



# MATERIAL SAFETY DATA SHEET

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

## SECTION 1. PRODUCT IDENTIFICATION

**PRODUCT NAME:** 2500 ppm - 50% CARBON DIOXIDE IN NITROGEN  
**CHEMICAL NAME:** Mixture of Carbon Dioxide (2500 ppm - 50%) and Nitrogen (Balance)  
**FORMULA:** Carbon Dioxide = CO<sub>2</sub>; Nitrogen = N<sub>2</sub>  
**SYNONYMS:** Not Applicable

**MANUFACTURER:** SPECTRA GASES, INC.  
**ADDRESS:** 3434 Route 22 West  
 Branchburg, NJ 08876, U.S.A.  
**PHONE:** 908/252-9300  
**FAX:** 908/252-0811  
**WEB SITE:** www.spectra-gasses.com

**SPECTRA GASES EMERGENCY CONTACT:** 800-932-0624 8:30 am - 7:00 pm (EST)  
**24 HOUR EMERGENCY CONTACT, CHEMTREC:** 800/424-9300, 703-527-3887  
**REVISION DATE:** April 4, 2005  
**MSDS NUMBER:** 1605a  
**PRODUCT USE:** Environmental Calibration and Auditing Gas

## SECTION 2. COMPOSITION and INFORMATION ON INGREDIENTS

**COMPOSITION:** Carbon Dioxide 2500 ppm - 50%, Balance Nitrogen  
**CAS NUMBER:** Carbon Dioxide: 124-38-9  
 Nitrogen: 7727-37-9  
**EINECS NUMBER:** Carbon Dioxide: 204-696-9  
 Nitrogen: 231-783-9

### EXPOSURE LIMITS:

	OSHA PELs:	ACGIH TLVs:	NIOSH RELs:
Carbon Dioxide:			
TWA =	5,000 ppm	TWA = 5,000 ppm	TWA = 5,000 ppm
TWA =	10,000 ppm (vacated 1989 PEL)	STEL = 30,000 ppm	STEL = 30,000 ppm
ST =	30,000 ppm (vacated 1989 PEL)		IDLH = 40,000 ppm

Nitrogen:

There are no exposure limits for Nitrogen, Nitrogen is a simple asphyxiant.

## SECTION 3. HAZARD IDENTIFICATION

**EMERGENCY OVERVIEW:** This is a colorless, odorless, non-flammable gas mixture, shipped under pressure. This gas mixture may produce significant, adverse health effects at relatively low concentrations, due to the presence of Carbon Dioxide. Inhalation of Carbon Dioxide can increase respiration and heart rate (possibly resulting in circulatory insufficiency) and cause nausea, dizziness, headache, mental confusion. Severe inhalation overexposures can be fatal, due to the effects of Carbon Dioxide and oxygen deficiency. High levels of Carbon Dioxide can also cause eye irritation. Emergency Responders must protect themselves from inhalation exposures.

**ROUTES OF ENTRY, SYMPTOMS OF ACUTE EXPOSURE: WARNING** - If rescue personnel need to enter an area suspected of having a toxic level of Carbon Dioxide, they should be equipped with Self-Contained Breathing Apparatus (SCBA), and, if available, a full-body chemically resistant suit. Acute overexposure to this gas mixture may cause the following health effects:

**EYE CONTACT:** Exposure to high concentrations of Carbon Dioxide (a component of this gas mixture) may cause mild to moderate eye irritation with symptoms such as pain, redness, and tearing. Release of a high-pressure gas may result in airborne objects.

**INGESTION:** Ingestion of this gas mixture is not a likely route of industrial exposure.

<b>SECTION 3. HAZARD IDENTIFICATION (Continued)</b>
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**INHALATION:** This gas mixture can produce significant, adverse health effects at relatively low concentrations, due to the presence of Carbon Dioxide. Carbon Dioxide is an asphyxiant and a powerful cerebral vasodilator. If the concentration of Carbon Dioxide reaches 10% or more, suffocation can occur within minutes. If inhaled at concentrations between 2-10%, Carbon Dioxide can cause nausea, dizziness, headache, mental confusion, increased blood pressure and respiratory rate. Carbon Dioxide initially stimulates respiration and then causes respiratory depression. Repeated inhalation of low concentrations (3-5%) have no known permanent harmful effects. If this gas mixture is inhaled, symptoms from exposure Carbon Dioxide which may develop include those described below.

**CONCENTRATION****of CARBON DIOXIDE****EXPOSURE SYMPTOM**

1%	Slight increase in breathing rate.
2%	Breathing rate increases to 50% above normal level. Prolonged exposure can cause headache, tiredness.
3%	Breathing increases to twice normal rate and becomes labored. Weak narcotic effect. Impaired hearing, headache, increase in blood pressure and pulse rate.
4-5%	Breathing increases to approximately four times normal rate, symptoms of intoxication become evident and slight choking may be felt.
5-10%	Characteristic sharp odor noticeable. Very labored breathing, headache, visual impairment and ringing in the ears. Judgment may be impaired, followed within minutes by loss of consciousness.
50-100%	Unconsciousness occurs more rapidly above 10% level. Prolonged exposure to high concentrations may eventually result in death from asphyxiation.

An additional health hazard associated with this gas mixture is asphyxiation after inhalation of oxygen-deficient environments. If large volumes of this gas mixture are released or if this gas mixture is released in poorly-ventilated areas (i.e., enclosed or confined spaces), an oxygen-deficient environment may occur. It should be noted that before adverse health effects or suffocation could occur, the effects of overexposure to Carbon Dioxide will be felt. Individuals breathing an oxygen-deficient atmosphere may experience symptoms that include headaches, ringing in ears, dizziness, drowsiness, unconsciousness, nausea, vomiting, and depression of all the senses. The following effects associated with various levels of oxygen are as follows:

**CONCENTRATION****of OXYGEN****EXPOSURE SYMPTOM**

20.9% Oxygen:	Normal oxygen concentration in air.
15-19% Oxygen:	Decreased ability to perform tasks. May impair coordination and may induce early symptoms in persons with heart, lung, or circulatory problems.
12-15% Oxygen:	Breathing increases, especially in exertion. Pulse up. Impaired coordination, perception, and judgment.
10-12% Oxygen:	Breathing further increases in rate and depth, poor coordination and judgment, lips slightly blue.
8-10% Oxygen:	Mental failure, fainting, unconsciousness, ashen face, blueness of lips, nausea (upset stomach), and vomiting.
6-8% Oxygen:	8 minutes, may be fatal in 50-100% of cases; 6 minutes, may be fatal in 25 to 50% of cases; 4-5 minutes, recovery with treatment.
4-6% Oxygen:	Coma in 40 seconds, followed by convulsion, breathing failure, 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.

**SKIN CONTACT:** Not applicable.

**HMIS RATINGS:** HEALTH: = 1; FLAMMABILITY: = 0; REACTIVITY: = 0;

PPE: Level B (see Section 8, Exposure Controls/Personal protective Equipment)

**ROUTES OF ENTRY, SYMPTOMS OF CHRONIC EXPOSURE:**

**ROUTE OF ENTRY:** Inhalation, Eyes

**TARGET ORGANS:** Eyes.

**SECTION 3. HAZARD IDENTIFICATION (Continued)**

**SYMPTOMS:** Prolonged contact of high concentrations of Carbon Dioxide with the eyes can cause damage to the retinal ganglion cells.

**MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE:** Acute or chronic respiratory conditions and eye conditions may be aggravated by over-exposure to this gas mixture.

**CARCINOGENICITY:** Carbon Dioxide is not found on the FEDERAL OSHA Z LIST, NTP, CAL/OSHA, or IARC Carcinogenicity lists and therefore are neither considered to be nor suspected to be cancer-causing agents by these agencies.

**SECTION 4. FIRST AID MEASURES**

**EYE CONTACT:** If irritation of the eye develops after exposure to this gas, open victim's eyes while under gentle, lukewarm, running water. Use sufficient force to open eyelids. Have victim "roll" eyes. Minimum flushing is for 15 minutes. Victim must seek immediate medical attention from an ophthalmologist.

**INGESTION:** Ingestion is an unlikely route of exposure for this gas.

**INHALATION:** Remove victim(s) to fresh air, as quickly as possible. Trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation, if necessary.

**SKIN CONTACT:** No symptoms expected.

**NOTES TO PHYSICIANS:** Administer oxygen, if necessary and treat symptoms.

**SECTION 5. FIRE FIGHTING MEASURES**

**FLASH POINT:** Not Applicable

**AUTOIGNITION:** Not Applicable

**FLAMMABLE RANGE:** Not Applicable

**NFPA RATINGS:**

HEALTH: = 1                      FLAMMABILITY: = 0

REACTIVITY: = 0                SPECIAL: None

**EXTINGUISHING MEDIA:** This is a non-flammable gas mixture; use fire-extinguishing media appropriate for the surrounding materials.

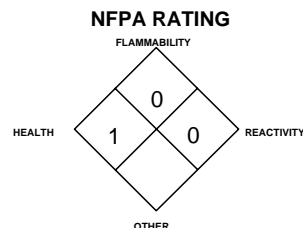
**SPECIAL FIRE-FIGHTING PROCEDURES:** Evacuate all personnel from area. If possible without risk, shut off source of gas, then fight fire according to types of materials burning. If cylinder is not actively a part of the fire, remove from fire area. If this is not possible, cool cylinder with a water spray to prevent violent rupture. Fire fighters must wear Self-Contained Breathing Apparatus and full protective equipment. If necessary, decontaminate fire-response equipment with soap and water solution.

**UNUSUAL FIRE AND EXPLOSION HAZARDS:** This gas mixture presents a significant inhalation hazard to firefighters, due to the presence of Carbon Dioxide. This gas mixture does not burn; 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.

**HAZARDOUS COMBUSTION PRODUCTS:** Carbon Dioxide will produce carbon monoxide and oxygen when heated to temperatures above 1648°C (3000°F).



**See Section 16 for  
Definition of Ratings**

**SECTION 6. ACCIDENTAL RELEASE MEASURES**

**STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:** In the event of a leak of this product, operator should close the gas source if possible to do so safely. Evacuate immediate area. Only trained personnel, wearing Self-Contained Breathing Apparatus (SCBA) and a chemically resistant suit should re-enter a contaminated area.

If leak is in user's gas handling equipment or system, close cylinder valve, safely vent high pressure and purge with inert gas, being sure to bring purge gas to near atmospheric pressure before attempting repairs. If leak is from the cylinder, cylinder valve or the valve pressure relief device (PRD), contact your supplier.

Levels of Carbon Dioxide should be below applicable exposure levels listed in Section 2 (Composition / Information on Ingredients) and oxygen level should be above 19.5% before personnel can be allowed in the area without SCBA.

Detection systems should be available to monitor for leaks and to measure the level of Carbon Dioxide.

**SECTION 7. HANDLING AND STORAGE**

**STORAGE:** Cylinders should be stored upright (with valve protection caps or plugs in place) and firmly secured to prevent falling or being knocked over. Cylinders should be stored in dry, well-ventilated areas. Protect from salt or other corrosive materials. Storage should be away from heavily traveled areas, walkways, elevators, platform edges or other objects or situations that could damage the cylinder wall. Do not store in a manner that will block emergency exits, fire extinguishers or other safety equipment. Do not allow storage temperature to exceed 125°F (52°C). Use a first-in, first-out inventory system to prevent full containers from being stored for long periods of time. Store empty cylinders away from full cylinders. Consideration should be taken to install leak detection and alarm equipment for storage areas. **NOTE:** Use only DOT or ASME code cylinders designed for compressed gas storage. Cylinders must not be recharged except by or with the consent of owner.

**HANDLING:** This mixture can be dangerous and should only be handled by trained personnel. Wearing contact lenses is not recommended when handling this gas mixture. Spectra Gases, Inc., strongly recommends that this gas mixture only be handled in areas with extensive venting capabilities, preferably a gas handling cabinet.

**Before using this gas, meticulous leak checking using inert gas is strongly recommended, particularly after new connections are made.** Cylinder valves should be inspected regularly for physical damage or corrosion (apparent by discoloration or rust). Care should be taken to inspect the following valve locations for corrosion: neck (where valve inserts into cylinder); bonnet nut (where handle attaches to valve body). Close valve after each use and when empty.

Carbon Dioxide and/or detectors for oxygen deficiency, are strongly recommended. Do not drag, roll, slide or drop cylinder. Use a suitable hand truck designed for cylinder movement. Never attempt to lift a cylinder by its cap. Secure cylinders at all times while in use. Use a pressure regulator to safely discharge product from cylinder. Use a check valve to prevent reverse flow into cylinder. Once cylinder has been connected to properly purged process, open cylinder valve slowly and carefully. If user experiences any difficulty operating cylinder valve, discontinue use and contact supplier. Never insert an object (e.g., wrench, screwdriver, 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.

Do not heat cylinders by any means to increase the discharge rate of product from the cylinder. Never apply flame or localized heat directly to any part of the cylinder. Cylinders should not be artificially cooled as certain types of steel undergo property changes when cryogenically cooled, thus making the cylinder unstable.

**PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT:** Follow practices indicated in Section 6 (Accidental Release Measures). Purge gas handling equipment with inert gas and relieve pressure before attempting repairs.

**SPECIAL PRECAUTIONS:** Be aware of any signs of dizziness or fatigue; exposures to fatal concentrations of this gas mixture could occur without any significant warning symptoms. All work operations should be monitored in such a way that emergency personnel can be immediately contacted in the event of a release. Always store and handle compressed gas cylinders in accordance with Compressed Gas Association, Inc. (telephone 703-412-0900) pamphlet CGA P-1, *Safe Handling of Compressed Gases in Containers*. Local regulations may require specific equipment for storage and use.

**SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION**

**VENTILATION AND ENGINEERING CONTROLS:** Forced ventilation systems for the general work area should be provided. Spectra Gases, Inc. recommends that cylinders in use be secured within a ventilated enclosure such as a gas cabinet. Employee exposure should be monitored and reduced to the lowest practical levels using ventilation or other appropriate engineering controls. If appropriate, install automatic monitoring equipment to detect the level of Carbon Dioxide.

**RESPIRATORY PROTECTION:** Maintain exposure levels of Carbon Dioxide below the levels listed in Section 2 (Composition / Information on Ingredients) and oxygen levels above 19.5% in the workplace. Use supplied air respiratory protection if Carbon Dioxide levels exceed exposure limits, if oxygen level is below 19.5%, or during emergency response to a release of this product. If respiratory protection is required, follow the requirements of the U.S. Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), or equivalent U.S. State standards, standards of Canada, the European Standard EN166, and EC member states.

## SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION (Continued)

**RESPIRATORY PROTECTION (continued):** The following NIOSH respiratory protection recommendations are for Carbon Dioxide.

### CONCENTRATION of CARBON DIOXIDE

### RESPIRATORY EQUIPMENT

Up to 40,000 ppm:

Supplied Air Respirator (SAR); or full-facepiece Self-Contained Breathing Apparatus (SCBA).

Emergency or Planned Entry into Unknown Concentrations or IDLH Conditions: Positive pressure, full-facepiece SCBA; or positive pressure, full-facepiece SAR with an auxiliary positive pressure SCBA.

Escape:

Escape-type SCBA. The IDLH concentration for Carbon Dioxide is 40,000 ppm.

**EYE PROTECTION:** Use approved safety goggles or safety glasses, as described in OSHA 29 CFR 1910.133 or by the European Standard EN166. Eye wash stations/safety showers should be available.

**SKIN PROTECTION:** Work (such as leather) gloves are recommended when handling cylinders of this gas mixture. Wear chemically-resistant gloves when using this gas. Wear gloves when handling cylinders of Carbon Dioxide. Use chemical-resistant gloves in emergency situations. Use triple gloves for spill response.

**OTHER PROTECTIVE EQUIPMENT:** Use body protection appropriate for task. Safety shoes are recommended when handling cylinders. Transfer of large quantities under pressure may require use of chemically impervious clothing.

## SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

The following information is for nitrogen, the component of greatest percentage:

**MOLECULAR WEIGHT:** 28.01

**GAS DENSITY @ 21.1°C (70°F):** 0.072 lb./ft<sup>3</sup> (1.153 kg/m<sup>3</sup>)

**BOILING POINT @ 1 atm:** -195.8°C (-320.4°F)

**FREEZING/MELTING POINT @ 1 atm:** -210°C (-345.8°F)

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

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

**SPECIFIC VOLUME @ 21.1°C (70°F):** 13.8 lb/ft<sup>3</sup> (0.867 m<sup>3</sup>/kg)

**CRITICAL PRESSURE:** 492.9 psia (3399 kPa abs)

**COEFFICIENT WATER/OIL DISTRIBUTION:** Not applicable.

The following information is for the Carbon Dioxide component of this gas mixture.

**ODOR THRESHOLD:** Not applicable.

**GAS DENSITY @ 21.1°C (70°F):** 0.1144 lb/ft<sup>3</sup> (1.833 kg/m<sup>3</sup>)

**VAPOR PRESSURE @ 21.1°C (70°F):** 838 psig (5778 kPa)

Information for gas mixture:

**APPEARANCE, ODOR AND STATE:** Colorless, odorless gas.

**WARNING PROPERTIES FOR THIS GAS MIXTURE:** There are no distinct warning properties. Monitoring for levels of Carbon Dioxide and oxygen deficiency are recommended.

## SECTION 10. STABILITY AND REACTIVITY

**CHEMICAL STABILITY:** Stable.

**CONDITIONS TO AVOID:** Cylinders should not be exposed to temperatures in excess of 125°F (52°C).

**MATERIALS WITH WHICH GAS MIXTURE IS INCOMPATIBLE:** This gas mixture is incompatible with powdered metals (e.g., beryllium, cerium and alloys, thorium, titanium) due to the presence of Carbon Dioxide.

**REACTIVITY:**

**A) HAZARDOUS DECOMPOSITION PRODUCTS:** Carbon Dioxide will react with alkaline materials to form carbonates and bicarbonates. In addition, in the presence of ultraviolet light or electrical discharge, Carbon Dioxide decomposes to carbon monoxide and oxygen.

**B) HAZARDOUS POLYMERIZATION:** Will not occur.

## SECTION 11. TOXICOLOGICAL INFORMATION

## TOXICITY DATA ON COMPONENTS:

**CARBON DIOXIDE:**

Inhalation - Human LCLo: 9 pph/5 minutes  
 Inhalation-rat TCLo: 10000 ppm/24 hours/30 days-continuous: Blood: other changes  
 Inhalation-rat TCLo: 6 pph/24 hours: female 10 day(s) after conception; Reproductive: Specific Developmental Abnormalities: musculoskeletal system, cardiovascular (circulatory) system, respiratory system  
 Inhalation-rat TCLo: 6 pph/24 hours: female 10 day(s) after conception: Reproductive: Effects on Newborn: growth statistics (e.g. %, reduced weight gain)

**CARBON DIOXIDE (continued):**

Inhalation-mouse TCLo: 55 pph/4 hours: male 6 day(s) pre-mating: Reproductive: Fertility: male fertility index (e.g. # males impregnating females per # males exposed to fertile non-pregnant females)  
 Inhalation-rabbit TCLo: 27000 ppm/24 hours/30 days-continuous: Behavioral: somnolence (general depressed activity)  
 Inhalation-mouse TCLo: 55 pph/2 hours: male 3 day(s) pre-mating: Reproductive: Paternal Effects: spermatogenesis (incl. genetic material, sperm morphology, motility, and count)

**CARBON DIOXIDE (continued):**

Inhalation-mouse TCLo: 2 pph/8 hours: female 10 day(s) after conception: Reproductive: Fertility: post-implantation mortality (e.g. dead and/or resorbed implants per total number of implants), Reproductive: Specific Developmental Abnormalities: musculoskeletal system  
 Inhalation-rabbit TCLo: 13 pph/4 hours: female 9-12 day(s) after conception: Reproductive: Specific Developmental Abnormalities: musculoskeletal system  
 Inhalation-Mammal-species unspecified LCLo: 90000 ppm/5 minutes

**NITROGEN:** Nitrogen is a simply asphyxiant.

**CARCINOGENICITY:** The components of this gas mixture have not been found to be carcinogenic.

**IRRITANCY OF PRODUCT:** This gas mixture irritates the eyes and may irritate the skin. In addition, contact with rapidly expanding gases can cause frostbite to exposed tissue.

**SENSITIZATION OF PRODUCT:** Carbon Dioxide and Nitrogen (components of this gas mixture) are not known to cause sensitization in humans.

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

Mutagenicity: This gas mixture is not expected to cause mutagenic effects in humans.

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

Teratogenicity: This gas mixture is not expected to cause teratogenic effects in humans.

Reproductive Toxicity: This gas mixture is not expected to cause adverse reproductive effects in humans. Animal reproductive data are available for Carbon Dioxide (a component of this gas mixture); these data were obtained during clinical studies on specific animal tissues exposed to this compound.

*A mutagen is a chemical that causes permanent changes to genetic material (DNA) such that the changes will propagate through generational lines. An embryotoxin is a chemical that 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 that causes damage to a developing fetus, but the damage does not propagate across generational lines. A reproductive toxin is any substance that interferes in any way with the reproductive process.*

**BIOLOGICAL EXPOSURE INDICES (BEIs):** Currently, Biological Exposure Indices (BEIs) are not applicable for the components of gas mixture.

## SECTION 12. ECOLOGICAL INFORMATION

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

**CARBON DIOXIDE:** Food chain concentration potential: None. Biological Oxygen Demand: None. Log P = 0.83

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

**EFFECT OF MATERIAL ON PLANTS or ANIMALS:** Any adverse effect on plants would be related to oxygen-deficient environments or frost from rapidly expanding gases, unless exposure occurs in a confined space. This gas mixture may have adverse effects on animal life exposed to very high concentrations.

**EFFECT OF CHEMICAL ON AQUATIC LIFE:** This gas mixture may have adverse effects on aquatic life. Currently, the following aquatic toxicity data are available for Carbon Dioxide, a component of this gas mixture:

Lethal (trout) 1 hour = 240 mg/L

Lethal (rainbow trout) 96 hours = 35 mg/L

Harmful to some species of aquatic life in concentrations less than 20 mg/L

Lethal (rainbow trout) 12 hours = 60-240 mg/L

**MOBILITY:** The components of this gas mixture will not be mobile in the soil.

**PERSISTENCE AND BIODEGRADABILITY:** Persistence: Nitrogen is a natural element and presents no hazard of persistence. Carbon Dioxide persists in the atmosphere. Biodegradation: Nitrogen is fully biodegradable. Carbon Dioxide does not biodegrade, but will decompose in ultraviolet light to form carbon monoxide and oxygen.

**POTENTIAL TO BIOACCUMULATE:** The components of this gas mixture do not have bioaccumulation or food chain contamination potential.

**OZONE-DEPLETION POTENTIAL:** The components of this gas mixture are not Class I or Class II ozone depleting chemicals (40 CFR Part 82).

**SECTION 13. DISPOSAL CONSIDERATIONS**

**UNUSED PRODUCT / EMPTY CONTAINER:** Do not dispose of residual product. Return residual product in cylinders to: Spectra Gases, Inc., 80 Industrial Drive, Alpha, NJ 08865 or Spectra Gases, Inc., 1261 Activity Drive, Vista, CA 92083.

**DISPOSAL INFORMATION:** Residual product in the system may be burned if suitable burning unit (flair incinerator) is available on-site. This shall be done in accordance with U.S. Federal, State and local regulations, regulations of the provinces of Canada or EC member states.

**SECTION 14. TRANSPORT INFORMATION****U.S. SHIPPING INFORMATION:**

**U.S. DOT PROPER SHIPPING NAME:** Compressed gases, n.o.s. (Nitrogen, Carbon Dioxide)  
**HAZARD CLASS NUMBER and DESCRIPTION:** 2.2 (Non-Flammable Gas)  
**UN IDENTIFICATION NUMBER:** UN 1956  
**U.S. DOT SHIPPING LABEL(S) REQUIRED:** Non-Flammable Gas  
**PLACARD (When required):** Not Applicable

**SPECIAL SHIPPING INFORMATION:** Cylinders should be transported in a secure position in a well-ventilated truck (never transport in passenger compartment of a vehicle). Ensure cylinder valve is properly closed, valve outlet cap has been reinstalled, and valve protection cap is secured before shipping cylinder.

**CAUTION:** Compressed gas cylinders shall not be refilled except by qualified producers of compressed gases. Shipment of a compressed gas cylinder which has not been filled by the owner or with the owner's written consent is a violation of Federal law (49 CFR 173.301).

**NAERG (NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK) #:** 126

**CANADIAN SHIPPING INFORMATION:**

**TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS:** This gas mixture is considered as dangerous goods; use the above information for the preparation of Canadian Shipments.

**INTERNATIONAL AIR TRANSPORT ASSOCIATION SHIPPING INFORMATION (IATA):**

**IATA DESIGNATION:** This gas mixture is considered as dangerous goods, per the International Air Transport Association.

**PROPER SHIPPING NAME:** Compressed gas, n.o.s. (Nitrogen, Carbon Dioxide)  
**HAZARD CLASS NUMBER and DESCRIPTION:** 2.2 (Non-Flammable Gas)  
**UN IDENTIFICATION NUMBER:** UN 1956  
**HAZARD LABEL(S) REQUIRED:** Not Applicable

The following Packaging Information is applicable to this product:

PASSENGER AND CARGO AIRCRAFT				CARGO AIRCRAFT ONLY	
Limited Quantity		Packing Instruction	Max. Qty per Pkg	Packing Instruction	Max. Qty per Pkg
Packing Instruction	Max. Qty per Pkg				
//////	//////	200	75 kg	200	150 kg

**INTERNATIONAL MARITIME ORGANIZATION SHIPPING INFORMATION (IMO):**

**IMO DESIGNATION:** This gas mixture is considered as dangerous goods, per the International Maritime Organization.

**PROPER SHIPPING NAME:** Compressed gas, n.o.s. (Nitrogen, Carbon Dioxide)  
**HAZARD CLASS NUMBER and DESCRIPTION:** 2.2 (Non-Flammable Gas)  
**UN IDENTIFICATION NUMBER:** UN 1956  
**HAZARD LABEL(S) REQUIRED:** Not Applicable  
**IMDG CODE:** Page 2124

**MARINE POLLUTANT:** The components of this product are not designated by the IMO to be Marine Pollutants.

**EUROPEAN SHIPPING INFORMATION:**

**EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY ROAD (ADR):** This gas mixture is considered by the Economic Commission for Europe to be dangerous goods. Additional information is as follows:

**SUBSTANCE IDENTIFICATION NO.:** 1956  
**NAME OF SUBSTANCE:** Compressed gas, n.o.s. (Nitrogen, Carbon Dioxide)  
**HAZARD IDENTIFICATION NO.:** 20  
**LABEL:** 2  
**CLASS AND ITEM NUMBER:** 2, 1<sup>o</sup>A

<b>SECTION 15. REGULATORY INFORMATION</b>
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**U.S. FEDERAL REGULATIONS:****EPA - ENVIRONMENTAL PROTECTION AGENCY:**

**CERCLA:** Comprehensive Environmental Response, Compensation, and Liability Act of 1990  
(40 CFR Parts 117 and 302)

Reportable Quantity (RQ): Carbon Dioxide = Not applicable.

**SARA TITLE III:** Superfund Amendment and Reauthorization Act

**SECTIONS 302/304:** Emergency Planning and Notification (40 CFR Part 355)

Extremely Hazardous Substances: Nitrogen and Carbon Dioxide are not listed.

Threshold Planning Quantity (TPQ): Not applicable.)

Reportable Quantity (RQ): Not applicable.

**SECTIONS 311/312:** Hazardous Chemical Reporting (40 CFR Part 370)

IMMEDIATE HEALTH: Yes

PRESSURE: Yes

DELAYED HEALTH: No

REACTIVITY: No

FIRE: No

**SECTION 313:** Toxic Chemical Release Reporting (40 CFR 372)

Releases of Carbon Dioxide and Nitrogen do not require reporting under Section 313.

**CLEAN AIR ACT:**

**SECTION 112 (r):** Risk Management Programs for Chemical Accidental Release  
(40 CFR Part 68)

Threshold Planning Quantity (TPQ): Not applicable.

**TSCA:** Toxic Substances Control Act

The components of this gas mixture are listed on the TSCA Inventory.

**OSHA - OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION:**

**29 CFR Part 1910.119:** Process Safety Management of Highly Hazardous Chemicals.

Threshold Planning Quantity (TPQ): Not applicable

**U.S. STATE REGULATORY INFORMATION:**

**CALIFORNIA PROPOSITION 65:** No component of this product is on the California Proposition 65 lists.

The components of this gas mixture are listed by the following State regulations (more specific regulations exist in some States):

**Alaska - Designated Toxic and Hazardous Substances:** Carbon Dioxide.

**California - Permissible Exposure Limits for Chemical Contaminants:** Nitrogen, Carbon Dioxide.

**Florida - Substance List:** Nitrogen, Carbon Dioxide.

**Illinois - Toxic Substance List:** Carbon Dioxide.

**Kansas - Section 302/313 List:** No.

**Massachusetts - Substance List:** Nitrogen, Carbon Dioxide.

**Michigan - Critical Materials Register:** Carbon Dioxide.

**Minnesota - List of Hazardous Substances:** Carbon Dioxide.

**Missouri - Employer Information/Toxic Substance List:** Carbon Dioxide.

**New Jersey - Right to Know Hazardous Substance List:** Nitrogen, Carbon Dioxide.

**North Dakota - List of Hazardous Chemicals, Reportable Quantities:** No.

**Pennsylvania - Hazardous Substance List:** Nitrogen, Carbon Dioxide.

**Rhode Island - Hazardous Substance List:** Nitrogen, Carbon Dioxide.

**Texas - Hazardous Substance List:** Carbon Dioxide.

**West Virginia - Hazardous Substance List:** Carbon Dioxide.

**Wisconsin - Toxic and Hazardous Substances:** Carbon Dioxide.

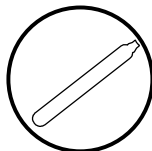
**CANADIAN FEDERAL REGULATIONS:**

**CANADIAN DSL INVENTORY STATUS:** The components of this gas mixture are listed on the Canadian DSL Inventory.

**OTHER CANADIAN REGULATIONS:** This gas mixture is categorized as a Controlled Product, Hazard Class A, as per the Controlled Product Regulations. The components of this product are not on the CEPA Priorities Substances Lists.

**CANADIAN WHMIS SYMBOLS:**

**Class A:** Compressed Gas



<b>SECTION 15. REGULATORY INFORMATION (Continued)</b>
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**EUROPEAN ECONOMIC COMMUNITY REGULATIONS:**

**EC LABELING AND CLASSIFICATION:** This product does not meet the definition of any hazard class as defined by the European Community Council Directive 67/548/EEC.

**EC CLASSIFICATION:** Not applicable.

**EC RISK PHRASES:** Not applicable.

**EC SAFETY PHRASES:** Not applicable.

**EUROPEAN COMMUNITY ANNEX II HAZARD SYMBOL:** Not applicable.

**EUROPEAN COMMUNITY INFORMATION FOR COMPONENTS:****CARBON DIOXIDE:**

**EC EINECS/ELINCS NUMBER:** 204-696-9

**EC CLASSIFICATION:** An official classification for this substance has not been published in Commission Directives 93/72/EEC, 94/69 EC, or and 96/54/EC.

**NITROGEN:**

**EC EINECS/ELINCS NUMBER:** 231-783-9

**EC CLASSIFICATION:** An official classification for this substance has not been published in Commission Directives 93/72/EEC, 94/69 EC, or and 96/54/EC.

<b>SECTION 16. OTHER INFORMATION</b>
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Information contained in this Material Safety Data Sheet is provided to our customers so they may comply with 29 CFR 1910.1200, Hazard Communication Standard, the Canadian WHMIS Standard, and the requirements of the European Community Directives. The intent of this Material Safety Data Sheet is to provide end users of this product with the health and physical hazards associated with possible exposure to this product. All statements, technical data and recommendations are based on readily available texts and data that Spectra Gases, Inc., believes to be reliable and accurate. Spectra Gases, Inc., makes no warranties, guarantees or representations of any kind with respect to this product or this data. It is the responsibility of the user to obtain and use the most recent version of this MSDS.

Further information about 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.

<i>P-1</i>	<i>"Safe Handling of Compressed Gases in Containers"</i>
<i>AV-1</i>	<i>"Safe Handling and Storage of Compressed Gases"</i>
	<i>"Handbook of Compressed Gases"</i>

**PREPARED BY:** CHEMICAL SAFETY ASSOCIATES, Inc.  
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619/565-0302

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Revision History: 1/3/99 Date of Preparation; 4/4/05 general review

## DEFINITIONS OF TERMS

A large number of abbreviations and acronyms appear on a MSDS. Some of these which are commonly used include the following:

**CAS #:** This is the Chemical Abstract Service Number which uniquely identifies each constituent. It is used for computer-related searching.

### EXPOSURE LIMITS IN AIR:

**ACGIH** - American Conference of Governmental Industrial Hygienists, a professional association which establishes exposure limits.

**TLV** - Threshold Limit Value - an airborne concentration of a substance which represents conditions under which it is generally believed that nearly all workers may be repeatedly exposed without adverse effect. The duration must be considered, including the 8-hour Time Weighted Average (**TWA**), the 15-minute Short Term Exposure Limit (**STEL**), and the instantaneous Ceiling Level (**C**). Skin absorption effects must also be considered.

**OSHA** - U.S. Occupational Safety and Health Administration.

**PEL** - Permissible Exposure Limit - This exposure value means exactly the same as a TLV, except that it is enforceable by OSHA. The OSHA Permissible Exposure Limits are based in the 1989 PELs and the June, 1993 Air Contaminants Rule (Federal Register: 58: 35338-35351 and 58: 40191). Both the current PELs and the vacated PELs are indicated. The phrase, "Vacated 1989 PEL," is placed next to the PEL which was vacated by Court Order.

**IDLH** - Immediately Dangerous to Life and Health - This level represents a concentration from which one can escape within 30-minutes without suffering escape-preventing or permanent injury.

**The DFG - MAK** is the Republic of Germany's Maximum Exposure Level, similar to the U.S. PEL.

**NIOSH** is the National Institute of Occupational Safety and Health, which is the research arm of the U.S. Occupational Safety and Health Administration (**OSHA**). NIOSH issues exposure guidelines called Recommended Exposure Levels (**RELs**). When no exposure guidelines are established, an entry of **NE** is made for reference.

### HAZARD RATINGS:

**HAZARDOUS MATERIALS IDENTIFICATION SYSTEM:** Health Hazard: **0** (minimal acute or chronic exposure hazard); **1** (slight acute or chronic exposure hazard); **2** (moderate acute or significant chronic exposure hazard); **3** (severe acute exposure hazard; onetime overexposure can result in permanent injury and may be fatal); **4** (extreme acute exposure hazard; onetime overexposure can be fatal). Flammability Hazard: **0** (minimal hazard); **1** (materials that require substantial pre-heating before burning); **2** (combustible liquid or solids; liquids with a flash point of 38-93°C [100-200°F]); **3** (Class IB and IC flammable liquids with flash points below 38°C [100°F]); **4** (Class IA flammable liquids with flash points below 23°C [73°F] and boiling points below 38°C [100°F]. Reactivity Hazard: **0** (normally stable); **1** (material that can become unstable at elevated temperatures or which can react slightly with water); **2** (materials that are unstable but do not detonate or which can react violently with water); **3** (materials that can detonate when initiated or which can react explosively with water); **4** (materials that can detonate at normal temperatures or pressures).

**NATIONAL FIRE PROTECTION ASSOCIATION:** Health Hazard: **0** (material that on exposure under fire conditions would offer no hazard beyond that of ordinary combustible materials); **1** (materials that on exposure under fire conditions could cause irritation or minor residual injury); **2** (materials that on intense or continued exposure under fire conditions could cause temporary incapacitation or possible residual injury); **3** (materials that can on short exposure could cause serious temporary or residual injury); **4** (materials that under very short exposure could cause death or major residual injury). Flammability Hazard and Reactivity Hazard: Refer to definitions for "Hazardous Materials Identification System".

### FLAMMABILITY LIMITS IN AIR:

Much of the information related to fire and explosion is derived from the National Fire Protection Association (**NFPA**). Flash Point - Minimum temperature at which a liquid gives off sufficient vapors to form an ignitable mixture with air. Autoignition Temperature: The minimum temperature required to initiate combustion in air with no other source of ignition. LEL - the lowest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source. UEL - the highest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source.

### TOXICOLOGICAL INFORMATION:

Possible health hazards as derived from human data, animal studies, or from the results of studies with similar compounds are presented. Definitions of some terms used in this section are: **LD<sub>50</sub>** - Lethal Dose (solids & liquids) which kills 50% of the exposed animals; **LC<sub>50</sub>** - Lethal Concentration (gases) which kills 50% of the exposed animals; **ppm** concentration expressed in parts of material per million parts of air or water; **mg/m<sup>3</sup>** concentration expressed in weight of substance per volume of air; **mg/kg** quantity of material, by weight, administered to a test subject, based on their body weight in kg. Data from several sources are used to evaluate the cancer-causing potential of the material. The sources are: **IARC** - the International Agency for Research on Cancer; **NTP** - the National Toxicology Program, **RTECS** - the Registry of Toxic Effects of Chemical Substances, **OSHA** and **CAL/OSHA**. IARC and NTP rate chemicals on a scale of decreasing potential to cause human cancer with rankings from 1 to 4. Subrankings (2A, 2B, etc.) are also used. Other measures of toxicity include **TDL<sub>0</sub>**, the lowest dose to cause a symptom and **TCL<sub>0</sub>** the lowest concentration to cause a symptom; **TDo**, **LDLo**, and **LDo**, or **TC**, **TCo**, **LCLo**, and **LCo**, the lowest dose (or concentration) to cause lethal or toxic effects. **BEI** - Biological Exposure Indices, represent the levels of determinants which are most likely to be observed in specimens collected from a healthy worker who has been exposed to chemicals to the same extent as a worker with inhalation exposure to the TLV. Ecological Information: EC is the effect concentration in water.

### REGULATORY INFORMATION:

**U.S. and CANADA:** This section explains the impact of various laws and regulations on the material. **EPA** is the U.S. Environmental Protection Agency. **WHMIS** is the Canadian Workplace Hazardous Materials Information System. **DOT** and **TC** are the U.S. Department of Transportation and the Transport Canada, respectively. Superfund Amendments and Reauthorization Act (**SARA**); the Canadian Domestic/Non-Domestic Substances List (**DSL/NDSL**); the U.S. Toxic Substance Control Act (**TSCA**); Marine Pollutant status according to the **DOT**; the Comprehensive Environmental Response, Compensation, and Liability Act (**CERCLA** or **Superfund**); and various state regulations. This section also includes information on the precautionary warnings which appear on the material's package label.

**EUROPEAN:** **EC** is the European Community (formerly known as the **EEC**, European Economic Community). **EINECS**: This is the European Inventory of Now-Existing Chemical Substances. The **ARD** is the European Agreement Concerning the International Carriage of Dangerous Goods by Road and the **RID** are the International Regulations Concerning the Carriage of Dangerous Goods by Rail.