

1. IDENTIFICATION

Product Name: Hydrogen Sulphide
SDS Number: 778987

Intended Use: Byproduct

Manufacturer/Supplier: CENOVUS ENERGY INC.
 500 Centre Street SE, PO Box 766
 Calgary, AB T2P 0M5

Prepared By: Cenovus Energy Inc. Health and Safety

Phone Number: 1-403-766-2000

Emergency Telephone: Cenovus 1-877-458-8080
 CANUTEC 1-613-996-6666 (Canada)
 CHEMTREC 1-800-424-9300

2. HAZARDS IDENTIFICATION

Classification

H220 -- Flammable gases -- Category 1
 H280 -- Gases under pressure -- Compressed gas
 H330 -- Acute toxicity, Inhalation -- Category 2
 H335 -- Specific target organ toxicity (single exposure) -- Category 3
 H400 -- Hazardous to the aquatic environment, acute toxicity -- Category 1

Hazards not Otherwise Classified

Contains poisonous hydrogen sulfide gas

Label Elements



DANGER

Extremely flammable gas. (H220)*
Contains gas under pressure. May explode if heated. (H280)*
Causes eye irritation. (H320)*
Contains poisonous hydrogen sulfide gas
Fatal if inhaled. (H330)*
May cause respiratory irritation. (H335)*
Very toxic to aquatic life. (H400)*

Precautionary Statement(s):

Keep away from heat/sparks/open flames/hot surfaces. - No smoking. (P210)*
 Do not breathe dust/fume/gas/mist/vapours/spray. (P260)*
 Use only outdoors or in a well-ventilated area. (P271)*
 Avoid release to the environment. (P273)*
 Wear respiratory protection. (P284)*
 In case of inadequate ventilation wear respiratory protection. (P285)*

Leaking gas fire: Do not extinguish, unless leak can be stopped safely. (P377)*
 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. (P305+P351+P338*)
 If eye irritation persists: Get medical advice/attention. (P313)*
 IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. (P340)* Immediately call a POISON CENTER or doctor/physician. (P310)*
 Specific treatment is urgent: maintain adequate ventilation and consider administration of 100% oxygen. Sodium nitrite may be a useful antidote. (P320)*
 Eliminate all ignition sources if safe to do so. (P381)*
 Store in a well-ventilated place. Keep container tightly closed. (P403+P233)*
 Store locked up. (P405)*
 Dispose of contents/container to approved disposal facility. (P501)*

* (Applicable GHS hazard code.)

3. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CASRN	Concentration ¹
Hydrogen Sulfide	7783-06-4	100

¹ All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

4. FIRST AID MEASURES

Eye Contact: For direct contact, remove contact lenses if present and easy to do. Immediately hold eyelids apart and flush the affected eye(s) with clean water for at least 15 minutes. Seek immediate medical attention.

Skin Contact: First aid is not normally required. However, it is good practice to wash any chemical from the skin.

Inhalation (Breathing): Immediately move victim away from exposure and into fresh air in a position comfortable for breathing. If respiratory symptoms or other symptoms of exposure develop, seek immediate medical attention. If victim is not breathing, clear airway and immediately begin artificial respiration. If breathing difficulties develop, oxygen should be administered by qualified personnel. Seek immediate medical attention.

Ingestion (Swallowing): This material is a gas under normal atmospheric conditions and ingestion is unlikely.

Most important symptoms and effects

Acute: Respiratory tract irritation.

Delayed: Pulmonary edema.

Notes to Physician: At high concentrations hydrogen sulfide may produce pulmonary edema, respiratory depression, and/or respiratory paralysis. The first priority in treatment should be the establishment of adequate ventilation and the administration of 100% oxygen. Animal studies suggest that nitrites are a useful antidote, however, documentation of the efficacy of nitrites in humans is lacking. If the diagnosis of hydrogen sulfide poisoning is confirmed and if the patient does not respond rapidly to supportive care, the use of nitrites may be an effective antidote if delivered within the first few minutes of exposure. For adults the dose is 10 mL of a 3% NaNO₂ solution (0.5 gm NaNO₂ in 15 mL water) I.V. over 2-4 minutes. The dosage should be adjusted in children or in the presence of anemia, and methemoglobin levels, arterial blood gases, and electrolytes should be monitored closely.

Other Comments: Before attempting rescue, first responders should be alert to the possible presence of hydrogen sulfide, a poisonous gas with the smell of rotten eggs, and should consider the need for respiratory protection (see Section 8). Remove casualty to fresh air as quickly as possible. Immediately begin artificial respiration if breathing has ceased. Consider whether oxygen administration is needed. Obtain medical advice for further treatment.

5. FIRE FIGHTING MEASURES



NFPA 704 Hazard Class

Health: 4 **Flammability:** 4 **Instability:** 0 (0-Minimal, 1-Slight, 2-Moderate, 3-Serious, 4-Severe)

Unusual Fire & Explosion Hazards: Extremely flammable. Contents under pressure. This material can be ignited by heat, sparks, flames, or other sources of ignition (e.g., static electricity, pilot lights, mechanical/electrical equipment, and electronic devices such as cell phones, computers, calculators, and pagers which have not been certified as intrinsically safe). Vapors may travel considerable distances to a source of ignition where they can ignite, flash back, or explode. May create vapor/air explosion hazard indoors, in confined spaces, outdoors, or in sewers. If container is not properly cooled, it can rupture in the heat of a fire. Hazardous combustion/decomposition products, including hydrogen sulfide, may be released by this material when exposed to heat or fire. Use caution and wear protective clothing, including respiratory protection.

Extinguishing Media: Dry chemical or carbon dioxide is recommended. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces.

Fire Fighting Instructions: For fires beyond the initial stage, emergency responders in the immediate hazard area should wear protective clothing. When the potential chemical hazard is unknown, in enclosed or confined spaces, a self contained breathing apparatus should be worn. In addition, wear other appropriate protective equipment as conditions warrant (see Section 8).

Isolate immediate hazard area and keep unauthorized personnel out. Stop spill/release if it can be done safely. If this cannot be done, allow fire to burn. Move undamaged containers from immediate hazard area if it can be done safely. Stay away from ends of container. Water spray may be useful in minimizing or dispersing vapors and to protect personnel. Cool equipment exposed to fire with water, if it can be done safely.

Hazardous Combustion Products: Combustion may yield oxides of sulfur. (See Section 10)

See Section 9 for Flammable Properties including Flash Point and Flammable (Explosive) Limits

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions: Extremely flammable. Contains poisonous hydrogen sulfide gas. If the presence of dangerous amounts of H₂S around the spilled product is suspected, additional or special actions may be warranted, including access restrictions and use of protective equipment. Spillages of liquid product will create a fire hazard and may form an explosive atmosphere. Keep all sources of ignition and hot metal surfaces away from spill/release if safe to do so. The use of explosion-proof electrical equipment is recommended. Beware of accumulation of gas in low areas or contained areas, where explosive concentrations may occur. Prevent from entering drains or any place where accumulation may occur. Ventilate area and allow to evaporate. Stay upwind and away from spill/release. Avoid direct contact with material. For large spillages, notify persons down wind of the spill/release, isolate immediate hazard area and keep unauthorized personnel out. Wear appropriate protective equipment, including respiratory protection, as conditions warrant (see Section 8). See Sections 2 and 7 for additional information on hazards and precautionary measures.

Environmental Precautions: Stop spill/release if it can be done safely. Water spray may be useful in minimizing or dispersing vapors. If spill occurs on water notify appropriate authorities and advise shipping of any hazard. If spill/release in excess of EPA reportable quantity (see Section 15) is made into the environment, immediately notify the National Response Center (phone number 800-424-8802).

Methods for Containment and Clean-Up: Notify relevant authorities in accordance with all applicable regulations.

Recommended measures are based on the most likely spillage scenarios for this material; however local conditions and regulations may influence or limit the choice of appropriate actions to be taken.

7. HANDLING AND STORAGE

Precautions for safe handling: Keep away from ignition sources such as heat/sparks/open flame – No smoking. Take precautionary measures against static discharge. May contain or release dangerous levels of hydrogen sulfide. Do not breathe gas. Use only outdoors or in well-ventilated area. Wear eye/face protection. Wear respiratory protection. Use good personal hygiene practices and wear appropriate personal protective equipment (see section 8).

Contents under pressure. The use of explosion-proof electrical equipment is recommended and may be required (see appropriate fire codes). Refer to NFPA-70 and/or API RP 2003 for specific bonding/grounding requirements. Electrostatic charge may accumulate and create a hazardous condition when handling or processing this material. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material. Do not enter confined spaces such as tanks or pits without following proper entry procedures such as ASTM D-4276 and 29CFR 1910.146. Cold burns may occur during filling operations. Containers and delivery lines may become cold enough to present cold burn hazard.

Conditions for safe storage: Keep container(s) tightly closed and properly labeled. This material may contain or release poisonous hydrogen sulfide gas. In a tank, barge, or other closed container, the vapor space above this material may accumulate hazardous concentrations of hydrogen sulfide. Check atmosphere for oxygen content, H₂S, and flammability prior to entry. Use and store this material in cool, dry, well-ventilated areas away from heat, direct sunlight, hot metal surfaces, and all sources of ignition. Store only in approved containers. Post area "No Smoking or Open Flame." Keep away from any incompatible material (see Section 10). Protect container(s) against physical damage. Outdoor or detached storage is preferred. Indoor storage should meet OSHA standards and appropriate fire codes.

"Empty" containers retain residue and may be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, or other sources of ignition. They may explode and cause injury or death. Avoid exposing any part of a compressed-gas cylinder to temperatures above 125F(51.6C). Gas cylinders should be stored outdoors or in well ventilated storerooms at no lower than ground level and should be quickly removable in an emergency.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Component	ACGIH	OSHA	Alberta
Hydrogen Sulfide	STEL: 5 ppm TWA: 1 ppm	Ceiling: 20 ppm	TWA: 10 ppm 8hr CEILING: 15 ppm

Note: State, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local agencies, for further information.

Engineering controls: If current ventilation practices are not adequate to maintain airborne concentrations below the established exposure limits, additional engineering controls may be required.

Eye/Face Protection: The use of gas/vapor tight eye protection that meets or exceeds ANSI Z.87.1 is recommended against potential eye contact, irritation, or injury. Depending on conditions of use, a full face respirator may be necessary.

Skin/Hand Protection: The use of skin protection is not normally required; however, good industrial hygiene practice suggests the use of gloves or other appropriate skin protection whenever working with chemicals. Wear thermal insulating gloves and face shield or eye protection when working with materials that present thermal hazards (hot or cold).

Respiratory Protection: A NIOSH approved, self-contained breathing apparatus (SCBA) or equivalent operated in a pressure demand or other positive pressure mode should be used in situations of oxygen deficiency (oxygen content less than 19.5 percent), unknown exposure concentrations, or situations that are immediately dangerous to life or health (IDLH).

A respiratory protection program that meets or is equivalent to OSHA 29 CFR 1910.134 and ANSI Z88.2 should be followed whenever workplace conditions warrant a respirator's use.

Other Protective Equipment: Eye wash and quick-drench shower facilities should be available in the work area. Thoroughly clean shoes and wash contaminated clothing before reuse.

Suggestions provided in this section for exposure control and specific types of protective equipment are based on readily available information. Users should consult with the specific manufacturer to confirm the performance of their protective equipment. Specific situations may require consultation with industrial hygiene, safety, or engineering professionals.

9. PHYSICAL AND CHEMICAL PROPERTIES

Note: Unless otherwise stated, values are determined at 20°C (68°F) and 760 mm Hg (1 atm). Data represent typical values and are not intended to be specifications.

Appearance:	Colorless
Physical Form:	Compressed Gas
Odor:	Rotten egg / sulfurous
Odor Threshold:	No data
pH:	Not applicable
Vapor Pressure:	14000 mm Hg @ 68°F / 20°C
Vapor Density (air=1):	1.19
Initial Boiling Point/Range:	-76 °F / -60 °C
Melting/Freezing Point:	-122 °F / -86 °C
Solubility in Water:	Soluble
Partition Coefficient (n-octanol/water) (Kow):	No data
Specific Gravity (water=1):	1.54 (liquid under pressure)
Percent Volatile:	100%
Evaporation Rate (nBuAc=1):	>1
Flash Point:	< -76 °F / < -60 °C
Test Method:	(estimate)
Lower Explosive Limits (vol % in air):	4.3
Upper Explosive Limits (vol % in air):	46.0
Auto-ignition Temperature:	500 °F / 260 °C

10. STABILITY AND REACTIVITY

Stability: Stable under normal ambient and anticipated conditions of use.

Conditions to Avoid: Avoid all possible sources of ignition. Heat will increase pressure in the storage tank.

Materials to Avoid (Incompatible Materials): Avoid contact with acids and strong oxidizing agents.

Hazardous Decomposition Products: Not anticipated under normal conditions of use.

Hazardous Polymerization: Not known to occur.

11. TOXICOLOGICAL INFORMATION

Information on Toxicological Effects of Substance/Mixture

<u>Acute Toxicity</u>	<u>Hazard</u>	<u>Additional Information</u>	<u>LC50/LD50 Data</u>
Inhalation	Fatal if inhaled	Contains poisonous hydrogen sulfide gas. See Signs and Symptoms.	444 ppm (gas)
Skin Absorption	No information available		Not Applicable
Ingestion (Swallowing)	Ingestion is not anticipated		Not Applicable

Aspiration Hazard: Not applicable

Skin Corrosion/Irritation: Skin exposure is not anticipated.

Serious Eye Damage/Irritation: Causes eye irritation.

Signs and Symptoms: Hydrogen sulfide is a poisonous gas with the smell of rotten eggs. The smell disappears rapidly because of olfactory fatigue so odor may not be a reliable indicator of exposure. Effects of overexposure include irritation of the eyes, nose, throat and respiratory tract, blurred vision, photophobia (sensitivity to light), and pulmonary edema (fluid accumulation in the lungs). Severe exposures can result in nausea, vomiting, muscle weakness or cramps, headache, disorientation and other signs of nervous system depression, irregular heartbeats, convulsions, respiratory failure, and death. This material contains hydrogen sulfide, a poisonous gas with the smell of rotten eggs. The smell disappears rapidly because of olfactory fatigue so odor may not be a reliable indicator of exposure. Effects of overexposure include irritation of the eyes, nose, throat and respiratory tract, blurred vision, photophobia (sensitivity to light), and pulmonary edema (fluid accumulation in the lungs). Severe exposures can result in nausea, vomiting, muscle weakness or cramps, headache, disorientation and other signs of nervous system depression, irregular heartbeats, convulsions, respiratory failure, and death. Contains gas(es) which can cause asphyxiation at high concentrations by displacing oxygen. Symptoms of overexposure may include headache, fatigue, weakness, mental confusion, mood disturbances, and decreased coordination and judgment. Continued exposure can lead to hypoxia (inadequate oxygen), rapid breathing, impaired vision, ringing in the ears, cyanosis (bluish discoloration of skin), numbness of the extremities, unconsciousness and death.

Skin Sensitization: No information available.

Respiratory Sensitization: No information available.

Specific Target Organ Toxicity (Single Exposure): May cause respiratory irritation.

Specific Target Organ Toxicity (Repeated Exposure): Not expected to cause organ effects from repeated exposure.

Carcinogenicity: No information available. This substance is not listed as a carcinogen by IARC, NTP or OSHA.

Germ Cell Mutagenicity: Inadequate information available.

Reproductive Toxicity: Inadequate information available.

Other Comments: High concentrations may reduce the amount of oxygen available for breathing, especially in confined spaces. Hypoxia (inadequate oxygen) during pregnancy may have adverse effects on the developing fetus.

Information on Toxicological Effects of Components

12. ECOLOGICAL INFORMATION

Toxicity: H400: Very toxic to aquatic life.

Other Adverse Effects: None anticipated.

13. DISPOSAL CONSIDERATIONS

This material is a gas and would not typically be managed as a waste.

14. TRANSPORT INFORMATION

Canadian (TDG)

Shipping Description: UN1053, Hydrogen sulfide, 2.3, (2.1)
Small Means of Containment
Package Marking: Hydrogen sulfide, UN1053
Package Labeling: Toxic gas and Flammable gas
Large Means of Containment
Package Placard/Marking: Toxic gas / 1053
ERAP Index: 500
Emergency Response Guide: 117

U.S. Department of Transportation (DOT)

Shipping Description: UN1053, Hydrogen sulfide, 2.3;; , (2.1), Poison-Inhalation Hazard, Zone B RQ *

Non-Bulk Package Marking: Hydrogen Sulfide, UN1053
Non-Bulk Package Labeling: Poison gas and Flammable gas
Bulk Package/Placard Marking: Poison gas / 1053, Inhalation Hazard
Packaging - References: None; 49 CFR 173.304; 173.314 & .315
(Exceptions; Non-bulk; Bulk)

Hazardous Substance: See Section 15 for RQ`s
Emergency Response Guide: 117
Note: * *Omit "RQ" if the amount in a single packaging is less than the EPA Reportable Quantity amount shown in Section 15 for the hazardous substance. The following alternate shipping description order may be used until January 1, 2013:*
Proper Shipping name, Hazard Class or Division, (Subsidiary Hazard if any), UN or NA number, Packing Group Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code: Not applicable Other shipping description elements may be required for DOT compliance.

International Maritime Dangerous Goods (IMDG)

Shipping Description: UN1053, Hydrogen Sulphide, 2.3;; , (2.1)
Non-Bulk Package Marking: Hydrogen Sulphide, UN1053
Labels: Toxic gas , Flammable gas
Placards/Marking (Bulk): Toxic gas / 1053 and Flammable gas
Packaging - Non-Bulk: P200
EMS: F-D, S-U
Note: ***U.S. DOT compliance requirements may apply. See 49 CFR 171.22, 23 & 25.***

International Civil Aviation Org. / International Air Transport Assoc. (ICAO/IATA)

UN/ID #: *Forbidden*

	LTD. QTY	Passenger Aircraft	Cargo Aircraft Only
Packaging Instruction #:	---	---	---
Max. Net Qty. Per Package:	---	---	---

15. REGULATORY INFORMATION

CERCLA/SARA - Section 302 Extremely Hazardous Substances and TPOs (in pounds):

This material contains the following chemicals subject to the reporting requirements of SARA 302 and 40 CFR 372:

Component	TPO	EPCRA RQ
Hydrogen Sulfide	500 lb	100 lb

CERCLA/SARA - Section 311/312 (Title III Hazard Categories)

Acute Health: Yes
 Chronic Health: No
 Fire Hazard: Yes
 Pressure Hazard: Yes
 Reactive Hazard: No

CERCLA/SARA - Section 313 and 40 CFR 372:

This material does not contain any chemicals subject to the reporting requirements of SARA 313 and 40 CFR 372.

EPA (CERCLA) Reportable Quantity (in pounds):

This material contains the following chemicals subject to the reporting requirements of 40 CFR 302.4:

Component	RQ
Hydrogen Sulfide	100 lb

California Proposition 65:

This material does not contain any chemicals which are known to the State of California to cause cancer, birth defects or other reproductive harm at concentrations that trigger the warning requirements of California Proposition 65.

International Hazard Classification

Canada:

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the Regulations.

WHMIS Hazard Class:

A - Compressed Gas
 B1 - Flammable Gases
 D1B
 D2B

National Chemical Inventories

All components are either listed on the US TSCA Inventory, or are not regulated under TSCA All components are either on the DSL, or are exempt from DSL listing requirements

U.S. Export Control Classification Number: EAR99

16. OTHER INFORMATION

Date of Issue:	May 15, 2017
Status:	FINAL
Previous Issue Date:	April 3, 2012; January 13, 2012
SDS Number:	778987

Guide to Abbreviations:

ACGIH = American Conference of Governmental Industrial Hygienists; CASRN = Chemical Abstracts Service Registry Number; CEILING = Ceiling Limit (15 minutes); CERCLA = The Comprehensive Environmental Response, Compensation, and Liability Act; EPA = Environmental Protection Agency; GHS = Globally Harmonized System; IARC = International Agency for Research on Cancer; INSHT = National Institute for Health and Safety at Work; IOPC = International Oil Pollution Compensation; LEL = Lower Explosive Limit; NE = Not Established; NFPA = National Fire Protection Association; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration; PEL = Permissible Exposure Limit (OSHA); SARA = Superfund Amendments and Reauthorization Act; STEL = Short Term Exposure Limit (15 minutes); TLV = Threshold Limit Value (ACGIH); TWA = Time Weighted Average (8 hours); UEL = Upper Explosive Limit; WHMIS = Worker Hazardous Materials Information System (Canada)