomis macrochirus* bluegill sunfish) 96 hours = 35 day old fry 0.0131 mg/L at 21-22°C in a flow through bioassay

HYDROGEN SULFIDE (continued):

TLM (*Lepomis macrochirus* bluegill sunfish) 96 hours = juveniles 0.0478 mg/L at 21-22°C in a flow through bioassay
 TLM (*Lepomis macrochirus* bluegill sunfish adults) 96 hours = 0.0448 mg/L at 21-22°C in a flow through bioassay
 TLM (*Pimephales promelas* fathead minnow) 96 hours = 0.0071-0.55 mg/L at 6-24°C in a flow through bioassay
 TLM (*Salvelinus fontinalis* brook trout) 96 hours = 0.0216-0.038 mg/L at 8-12.5°C in a flow through bioassay

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.

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

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.

U.S. EPA WASTE NUMBER: Not applicable.

EUROPEAN (EWC) WASTE CODES: 16 05 05: Gases in pressure containers other than those mentioned in 16 05 04.

14. TRANSPORTATION INFORMATION

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

UN IDENTIFICATION NUMBER: UN 1956
PROPER SHIPPING NAME: Compressed gases, n.o.s. (Nitrogen, Oxygen, Methane)
HAZARD CLASS NUMBER and DESCRIPTION: 2.2 (Non-Flammable Gas)
PACKING GROUP: Not applicable.
DOT LABEL(S) REQUIRED: Class 2.2 (Non-Flammable Gas)
NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2008): 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 is classified as Dangerous Goods, per regulations of Transport Canada.

UN IDENTIFICATION NUMBER: UN 1956
PROPER SHIPPING NAME: Compressed gases, n.o.s. (Nitrogen, Oxygen, Methane)
HAZARD CLASS NUMBER and DESCRIPTION: 2.2 (Non-Flammable Gas)
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 (2004): 126

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).

INTERNATIONAL AIR TRANSPORT ASSOCIATION SHIPPING INFORMATION (IATA): This gas mixture is classified as Dangerous Goods, per the International Air Transport Association.

UN IDENTIFICATION NUMBER: UN 1956
PROPER SHIPPING NAME: Compressed gases, n.o.s. (Nitrogen, Oxygen, Methane)
HAZARD CLASS NUMBER and DESCRIPTION: 2.2 (Non-Flammable Gas)
HAZARD LABEL(S) REQUIRED: Class 2.2 (Non-Flammable Gas)
PACKING GROUP: None

PASSENGER & CARGO AIRCRAFT LIMITED QUANTITY PACKING INSTRUCTION: Forbidden

PASSENGER & CARGO AIRCRAFT LIMITED QUANTITY MAXIMUM NET QUANTITY/PKG: Forbidden

PASSENGER & CARGO AIRCRAFT PACKING INSTRUCTION: 200

PASSENGER & CARGO AIRCRAFT MAXIMUM NET QUANTITY/PKG: 75 kg

CARGO AIRCRAFT ONLY PACKING INSTRUCTION: 200

CARGO AIRCRAFT ONLY MAXIMUM NET QUANTITY/PKG: 150 kg

SPECIAL PROVISIONS: None

ERG CODE: 2L

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

UN No.: 1956
PROPER SHIPPING NAME: Compressed gases, n.o.s. (Nitrogen, Oxygen, Methane)
HAZARD CLASS NUMBER: 2.2 (Non-Flammable Gas)
LABELS: Class 2.3 2.2 (Non-Flammable Gas)
PACKING GROUP: None
SPECIAL PROVISIONS: None
LIMITED QUANTITIES: 120 mL
EXCEPTED QUANTITIES: E1
PACKING: Instructions: P200; Provisions: None
IBCs: Instructions: None; Provisions: None
TANKS: Instructions: None; Provisions: None
EmS: F-C, S-V

STOWAGE CATEGORY: Category A.

MARINE POLLUTANT: Nitric Oxide does not meet the criteria of 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.: 1956
PROPER SHIPPING NAME: Compressed gases, n.o.s. (Nitrogen, Oxygen, Methane)
CLASS: 2
CLASSIFICATION CODE: 1A
PACKING GROUP: None
LABELS: 2.2
SPECIAL PROVISIONS: 274, 292, 567
LIMITED QUANTITIES: LQ1
EXCEPTED QUANTITIES: E1
PACKING INSTRUCTIONS: P002
SPECIAL PACKING INSTRUCTIONS: None
MIXED PACKING PROVISIONS: MP9
PORTABLE TANK and BULK CONTAINER: Instructions: (M); Special Provisions: None
HAZARD IDENTIFICATION No.: 20

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

ENVIRONMENTAL HAZARDS: This gas mixture 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).

COMPOUND	SARA 302 (40 CFR 355, Appendix A)	SARA 304 (40 CFR Table 302.4)	SARA 313 (40 CFR 372.65)
Hydrogen Sulfide	Yes	Yes	Stayed Chemical
Sulfur Dioxide	Yes	Yes	No

U.S. SARA 302 EXTREMELY HAZARDOUS THRESHOLD PLANNING QUANTITY (TPQ): Hydrogen Sulfide = 500 lb (227 kg); Sulfur Dioxide = 500 lb (227 kg)

U.S. SARA 304 EXTREMELY HAZARDOUS REPORTABLE QUANTITY (RQ): Hydrogen Sulfide = 100 lb (45.4 kg); Sulfur Dioxide = 500 lb (227 kg)

U.S. CERCLA REPORTABLE QUANTITY (RQ): Hydrogen Sulfide = 100 lb (45.4 kg). Sulfur Dioxide is an extremely hazardous substance (EHS) subject to reporting requirements when stored in amounts in excess of its threshold planning quantity (TPQ) of 500 lbs.

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

U.S. EPA CLEAN WATER ACT SECTIONS 301, 307, AND 311: Code of Federal Regulations 40 CFR 116 & 117 (01 Jul 2002). Under the provisions of Section 311 of the Clean Water Act, Hydrogen Sulfide is designated a hazardous substance if discharged in navigable waters. The Reportable Quantity (RQ) for notification is 100 lb (45.4 kg).

U.S. EPA LIST OF REGULATED TOXIC SUBSTANCES AND THRESHOLD QUANTITIES FOR ACCIDENTAL RELEASE PREVENTION- Table 1 to §68.130: Under this regulation, the Threshold Quantity (TQ) for Hydrogen Sulfide is 10,000 lb (4540 kg). The basis for listing is a) mandated by Congress and b) the gas is on the EHS list with a vapor pressure of 10 mmHg or greater.

U.S. EPA REGULATED SUBSTANCES, PER 40 CFR, PART 68, OF THE RISK MANAGEMENT FOR CHEMICAL RELEASES CLEAN AIR ACT SECTION 112(r)- Table 3 to §68.130: Methane is listed under this regulation in Table 3 as a Regulated Substance (Flammable Substance), in quantities of 10,000 lb (4,540 kg) or greater.

U.S. OSHA HIGHLY HAZARDOUS CHEMICALS (HHCS): Code of Federal Regulations (CFR) v.29 Part 1910, Section 1910.119, July 1, 1997. The Hydrogen Sulfide component has a reportable quantity under this regulation of 1500 lb (681 kg).

OTHER U.S. FEDERAL REGULATIONS:

• This gas mixture does not contain any Class I or Class II ozone depleting chemicals (40 CFR part 82).

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): The Carbon Monoxide component of this gas mixture is on the California Proposition 65 lists. WARNING! This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.

ADDITIONAL CANADIAN REGULATIONS:

CANADIAN DSL/NDL 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 on the CEPA Priorities Substances Lists, as follows:

Carbon Monoxide: This is a National Pollutant Release Inventory (NPRI) substance for 2007. Information about this substance must be reported to the Minister of the Environment in accordance with subsection 46(1) of the Canadian Environmental Protection Act, 1999. This substance is listed under PART 4, CRITERIA AIR CONTAMINANTS CACs).

Hydrogen Sulfide: This is a National Pollutant Release Inventory (NPRI) substance for 2007. Information about this substance must be reported to the Minister of the Environment in accordance with subsection 46(1) of the Canadian Environmental Protection Act, 1999. This substance is listed under PART 1, GROUP 1 SUBSTANCES.

GREENHOUSE GASES KYOTO PROTOCOL: Not applicable.

CANADIAN WHMIS REGULATIONS: This gas mixture is categorized as a Controlled Product, Hazard Classes A, D2A and D2B, as per the Controlled Product Regulations.

CANADIAN WHMIS CLASSIFICATION AND SYMBOLS: Class A: Compressed Gas; Class D2B: Poisonous and Infectious Material: Other toxic effects



16. OTHER INFORMATION

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

Classification: Gases Under Pressure, Acute Inhalation Toxicity Category 4, Eye Irritation Category 2, Skin Irritation Category 2, Specific Target Organ Toxicity Inhalation-Eyes Repeated Exposure Category 2, Specific Target Organ Toxicity Inhalation-Respiratory System Single Exposure Category 3, Reproductive Toxicity Category 1A

Signal Words: Danger

Hazard Statements: H280: Contains gas under pressure; may explode if heated. H332: Harmful if inhaled. H319: Causes serious eye irritation. H335: May cause respiratory irritation. H315: Causes skin irritation. H360D: May damage the unborn child. H372: Causes damages to organs (fetus, central and peripheral nervous systems, eyes) through prolonged or repeated exposure.

Prevention Statements:

Precautionary: P201: Obtain special instructions before use. P202: Do not handle until all safety precautions have been read and understood. P261: Avoid breathing mists, sprays, fume. P264: Wash thoroughly after handling. P271: Use only outdoors or in a well-ventilated area. P280: Wear protective gloves/protective clothing/eye protection/face protection.

Response: P304 + P340: If inhaled, remove victim to fresh air and keep at rest in a position comfortable for breathing. P312: Call a POISON CENTER or doctor/physician if you feel unwell. P305 + P351 + P338 + P310: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. P337 + P313: If eye irritation persists: get medical advice/attention. P302 + P352: IF ON SKIN: Wash with plenty of soap and water. P321: Specific treatment (remove from exposure and treat symptoms). P332 + P313: If skin irritation occurs, get medical attention. P362: Take off all contaminated clothing and wash before reuse. P308 + P313: IF exposed or concerned: Get medical advice/attention. P314: Get medical advice/attention if you feel unwell.

Storage: 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: GHS03, GHS04, GHS06, GHS09

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

Classification: Toxic, Irritant

Risk Phrases: R20: Harmful by inhalation. R36/37/38: Irritating to eyes, respiratory system and skin. R61: May cause harm to the unborn child.

Safety Phrases: S(1/2*): Keep locked up and out of the reach of children *This safety phrase can be omitted from the label when the substance or preparation is sold for industrial use only. S45: In case of accident or if you feel unwell seek medical advice immediately (show the label where possible). S53: Avoid exposure - obtain special instructions before use.

Hazard Symbol: T, Xi

16. OTHER INFORMATION (Continued)

CLASSIFICATION OF COMPONENTS:

CLP Regulation (EC) 1272/2008

Sulfur Dioxide: This is published classification.

Classification: Gas under Pressure, Acute Inhalation Toxicity Category 3, Skin Corrosion Category 1 B

Signal Word: Danger

Hazard Statements: H280: Contains gas under pressure; may explode if heated. H331: Toxic if inhaled. H314: Causes severe skin burns and eye damage.

Hazard Symbol: GHS04, GHS06, GHS05

Carbon Monoxide: This is a published classification.

Classification: Flammable Gas Category 1, Gas Under Pressure, Reproductive Toxicity Category 1A, Acute Inhalation Toxicity Category 3, Specific Target Organ Toxicity Single Exposure Chemical Asphyxiation Cat. 1

Signal Word: Danger

Hazard Statements: H220: Extremely flammable gas. H280: Contains gas under pressure; may explode if heated. H331: Toxic if inhaled. H360D: May damage the unborn child. H372: Causes damages to organs (eyes) through prolonged or repeated exposure.

Hazard Symbol: GHS02, GHS04, GHS06, GHS08

Hydrogen Sulfide: This is a published classification.

Classification: Flammable Gas Category 1, Gas under Pressure, Acute Inhalation Toxicity Category 1, Aquatic Acute Toxicity Category 1

Signal Word: Danger

Hazard Statements: H220: Extremely flammable gas. H280: Contains gas under pressure; may explode if heated. H330: Fatal if inhaled. H400: Very toxic to aquatic life.

Hazard Symbol: GHS02, GHS04, GHS06, GHS09

Methane: This is a published classification.

Classification: Flammable Gas Category 1, Gas Under Pressure

Signal Word: Danger

Hazard Statements: H220: Extremely flammable gas. H280: Contains gas under pressure; may explode if heated.

Hazard Symbol: GHS02, GHS03

Nitrogen: This is a published classification.

Classification: Gas Under Pressure

Signal Word: Danger

Hazard Statements: H280: Contains gas under pressure; may explode if heated.

Hazard Symbol: GHS04

Oxygen: This is a published classification.

Classification: Oxidizing Gas Category 1, Gas Under Pressure

Signal Word: Danger

Hazard Statements: H270: May cause or intensify fire; oxidiser. H280: Contains gas under pressure; may explode if heated.

Hazard Symbol: GHS03

67/548/EEC:

Carbon Monoxide: This is a published classification.

Hazard Classification: Extremely Flammable, Toxic, Reproductive Toxicity Category 1

Risk Phrases: R12: Extremely Flammable. R23: Toxic by inhalation. R48/23: Toxic: danger of serious damage to health by prolonged exposure through inhalation. R61: May cause harm to the unborn child.

Symbol: F+, T

Hydrogen Sulfide: This is a published classification.

Hazard Classification: Extremely Flammable, Toxic, Dangerous for the Environment

Risk Phrases: R12: Extremely Flammable. R26: Very toxic by inhalation. R50: Very toxic to aquatic organisms.

Symbol: F+, T, N

Methane: This is a published classification.

Hazard Classification: Extremely Flammable

Risk Phrases: R12: Extremely Flammable.

Symbol: F+

Oxygen: This is a published classification.

Hazard Classification: Oxidizer

Risk Phrases: R8: Contact with combustible material may cause fire.

Symbol: O

Nitrogen:

Hazard Classification: None

Risk Phrases: None

Symbol: None

Sulfur Dioxide: This is a published classification.

Hazard Classification: Toxic, Corrosive

Risk Phrases: R23: Toxic by inhalation. R34: Causes burns.

Symbol: 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 the handling of compressed gases can be found in the following pamphlets published by: Compressed Gas Association Inc. (CGA), 421 Walney Road, 5th Floor, Chantilly, VA 20151. Telephone: (703) 788-2700, Fax: (703) 961-1831.

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



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 Calgas' 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.