



MATERIAL SAFETY DATA SHEET

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

SECTION 1. PRODUCT IDENTIFICATION

PRODUCT NAME: 5 - 1000 ppm HYDROGEN SULFIDE IN AIR
CHEMICAL NAME: Mixture of Hydrogen Sulfide (5 - 1000 ppm) and Air (Balance)
FORMULA: Hydrogen Sulfide = H₂S; Air = Not Applicable
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

SPECTRA GASES EMERGENCY CONTACT: 800-932-0624 8:30 am - 7:00 pm (EST)
24 HOUR EMERGENCY CONTACT, CHEMTREC: 800/424-9300, 202/484-7616
PREPARATION DATE: September 29, 1998
MSDS NUMBER: 1609b
PRODUCT USE: Environmental Calibration and Auditing Gas

SECTION 2. COMPOSITION and INFORMATION ON INGREDIENTS

COMPOSITION: Hydrogen Sulfide 5 ppm - 1000 ppm, Balance Air
CAS NUMBER: Hydrogen Sulfide: 7783-06-4
 Air (compressed, atmospheric): 132259-10-0
EINECS NUMBER: Hydrogen Sulfide: 231-977-3
 Air (compressed, atmospheric): Unlisted

EXPOSURE LIMITS:

OSHA PELs:	ACGIH TLVs:	NIOSH RELs:
Hydrogen Sulfide:		
Ceiling = 20 ppm	TWA = 10 ppm	Ceiling = 10 ppm
STEL = 50 ppm (10 min peak per 8-hr shift)	STEL = 15 ppm TWA = 5 ppm (proposed)	IDLH = 100 ppm
[Note: Use Ceiling or STEL, not both]		
TWA = 10 ppm (vacated 1989 PEL)		
ST = 15 ppm (vacated 1989 PEL)		

Air:
Not Applicable

SECTION 3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: This gas is a colorless, non-flammable gas mixture with a distinct "rotten egg" odor (due to the presence of Hydrogen Sulfide). As olfactory fatigue from Hydrogen Sulfide may occur, odor is not an effective warning of a release. This gas mixture can cause significant, adverse health effects at relatively low concentrations, due to the presence of Hydrogen Sulfide. Overexposure can cause skin and eye irritation, nausea, dizziness, headaches, and collapse. 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 Hydrogen Sulfide, 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: Inflammation and irritation of the eyes can occur at very low airborne concentrations (containing less than 10 ppm Hydrogen Sulfide). 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 intense tearing, blurring of vision, and pain when looking at light. Exposed individuals may see rings around bright lights. Most eye symptoms disappear when exposure ceases; however, in serious cases, the eye can be permanently damaged.

SECTION 3. HAZARD IDENTIFICATION (Continued)

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

INHALATION: This gas mixture can cause significant, adverse effects at relatively low concentrations, due to the presence of Hydrogen Sulfide, which is toxic. Inhalation of relatively low 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 have been fatal. A summary of exposure concentrations and observed effects for Hydrogen Sulfide are as follows:

<u>CONCENTRATION</u> <u>of HYDROGEN SULFIDE</u>	<u>EXPOSURE SYMPTOM</u>
0.3-30 ppm:	Odor is obvious and unpleasant.
10-50 ppm:	Eye irritation. Dryness and irritation of nose, throat.
Slightly higher than 50 ppm:	Irritation of the respiratory system; pain, intense tearing of eyes and blurring of vision.
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:	Swifter onset of symptoms. Death occurs in 1-4 hours.
500 ppm:	Headache, excitement, staggering, stomachache after brief exposure. Death occurs in 0.5-1 hour.
> 600 ppm:	Rapid onset of unconsciousness, coma, death.
> 1000 ppm:	Immediate respiratory arrest.

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.

SKIN CONTACT: This gas mixture may irritate the skin, due to the presence of Hydrogen Sulfide.

HMIS RATINGS: HEALTH: = 3; 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, Skin Contact

TARGET ORGANS: Respiratory system, skin, central nervous system.

SYMPTOMS: Continuous inhalation of low concentrations of this gas mixture 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. Repeated low level skin exposure may cause dermatitis. Refer to Section 11 (Toxicological Information) for additional information.

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

CARCINOGENICITY: Hydrogen Sulfide 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 liquid or 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: If irritation of the skin develops after exposure to gas mixture, immediately begin decontamination with running water. Minimum flushing is for 15 minutes. Remove exposed or contaminated clothing, taking care not to contaminate eyes. Victim must seek immediate medical attention.

NOTES TO PHYSICIANS: Administer oxygen, if necessary and treat symptoms. Be observant for initial signs of pulmonary edema.

SECTION 5. FIRE FIGHTING MEASURES

FLASH POINT: Not Applicable

AUTOIGNITION: Not Applicable

FLAMMABLE RANGE: Not Applicable

NFPA RATINGS:

HEALTH: = 2

FLAMMABILITY: = 0

REACTIVITY: = 0

SPECIAL: None

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

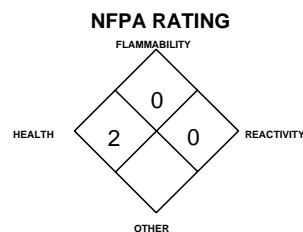
SPECIAL FIRE-FIGHTING PROCEDURES: Evacuate all personnel from area. If possible without risk, shut off source of gas, then fight fire according to types of materials burning. If cylinder is not actively a part of the fire, remove from fire area. If this is not possible, cool cylinder with a water spray 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 Hydrogen Sulfide. 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: If involved in a fire, the Hydrogen Sulfide in this mixture decomposes to yield water and sulfur dioxide.



**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 Hydrogen Sulfide should be below applicable exposure levels listed in Section 2 (Composition / Information on Ingredients) 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 Hydrogen Sulfide.

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.

SECTION 7. HANDLING AND STORAGE (Continued)

Hydrogen Sulfide detectors 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 Hydrogen Sulfide 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 Hydrogen Sulfide.

RESPIRATORY PROTECTION: Maintain exposure levels of Hydrogen Sulfide below the levels listed in Section 2 (Composition / Information on Ingredients). Use supplied air respiratory protection if Hydrogen Sulfide levels exceed exposure limits 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. The following NIOSH respiratory protection recommendations are for Hydrogen Sulfide.

CONCENTRATION of HYDROGEN SULFIDE

RESPIRATORY EQUIPMENT

Up to 100 ppm:

Powered air-purifying respirator with cartridge(s) to protect against Hydrogen Sulfide, gas mask with canister to protect against Hydrogen Sulfide, Supplied Air Respirator (SAR), or full facepiece Self-Contained Breathing Apparatus (SCBA).

Emergency or Planned Entry into

Unknown Concentration or IDLH Conditions: Positive pressure, full facepiece SCBA or positive pressure, full facepiece SAR with an auxiliary positive pressure SCBA.

Escape:

Gas mask with canister to protect against Hydrogen Sulfide or escape-type SCBA. The IDLH concentration for Hydrogen Sulfide is 100 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. 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. Butyl rubber, chlorinated polyethylene, neoprene nitrile, and polyvinyl rubber are recommended. 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 Air, the component of greatest percentage:

MOLECULAR WEIGHT: 28.975
GAS DENSITY @ 21.1°C (70°F): 0.07493 lb/ft³ (1.2 kg/m³)
BOILING POINT @ 1 atm: -194.3°C (-317.8°F)
FREEZING/MELTING POINT @ 1 atm: -216.2°C (-357.2°F)
SPECIFIC GRAVITY (air = 1) @ 21.1°C (70°F): 1.00
SOLUBILITY IN WATER vol/vol at 0°C (32°F) and 1 atm: 0.0292
SPECIFIC VOLUME @ 21.1°C (70°F): 13.346 ft³/lb (0.8333 m³/kg)
CRITICAL PRESSURE (psia): 547 psia (3771 kPa abs)
COEFFICIENT WATER/OIL DISTRIBUTION: Not applicable.

The following information is for the Hydrogen Sulfide component of this gas mixture.

ODOR THRESHOLD: 0.13 ppm Odor is a poor warning of a release of this mixture due to potential olfactory fatigue.

Information for gas mixture:

APPEARANCE, ODOR AND STATE: Colorless gas. Due to the presence of Hydrogen Sulfide, this gas mixture will have an odor of "rotten eggs".

WARNING PROPERTIES FOR THIS GAS MIXTURE: Continuous inhalation of low concentrations of Hydrogen Sulfide (a component of this gas mixture) may cause olfactory fatigue, so the odor is not a reliable warning property of a release. 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. Leaks of this gas mixture, containing Hydrogen Sulfide in relatively low concentration, can be detected through the use of wet lead acetate paper. The paper turns black in the presence of Hydrogen Sulfide. Cadmium chloride solutions can also be used. The solution will turn yellow upon contact with the Hydrogen Sulfide in the gas mixture.

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 strong oxidizers (e.g., chlorine, bromine pentafluoride, oxygen, oxygen difluoride, and nitrogen trifluoride), alkaline materials, metals (e.g., copper, lead, silver), and metal oxides, due to the presence of Hydrogen Sulfide, which is a strong reducing agent.

REACTIVITY:

A) HAZARDOUS DECOMPOSITION PRODUCTS: Hydrogen and sulfur (due to the presence of Hydrogen Sulfide).

B) HAZARDOUS POLYMERIZATION: Will not occur.

SECTION 11. TOXICOLOGICAL INFORMATION

TOXICITY DATA ON COMPONENTS:

HYDROGEN SULFIDE:

Human LCLo: 600 ppm/30 minutes; Man LDLo: 5700 mg/kg
 Human LCLo: 800 ppm/5 minutes; Rat LC₅₀: 444 ppm; Rat TCLo: 20 ppm (female 6-22 days post
 Mammal LCLo: 800 ppm/5 minutes; Rat TCLo: 1200 mg/m³/2 hours/5 days-intermittent
 Rat TCLo: 100 ppm/8 hours/5 weeks-intermittent; Brain and Coverings - other degenerative changes; Lungs, Thorax, or Respiration - other changes; Biochemical - Enzyme inhibition, induction, or change in blood or tissue levels - cytochrome oxidases (including oxidative phosphorylation)
 Rat TCLo: 80 ppm/6 hours/90 days-intermittent; Brain and Coverings - changes in brain weight; Nutritional and Gross Metabolic - weight loss or decreased weight gain

HYDROGEN SULFIDE (continued)

Rat TCLo: 80 ppm/6 hours/90 days-intermittent; Nutritional and Gross Metabolic - weight loss or decreased weight gain; Related to Chronic Data - death
 Mouse LC₅₀: 634 ppm/1 hour; Rabbit TCLo: 40 mg/m³/5 hours/30 weeks-intermittent; Sense Organs and Special Senses (Eye) - conjunctive irritation
 Rat TCLo: 20 ppm: female 6-22 day(s) after conception; lactating female 21 day(s) post-birth; Reproductive - Effects on Newborn - physical.
 LC₅₀ = 712 ppm (DOT Point of Inhalation List)

AIR: Not applicable.

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: Hydrogen Sulfide and Air (components of this gas mixture) are not known to cause sensitization in humans.

SECTION 11. TOXICOLOGICAL INFORMATION (Continued)

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

Mutagenicity: 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 Hydrogen Sulfide (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 this 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.

HYDROGEN SULFIDE: Water Solubility = 1 g/242 mL 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 Hydrogen Sulfide, a component of this gas mixture:

TLm (Asellussp) 96 hours = 0.111 mg/L

TLm (Cranfngonyx sp) 96 hours = 1.07 mg/L

TLm (Gammarrus) 96 hours = 0.84 mg/L

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

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

TLm (Lepomis macrochirus, bluegill sunfish) 96 hours = 0.0478 mg/L

TLm (*Lepomis macrochirus*, bluegill sunfish) 96 hours = 0.0448 mg/L at 21-22 °C

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

TLm (*Salvenilis foninalis*, brook trout) 96 hours = 0.0216-0.038 mg/L at 8-12.5 °C

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

PERSISTENCE AND BIODEGRADABILITY: Persistence: Hydrogen Sulfide will convert to elemental sulfur upon standing in water. Biodegradation: Hydrogen Sulfide will biodegrade to elemental sulfur.

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 unused product. Return used 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
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U.S. SHIPPING INFORMATION:

U.S. DOT PROPER SHIPPING NAME: Compressed gases, n.o.s. (Air, Hydrogen Sulfide)
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. (Air, Hydrogen Sulfide)
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. (Air, Hydrogen Sulfide)
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. (Air, Hydrogen Sulfide)
HAZARD IDENTIFICATION NO.: 20
LABEL: 2
CLASS AND ITEM NUMBER: 2, 1^oA

SECTION 15. REGULATORY INFORMATION

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): Hydrogen Sulfide = 100 lb (45.5 kg)

SARA TITLE III: Superfund Amendment and Reauthorization Act

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

Extremely Hazardous Substances: Hydrogen Sulfide is listed.

Threshold Planning Quantity (TPQ): Hydrogen Sulfide = 500 lb (227.5 kg)

Reportable Quantity (RQ): Hydrogen Sulfide = 100 lb (45.5 kg)

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 Hydrogen Sulfide 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): Hydrogen Sulfide is listed under Table 1 as a Regulated Substance, per 40 CFR, Part 68, of the Risk Management for Chemical Release Prevention, as a flammable substance and an extremely hazardous substance. The threshold quantity for Hydrogen Sulfide under this regulation is 10,000 lb (4,553 kg).

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): Hydrogen Sulfide is listed in Appendix A of this regulation. The threshold quantity for Hydrogen Sulfide under this regulation is 1500 lb (682 kg)

U.S. STATE REGULATORY INFORMATION:

CALIFORNIA PROPOSITION 65: No component of this gas mixture is a listed substance which the State of California requires warning under this statute.

The components of this gas mixture are covered under the following specific State regulations:

Alaska - Designated Toxic and Hazardous Substances: Hydrogen Sulfide.

California - Permissible Exposure Limits for Chemical Contaminants: Hydrogen Sulfide.

Florida - Substance List: Hydrogen Sulfide.

Illinois - Toxic Substance List: Hydrogen Sulfide.

Kansas - Section 302/313 List: Hydrogen Sulfide.

Massachusetts - Substance List: Hydrogen Sulfide.

Michigan - Critical Materials Register: Hydrogen Sulfide.

Minnesota - List of Hazardous Substances: Hydrogen Sulfide.

Missouri - Employer Information/Toxic Substance List: Hydrogen Sulfide.

New Jersey - Right to Know Hazardous Substance List: Hydrogen Sulfide.

North Dakota - List of Hazardous Chemicals, Reportable Quantities: Hydrogen Sulfide.

Pennsylvania - Hazardous Substance List: Hydrogen Sulfide.

Rhode Island - Hazardous Substance List: Hydrogen Sulfide.

Texas - Hazardous Substance List: Hydrogen Sulfide.

West Virginia - Hazardous Substance List: Hydrogen Sulfide.

Wisconsin - Toxic and Hazardous Substances: Hydrogen Sulfide.

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 Classes A and D2B, as per the Controlled Product Regulations. This components of this product are not on the CEPA Priorities Substances Lists.

SECTION 15. REGULATORY INFORMATION (Continued)

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:**HYDROGEN SULFIDE:**

EC EINECS/ELINCS NUMBER: 231-977-3

EC CLASSIFICATION: Extremely flammable. Very toxic. [F+;T+]

EC RISK PHRASES: Extremely flammable. Very toxic by inhalation. [R: 12-26]

EC SAFETY PHRASES: 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.* Keep container tightly closed and in a well ventilated place. Keep away from sources of ignition - No smoking. In case of accident or if you feel unwell, seek medical advice immediately (show label where possible). [S:(1/2-)* 7/9-16-45]

EC COMMENTS: In terms of hydrogen sulfide toxicity, use the following concentration limits:

C ≥ 10%: Very toxic by inhalation. [R: 26]

5% ≤ C < 10%: Toxic by inhalation. [R: 23]

1% ≤ C < 5%: Harmful by Inhalation [R: 23]

Product: This gas mixture contains less than 1% Hydrogen Sulfide and does not meet the requirements for classification and labeling for dangerous substances under European Community Standards.

AIR:

EC EINECS/ELINCS NUMBER: Not listed.

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.

SECTION 16. OTHER INFORMATION

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 gas mixtures 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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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: **LD₅₀** - Lethal Dose (solids & liquids) which kills 50% of the exposed animals; **LC₅₀** - 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/m³** 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 **TDLo**, the lowest dose to cause a symptom and **TCLo** 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