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 a Nitrogen Balance Gas:
- Oxygen, 0.0015-23.5%;
- Propane, 0-1.1%;
- n-Pentane, 0-0.75%;
- n-Hexane, 0-0.48%;
- Carbon Monoxide, 0.0005-1.0%;
- Hydrogen Sulfide, 0.001-0.025%

NOTE: MIXTURES COMPRISED OF AN AIR BALANCE GAS CONTAIN BETWEEN 19.5-23.5% OXYGEN.

SYNONYMS: Not Applicable

CHEMICAL FAMILY NAME: Not Applicable

FORMULA: Not Applicable

Document Number: 50016 (Replaces ISC MSDS No. 1810-2187, 1810-2343, 1810-3366, 1810-3937 1810-7219, 1810-7599, 1810-6179)

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

<table>
<thead>
<tr>
<th>CHEMICAL NAME</th>
<th>CAS #</th>
<th>mole %</th>
<th>ACGIHTLV TWA ppm</th>
<th>IDLH ppm</th>
<th>OTHER ppm</th>
<th>OSHA TWA ppm</th>
<th>STEL ppm</th>
<th>EXPOSURE LIMITS IN AIR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxygen</td>
<td>7782-44-7</td>
<td>0.0015 - 23.5%</td>
<td>2500 NE</td>
<td>1000 NE</td>
<td>2100</td>
<td>There are no specific exposure limits for Oxygen. Oxygen levels should be maintained above 19.5%.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Propane</td>
<td>74-98-6</td>
<td>0 - 1.1%</td>
<td>600 750</td>
<td>1900</td>
<td>1500</td>
<td>750 (Vacated 1989 PEL)</td>
<td>1000 DFG MAK; 1000 ppm</td>
<td></td>
</tr>
<tr>
<td>n-Pentane</td>
<td>109-66-0</td>
<td>0 - 0.75%</td>
<td>500 500 (Vacated 1989 PEL)</td>
<td>50</td>
<td>35</td>
<td>20 (ceiling) 50 (10 min. peak, once per shift)</td>
<td>15 (Vacated 1989 PEL)</td>
<td>100</td>
</tr>
<tr>
<td>n-Hexane</td>
<td>110-54-3</td>
<td>0 - 0.48%</td>
<td>50 NE</td>
<td>500 NE</td>
<td>1100</td>
<td>50 (Vacated 1989 PEL)</td>
<td>50 DFG MAK 50</td>
<td></td>
</tr>
<tr>
<td>Hydrogen Sulfide</td>
<td>7783-06-4</td>
<td>0.001-0.025 %</td>
<td>10 NIC = 5</td>
<td>15 NIC = 5</td>
<td>10 (Vacated 1989 PEL)</td>
<td>20 (ceiling) 50 (10 min. peak, once per shift)</td>
<td>15 (Vacated 1989 PEL)</td>
<td>100</td>
</tr>
<tr>
<td>Carbon Monoxide</td>
<td>630-08-0</td>
<td>0.0005 - 1.0%</td>
<td>25 NE</td>
<td>50 35 (Vacated 1989 PEL)</td>
<td>200 (ceiling) (Vacated 1989 PEL)</td>
<td>1200</td>
<td>NIOSH RELs: TWA = 35 STEL = 200 ceiling DFG MAKs: TWA = 30 PEAK = 24MAK, 1 min., average value, 1 hr interval DFG MAK Pregnancy Risk Classification: B</td>
<td></td>
</tr>
<tr>
<td>Nitrogen</td>
<td>7727-37-9</td>
<td>Balance</td>
<td>There are no specific exposure limits for Nitrogen. Nitrogen is a simple asphyxiant (SA). Oxygen levels should be maintained above 19.5%.</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

NE = Not Established. NIC = Notice of Intended Change See Section 16 for Definitions of Terms Used.

NOTE: 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.
EMERGENCY OVERVIEW: This gas mixture is a colorless gas which has a rotten-egg odor (due to the presence of Hydrogen Sulfide). The odor cannot be relied on as an adequate warning of the presence of this gas mixture, because olfactory fatigue occurs after over-exposure to Hydrogen Sulfide. Hydrogen Sulfide and Carbon Monoxide (another component of this gas mixture) are toxic to humans in relatively low concentrations. Over-exposure to this gas mixture can cause skin or eye irritation, nausea, dizziness, headaches, collapse and unconsciousness, coma, and death. The Propane, n-Pentane, and n-Hexane components can cause anesthetic or peripheral neuropathy effects. Additionally, releases of this gas mixture may produce oxygen-deficient atmospheres (especially in small confined spaces or other poorly-ventilated environments); individuals in such atmospheres may be asphyxiated.

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. A slight health hazard associated with this gas mixture is the potential of inhalation of Hydrogen Sulfide, a component of this gas mixture. Such over-exposures may occur if this gas mixture is used in a confined space or other poorly-ventilated area. Over-exposures to Hydrogen Sulfide can cause dizziness, headache, and nausea. Exposure to this component can result in respiratory arrest, coma, or unconsciousness. Continuous inhalation of low concentrations of Hydrogen Sulfide may cause olfactory fatigue, so that the odor is no longer an effective warning of the presence of this gas. A summary of exposure concentrations and observed effects are as follows

CONCENTRATION OF HYDROGEN SULFIDE | OBSERVED EFFECT
--- | ---
0-3.3 ppm | Odor is obvious and unpleasant.
50 ppm | Eye irritation. Dryness and irritation of nose, throat.
Slightly higher than 50 ppm | Irritation of the respiratory system.
100-150 ppm | Temporary loss of smell.
200-250 ppm | Headache, vomiting nausea. Prolonged exposure may lead to lung damage. Exposures of 4-8 hours can be fatal.
300-500 ppm | Sudden onset of symptoms. Death occurs in 1-4 hours.
500 ppm | Headache, excitement, staggering, and stomach ache after brief exposure. Death occurs within 0.5 - 1 hour of exposure.
> 600 ppm | Rapid onset of unconsciousness, coma, death.
> 1000 ppm | Immediate respiratory arrest.

NOTE: This gas mixture contains a maximum of 250 ppm Hydrogen Sulfide. The higher concentration values here are presented to delineate the complete health effects which have been observed for humans after exposure to Hydrogen Sulfide.

Inhalation over-exposures to atmospheres containing more than the Threshold Limit Value of Carbon Monoxide (25 ppm), another component of this gas mixture, 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 the available oxygen. Through this replacement, the body is deprived of the required oxygen, and asphyxiation occurs.

Since the affinity of Carbon Monoxide for hemoglobin is about 200-300 times that of oxygen, only a small amount of Carbon Monoxide will cause a toxic reaction to occur. Carbon Monoxide exposures in excess of 50 ppm will produce symptoms of poisoning if breathed for a sufficiently long time. If this gas mixture is released in a small, poorly ventilated area (i.e. an enclosed or confined space), an oxygen-deficient environment may occur. Individuals breathing such an atmosphere may experience symptoms which include:

- Temporary loss of smell.
- Slight symptoms (i.e. headache) after several hours of exposure.
- Headache and discomfort experienced within 2-3 hours of exposure.
- Potential for collapse and death before warning symptoms.
- Within 30 minutes, slight palpitations of the heart occurs. Within 1.5 hours, there is a tendency to stagger.
- Within 2-250 ppm: Within 2 hours, there is mental confusion, headaches, and nausea. Unconsciousness within 30 minutes.
- > 250 ppm: Potential for collapse and death before warning symptoms.

Another hazard associated with this gas mixture is the potential for anesthetic and peripheral neuropathy effects after inhalation over-exposures to the Propane, n-Pentane and n-Hexane components of this gas mixture. Specific human over-exposure data are available for n-Pentane and n-Hexane, as follows:

CONCENTRATION OF n-PENTANE | OBSERVED EFFECT
--- | ---
Brief (10 minutes) up to 5,000 ppm: | No symptoms.
Higher than 5,000 ppm: | Exhalation, dizziness and headache can occur.
Long term: | Can cause chronic neurological disorder causing damage to the nerves in the hands and feet (peripheral neuropathy)

CONCENTRATION OF n-HEXANE | OBSERVED EFFECT
--- | ---
Brief (10 minutes) at 1,500 ppm: | Irritation of the respiratory tract, nausea and headache.
5000 ppm: | Dizziness and drowsiness can occur.
Long term at 500 ppm: | Can affect the nerves in the arms and legs. Effects include numbness or tingling sensations in the fingers and toes, tiredness, muscle weakness, cramps and spasms in the leg, difficulty in holding objects or walking, abdominal pains, loss of appetite, weight loss. More serious exposures can cause damage to the nerves in the hands and feet (peripheral neuropathy).

Eyes and Vision: Abnormal color perception and pigment changes in the eyes have been reported among industrial workers exposed to 423-1280 ppm for 5 years or more.

Blood Cells: Mild forms of anemia have also been associated with exposure to hexane. These are of temporary nature.

Additionally, if mixtures of this gas mixture contain less than 19.5% Oxygen and are released in a small, poorly ventilated area (i.e. an enclosed or confined space), an oxygen-deficient environment may occur. Individuals breathing such an atmosphere may experience symptoms which include headaches, ringing in ears, weakness, dizziness, unconsciousness, nausea, vomiting, and depression of all the senses. Under some circumstances of over-exposure, death may occur. The following effects associated with various levels of oxygen are as follows:

CONCENTRATION OF OXYGEN | OBSERVED EFFECT
--- | ---
12-16% Oxygen: | Emotional upset, abnormal fatigue, disturbed respiration.
10-14% Oxygen: | Nausea, vomiting, collapse, or loss of consciousness.
6-10% Oxygen: | Convulsive movements, possible respiratory collapse, and death.
Below 6%: | The Oxygen Sulfide component of this gas mixture may be irritating to the skin. Inflammation and irritation of the eyes can occur at very low airborne concentration of Hydrogen Sulfide (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 of Hydrogen Sulfide, there is an intense tearing, blurring of vision, and vision when looking at light. Over-exposed individuals may see rings around bright lights. 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: 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. However, the Hydrogen Sulfide and Carbon Monoxide components of this gas mixture are toxic to humans. Over-exposure to this gas mixture can cause nausea, dizziness, headaches, collapse, unconsciousness, coma, and death. Due to the presence of Hydrogen Sulfide, over-exposures to this gas mixture can also irritate the skin and eyes; severe eye contamination can result in blindness.

Inhalation over-exposures to Propane, n-Pentane, and n-Hexane can cause anesthetic effects and motor neuropathy (i.e. pain and tingling in feet and hands).
4. FIRST-AID MEASURES

RESCUE more patients to medical attention. 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 supplement the gas mixture. Therefore, the gas mixture is not flammable. Cylinders should be stored in dry, well-ventilated areas, away from sources of heat, ignition, and direct sunlight. Protect cylinders against physical damage. No special respiratory protection is required under normal circumstances of use. As with all chemicals, use this gas mixture in well-ventilated areas. If respiratory protection is required for emergency response to this gas mixture, follow the requirements of the Federal OSHA Respiratory Protection Standard (29 CFR 1910.134) or equivalent State standards. The following NIOSH respiratory protection recommendations for Hydrogen Sulfide and Carbon Monoxide are provided for further information.

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 Hydrogen Sulfide and Carbon Monoxide, the toxic components 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, the affected area, protect people, and respond with trained personnel.

For emergency disposal, secure the cylinder and slowly discharge the gas to the atmosphere in a well-ventilated area or outdoors. Allow the gas mixture to dissipate. If necessary, monitor the surrounding area (and the original area of the release) for Hydrogen Sulfide, Carbon Monoxide, and Oxygen. Hydrogen Sulfide and Carbon Monoxide level must be below exposure level listed in Section 2 (Composition and Information on Ingredients) and 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.

7. HANDLING AND USE

WORK PRACTICES AND HYGIENE PRACTICES: Be aware of any signs of dizziness or fatigue; exposures to fatal concentrations of this gas mixture can occur without any significant warning symptoms, due to olfactory fatigue or oxygen deficiency. Do not attempt to repair, adjust, or in any other way modify cylinders containing a gas mixture with Hydrogen Sulfide or Carbon Monoxide. If there is a malfunction or another type of operational problem, contact nearest distributor immediately. Eye wash stations/safety showers should be near areas where this gas mixture is used or stored. All personnel should be monitored for such a way that emergency personnel can be immediately contacted in the event of a release. All work practices should minimize releases of Hydrogen Sulfide and Carbon Monoxide-containing gas mixtures.

STORAGE AND HANDLING PRACTICES: Cylinders should be firmly secured to prevent falling or being knocked-over. Cylinders must be protected from the weather and preferably kept at room temperature (approx. 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: CAUTION! Compressed gases can present significant safety hazards. During cylinder use, use equipment designed for their 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 respiratory protection is used in a poorly-ventilated area, install automatic monitoring equipment to detect the levels of Oxygen, Hydrogen Sulfide, and Carbon Monoxide.

RESPIRATORY PROTECTION: No special respiratory protection is required under normal circumstances of use. Use supplied air respiratory protection if Carbon Monoxide levels exceed the exposure levels given in Section 2 (Composition and Information on Ingredients) or if oxygen levels are below 19.5%, or if either level is unknown during emergency response to a release of this gas mixture. If respiratory protection is required for emergency response to this gas mixture, follow the requirements of the Federal OSHA Respiratory Protection Standard (29 CFR 1910.134) or equivalent State standards. The following NIOSH respiratory protection recommendations for Hydrogen Sulfide and Carbon Monoxide are provided for further information.
5. 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 lb/ft³ (1.153 kg/m³)

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

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

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

MOLECULAR WEIGHT: 28.01

EVAPORATION RATE (nBuAc = 1): Not applicable.

ODOR THRESHOLD: Not applicable.

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 AND COLOR: This gas mixture is a colorless gas which has an rotten egg-like odor, due to the presence of Hydrogen Sulfide.

HOW TO DETECT THIS SUBSTANCE (warning properties): Continuous inhalation of low concentrations of Hydrogen Sulfide (a component of this gas mixture) may cause olfactory fatigue, so that there are no distinct warning properties. 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 be used for leak detection. The paper turns black in the presence of Hydrogen Sulfide. Cadmium chloride solutions can also be used. Cadmium solutions will turn yellow upon contact with Hydrogen Sulfide.

10. STABILITY and REACTIVITY

STABILITY: Normally stable in gaseous state.

DECOMPOSITION PRODUCTS: The thermal decomposition products of Propane, n-Hexane, and n-Pentane include carbon oxides. The decomposition products of Hydrogen Sulfide include water and sulfur oxides. The other 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 THIS SUBSTANCE IS INCOMPATIBLE: Titanium will burn in Nitrogen (the main component of this gas mixture). Lithium reacts slowly with Nitrogen at ambient temperatures. Components of this gas mixture (Hydrogen Sulfide, Propane, n-Pentane, n-Hexane) are also incompatible with strong oxidizers (i.e. chlorine, bromine pentfluoride, oxygen, oxygen difluoride, and nitrogen trifluoride). Carbon Monoxide is mildly corrosive to nickel and iron (especially at high temperatures and pressures). Hydrogen Sulfide is corrosive to most metals, because it reacts with these substances to form metal sulfides.

HAZARDOUS POLYMORIZATION: 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 toxicity data are available for the components of this gas mixture:

NITROGEN: There are no specific toxicity data for Nitrogen. Nitrogen is a simple asphyxiant, which acts to displace oxygen in the atmosphere.

n-PENTANE: LD₅₀ (intravenous, mouse) = 445 mg/kg; LC₅₀ (inhalation, rat) = 364 mg/150 hours; LC₅₀ (inhalation, mouse) = 325 g/m³/2 hours

n-HEXANE: Eye, rabbit = 10 mg/ mild

TCL₀ (inhalation, rat) = 10,000 ppm/7 hr.

LD₅₀ (oral, rat) = 28710 mg/kg

LD₅₀ (intraperitoneal, rat) = 9100 mg/kg

LC₅₀ (inhalation, mouse) = 120,000 mg/kg

LD₅₀ (oral, rat) = 28,710 mg/kg

ACUTE INHALATION (mouse): 30,000 ppm, narcosis within 30 to 60 minutes; 35,000-40,000 ppm, convulsions and death

DERMAL (rabbit): 2 to 5 milig for 4 hours resulted in restlessness and disorientation, death occurred at 5 milig.

HYDROGEN SULFIDE: LCl₀ (inhalation, human) = 600 ppm/30 minutes

LCl₀ (inhalation, man) = 5.7 mg/kg; central nervous system, pulmonary effects

n-HEXANE (continued): CHRONIC INHALATION (rat): 400-600 ppm, 5 days/week, peripheral neuropathy in 45 days; 850 ppm for 143 days, loss of weight and degeneration of the sciatic nerve (female 8D post): 250 ppm, peripheral neuropathy within 7 months; no effects at 100 ppm.

PROPANE: Long-Term Inhalation: No toxicity or abnormalities were observed when monkeys were exposed to approximately 750 ppm for 90 days. Similar results were obtained when monkeys were exposed to an aerosol spray containing 65% propane and isobutane.

CARBON MONOXIDE: TCl₀ (inhalation, mouse) = 65 ppm/24 hours (7 minutes resp.); eff. effects

TCl₀ (inhalation, mouse) = 8 ppm/1 hour (female SD post); ter. effects

HYDROGEN SULFIDE (continued): LCl₀ (inhalation, human) = 800 ppm/5 minutes

LCl₀ (inhalation, rat) = 444 ppm

CARBON MONOXIDE (continued): TCl₀ (inhalation, human) = 600 mg/m³/10 minutes

TCl₀ (inhalation, man) = 400 ppm/30 minutes

TCl₀ (inhalation, rabbit) = 650 ppm/45 minutes

TCl₀ (inhalation, rat) = 1811 ppm/4 hours

TCl₀ (inhalation, guinea pig) = 2450 ppm/4 hours

TCl₀ (inhalation, guinea pig) = 5718 ppm/4 hours

TCl₀ (inhalation, mammal) = 5000 ppm/5 minutes

TCl₀ (inhalation, wild bird) = 1334 ppm/5 minutes

HYDROGEN SULFIDE (continued): CCl₂ (inhalation, mouse) = 673 ppm/1 hour

CCl₂ (inhalation, mammal) = 800 ppm/5 minutes

SUSPECTED CANCER AGENT: The components of this gas mixture are not found on the following lists: FEDERAL OSHA Z List, NTP, CARCINOGENS. In addition, they are not considered to be, nor suspected to be, cancer-causing agents by these agencies.

IRRITANCY OF PRODUCT: The Hydrogen Sulfide component of this gas mixture, is irritating to the eyes, and may be irritating to the skin.

SENSITIZATION OF PRODUCT: The components of this gas mixture are not known to be skin or respiratory sensizers. Peritoneal isomers (i.e. n-Pentane and Pentane) can cause cardiac sensitization effect on epinephrine.

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

Mutagenicity: No mutagenicity effects have been described for the components of this gas mixture.

Teratogenicity: This gas mixture is not expected to cause teratogenic effects in humans; however, due to the small total amount of the components, embryotoxic effects are not expected to occur.

简直太累了，我要去睡觉了。
exposure to Carbon Monoxide during pregnancy has caused adverse effects and the 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 is toxic to the fetus.

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

A teratogen is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate through generations. An embryotoxic 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.

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL STABILITY: The gas will be dissolved rapidly in well-ventilated areas. The following environmental data are applicable to the components of this gas mixture.

HYDROGEN SULFIDE: Water Solubility = 1 g/242 mL at 20°C. CARBON MONOXIDE: Water Solubility = 3.3 ml/100 cc at 0°C, 2.3 ml at 20°C.

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

EFFECT OF MATERIAL ON PLANTS or ANIMALS: No evidence is currently available on this gas mixture’s effects on plant and animal life. The Hydrogen Sulfide and Carbon Monoxide components of this gas mixture, can be deadly to exposed animal life, producing symptoms similar to those experienced by humans. This gas mixture may also be harmful to plant life.

EFFECT OF CHEMICAL ON AQUATIC LIFE: No evidence is currently available on the effects of this gas effects on aquatic life. The presence of more than a trace of Carbon Monoxide is a hazard to fish. The following aquatic toxicity data are available for the Hydrogen Sulfide component of this gas mixture.

TLm (Lepomis macrochirius, bluegill sunfish) = 0.0487 mg/L/96 hour

TLm (Pimephales promelas, fathead minnow) = 0.0071-0.55 mg/L/96 hour

TLm (Carassiusg sp) = 1.07 mg/L/96 hour

TLm (Graemius) = 0.84 mg/L/96 hour

LC50 (fry inhalation) = 380 mg/m3/960 minutes

LC50 (fry inhalation) = 1500 mg/m3/7 minutes

TLm (Pimephales promelas, fathead minnow) = 0.0071-0.55 mg/L/96 hour

TLm (Lepomis macrochirius, bluegill sunfish) = 0.0487 mg/L/96 hour

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 unsealed 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 considered as Dangerous Goods, per Transportation of Dangerous Goods Act, 1992).

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: This gas is considered as Dangerous Goods, per regulations of Transport Canada.

15. REGULATORY INFORMATION

ADDITIONAL U.S. REGULATIONS: U.S. SARA REPORTING REQUIREMENTS: This gas is not subject to the reporting requirements of Sections 302, 304 and 313 of Title III of the Superfund Amendments and Reauthorization Act, as follows:

COMPONENT SARA 302 SARA 304 SARA 313
n-Hexane YES YES YES
Hydrogen Sulfide YES YES YES

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15. REGULATORY INFORMATION (Continued)

U.S. SARA THRESHOLD PLANNING QUANTITY: Section 302 EHS TPO = Hydrogen Sulfide = 500 lbs (227 kg).  
U.S. TSCA INVENTORY STATUS: The components of this gas mixture are listed on the TSCA Inventory.  
U.S. CERCLA REPORTABLE QUANTITY (RQ): Hexane = 5000 lb (2270 kg); Hydrogen Sulfide = 100 lbs (45.4 lb)  

OTHER U.S. FEDERAL REGULATIONS:  
• Hydrogen Sulfide, Carbon Monoxide, Propane, n-Pentane and n-Hexane are subject to the reporting requirements of CFR 29 1910.100.  
• Hydrogen Sulfide, Propane and n-Pentane are subject to the reporting requirements of Section 112(r) of the Clean Air Act. The Threshold Quantity for each of these gases is 10,000 pounds and so this mixture will not be affected by the regulation.  
• 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). Hydrogen Sulfide is listed in Appendix A of this regulation. The Threshold Quantity for Hydrogen Sulfide under this regulation is 1500 lbs.  
• This gas mixture does not contain any Class I or Class II ozone depleting chemicals (40 CFR part 82).  
• Nitrogen, Oxygen and n-Hexane are not listed Regulated Substances, per 40 CFR, Part 68, of the Risk Management for Chemical Releases. Hydrogen Sulfide is listed under this regulation in Table 1 as a Regulated Substance (Toxic Substance), in quantities of 10,000 lbs (4,553 kg) or greater.  
• Carbon Monoxide, Propane and n-Pentane are listed under this regulation in Table 3, as Regulated Substances (Flammable), in quantities of 10,000 lbs (4,553 kg) or greater, and so this mixture will not be affected by the regulation.  

U.S. STATE REGULATORY INFORMATION:  
The components of this gas mixture are covered under the following specific State regulations:  
California - Permissible Exposure Limits for Chemical Contaminants: Carbon Monoxide, Oxygen, Carbon Monoxide, Propane, n-Pentane, n-Hexane, Hydrogen Sulfide.  
Kansas - Section 302/313 List: No.  
Michigan - Critical Materials Register: No.  

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

ADDITIONAL CANADIAN REGULATIONS:  
CANADIAN DSlNDSL INVENTORY STATUS: The components of this gas mixture are on the Canadian 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 CLASSIFICATION: This gas mixture is categorized as a Controlled Product, Hazard Classes A and D2A, 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 traditionally 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 of other materials, all component properties must be considered. Data may be changed from time to time. Be sure to consult the latest edition. 

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

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

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

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This Material Safety Data Sheet is offered pursuant to OSHA’s Hazard Communication Standard, 29 CFR, 1910.1200. Other government regulations must be reviewed for applicability to this 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.