H_2S

The Killer

Alberta
HUMAN RESOURCES AND EMPLOYMENT
the people & workplace department

HYDROGEN SULPHIDE INITIAL RESPONSE PROCEDURES

1. Evacuate

- Get to a safe area immediately
- Move upwind if release is downwind of you
- Move crosswind if release is upwind of you
- Move to higher ground if possible

2. Alarm

- Call for help ("Man Down"), sound bell, horn whistle or call by radio

3. Assess

- Do a head count
- Consider other hazards

4. Protect

- Put on breathing apparatus before attempting rescue

5. Rescue

- Remove victim to a safe area

6. Revive

- Apply rescue breathing if necessary

7. Medical Aid

- Arrange transport of victim to medical aid
- Provide information to Emergency Medical Services (EMS)

The information on this page is taken from "H_2S Alive," a publication of the Petroleum Industry Training Service. It has been reprinted here, with permission.

INTRODUCTION

The purpose of this booklet is to alert employers and workers to the dangers involved in working with H_2S and to provide guidance for controlling these dangers.

Hydrogen sulphide gas is one of the most deadly occupational hazards in Alberta. It goes by many names: H_2S, sour gas, sewer gas, stink damp, and sulfuretted hydrogen.

Workers in the oil and gas industry must be aware of its deadly properties. Sewer maintenance crews, blasters, and miners have learned to respect this gas.

Employers must ensure that workers who may be exposed to H_2S gas are able to recognize its lethal effects. Procedures must be in place to ensure that victims who are overcome are rescued and given first aid.

BE ALERT! TAKE EVERY PRECAUTION

SOURCES OF H_2S

GAS PLANTS
REFINERIES
PETRO-CHEMICAL PLANTS
SULFUR RECOVERY PLANTS

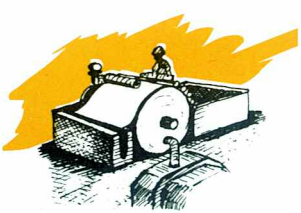
UNDERGROUND MINES

TANK CARS
TANK TRUCKS

SEPTIC TANKS, SEWERS

OIL & GAS WELLS, BATTERY STATIONS

COMMERCIAL LABORATORIES



PULP & PAPER MILLS

PIPELINES

PROPERTIES OF H_2S

COLOUR	Colourless
ODOUR	Very offensive, commonly referred to as odour of rotten eggs at low concentration
	1.188 at 25°C
VAPOUR DENSITY	1.189 (Air = 1.0)
	H_2S in its pure form is heavier than air
EXPLOSIVE LIMITS	4.3 to 46.0 percent by volume in air
AUTO IGNITION TEMPERATURE	260°C
FLAMMABILITY	Forms explosive mixture with air or oxygen
WATER SOLUBILITY	2.9 percent (2.9 g/100 ml water at 20°C)

EFFECTS OF H_2S

1 ppm	Can be smelled.
10 ppm	Alberta Occupational Exposure Limit (OEL). Allowable for 8 hours of exposure.
15 ppm	Alberta Ceiling OEL. An unprotected worker may not be exposed above this concentration.
20-50 ppm	Severe eye irritation. Nose, throat and lung irritation. Loss of appetite.

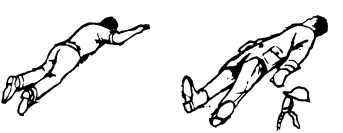
100-200 ppm	Severe nose, throat and lung irritation. Ability to smell odour completely disappears (150 ppm)
500 ppm	Severe lung irritation. Headaches, dizziness, staggering, collapse.
500-1000 ppm	Respiratory paralysis. Irregular heart beat, collapse or death.

ppm = Parts of gas per million parts of air by volume.
1% = 10,000 ppm

DETECTION OF H_2S

Hydrogen Sulphide in low concentrations is easily recognizable by its characteristic foul odour similar to rotten eggs. **However**, continued exposure or exposure to concentrations over 100 ppm will temporarily eliminate one's ability to smell the gas. The effect usually misleads the worker into thinking the danger has passed; often with tragic results.

The acute effects of H_2S on the body are twofold. H_2S acts as an irritant to eyes, nose, throat and lungs, and it acts as an internal poison causing unconsciousness by paralysis of the respiratory system.



WHEN TESTING FOR THE PRESENCE OF H_2S BE PREPARED FOR LETHAL CONCENTRATIONS

You can detect the presence of H_2S at less than 1 ppm by its odour. Unfortunately, it may be the last thing you ever smell. If the concentration of the gas is above the 100 ppm range the sense of smell is quickly deadened, giving a false sense of security that the danger has passed.

WARNING
You cannot rely on your nose to tell you how much H_2S is present!
Wear your respiratory protection.

To determine the presence of H_2S in your work area, one of the following means of detection should be used:

Continuous Monitors

In larger plants, a system is used where potentially hazardous areas are sampled by strategically located sensors. An alarm system is activated by any sensor and will give warning when the H_2S concentration rises above preset limits for the area sampled.

Personal Monitors

Battery worn H_2S monitors can be carried or worn by individual workers to indicate the concentration of H_2S to which they are being exposed.

Portable Monitors

Familiarize yourself with the detection equipment at your work site. Learn its proper operation. Maintain and operate it according to the manufacturer's specifications.
YOUR LIFE MAY DEPEND ON IT!

PROTECTION

When you are in an area where H_2S is a potential hazard, you must wear approved personal protective and respiratory protective equipment required by the Alberta *Occupational Health and Safety (OHS) Code, Part 18.*

The employer must:

- select respiratory protective equipment in accordance with the CSA Standard Z94.4-02, *Selection, Use and Care of Respirators*
- prepare a written code of practice regarding the selection, maintenance and use of respiratory protective equipment
- ensure that all equipment used is approved by NIOSH or another organization approved by a Director of Occupational Hygiene
- ensure that respiratory protective equipment is stored and maintained properly

- fit test equipment in accordance with the CSA Standard Z94.4-02, *Selection, Use and Care of Respirators*

- ensure that workers are clean shaven where the face piece of the respirator seals to the skin of the face

- if conditions at the work site may become immediately dangerous to life or health, workers must wear positive pressure self-contained breathing apparatus that meets the requirements in section 251 of the *OHS Code.*

TWO COMMON TYPES OF RESPIRATORY PROTECTION FOR H_2S

Self-Contained Breathing Apparatus

This type of apparatus supplies compressed air from a cylinder worn on the back to a full facepiece. This apparatus must be of the type that maintains positive pressure in the facepiece.

The cylinder must be rated to supply air for at least 30 minutes.

Heavy physical work will consume available air more quickly.

All self-contained breathing apparatus must be equipped with an alarm to warn when the air pressure is low.

Self-contained breathing apparatus

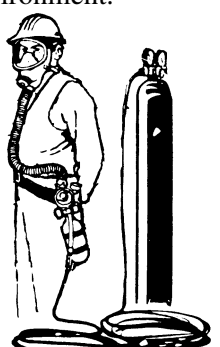
Supplied Air Breathing Apparatus

This apparatus supplies respirable air from cylinders, or a compressor in a remote location, via a hose to a full facepiece. This apparatus must be of a type that maintains positive pressure in the facepiece.

An emergency escape bottle must be worn with this type of equipment in case of an interruption of supplied air.

The emergency escape bottle is for escape purposes only and must never be used alone to carry out work in an H_2S environment.

NOTE: To prevent inward leaks of contaminated air, the worker must be clean shaven where the facepiece contacts the skin of the face.



Supplied air breathing apparatus

SPECIAL REQUIREMENTS

The first concern in any area contaminated with H_2S is the protection of the life and health of the worker. There are certain jobs which cause H_2S to be released into the air. When working inside vessels, tanks, etc., workers must be protected by respiratory protective equipment and practice safe work procedures.

A number of precautions must be observed if protection is to be adequate for the worker:

- The employer must take steps to eliminate or control the hazard from H_2S, if this is reasonably practicable.
- If the work involves entry into a confined space, the requirements in Part 5 of the *OHS Code* must be complied with.
- Since H_2S is a flammable gas, requirements in Part 10 of the *OHS Code* apply.

- If the work shift is more than 8 hours, the OEL for H_2S must be adjusted, using the formula in section 18, Part 4 of the *OHS Code.*

- A written code of practice is required for work sites where there is more than 10 kg of H_2S present as a pure substance, or there is a mixture in which there is more than 10 kg of H_2S and the concentration of H_2S is more than 0.1 percent by weight.

RESCUE & FIRST AID

ALWAYS PUT ON RESPIRATORY PROTECTION BEFORE ATTEMPTING ANY RESCUE.

YOU COULD BECOME A VICTIM!

It is VITALLY IMPORTANT that everyone working around or near H_2S has a good working knowledge or artificial respiration (rescue breathing):

- Training in C.P.R. (cardiopulmonary resuscitation) would be a strongly recommended addition to a worker's knowledge and skills in first aid.

- Part 11 of the *OHS Code* requires that personnel be trained in first aid.

- It is important when workers use respiratory protective equipment for rescue that they are aware of the limitations of each type of equipment.

- Regular practice and training in rescue are necessary to provide appropriate rescue capability at the work site.

- Part 7 of the *OHS Code* provides requirements for emergency preparedness and response.

EMPLOYER RESPONSIBILITY

The employer has key responsibilities for injury and incident prevention. It is most important to:

- Know and inform workers about the company policy on H_2S.
- Know safe work procedures and include them in instructions when teaching job methods.
- Identify unsafe conditions and actions.
- Take IMMEDIATE and appropriate action when H_2S is suspected or detected.
- Know the workers under your supervision well enough to notice any changes in attitude or physical/mental condition that may be due to H_2S exposure.

- Be aware of training required for H_2S environments where work may be done that could endanger a worker. A worker must either be competent or directly supervised by a competent worker.

- Conduct sessions to inform workers of the "Code of Practice" and "Safe Work Procedures" that are used on your work site prior to commencement of work.

- Ensure that safety meetings are held for workers. These should be used for instruction, review or discussion of unsafe conditions or actions which have been observed. Workers should be encouraged to take an active part in these meetings. Their constructive suggestions help keep safe work practices up to date.

- Ensure workers have appropriate first aid training.

- Ensure that personal protective equipment used by the worker does not endanger their health and safety.

WORKER RESPONSIBILITY

The worker, as well as the employer, has responsibilities under the *Occupational Health and Safety Act.*

- When workers must wear personal protective equipment, they must use the appropriate equipment and they must not use personal protective equipment that is not in a condition to perform the function for which it was designed.

- Workers with equipment under their control that does not comply with the *OHS Code* must remove that equipment from service.

- Workers must be aware of the "Code of Practice" developed for jobs involving confined space entry and must not enter or remain in a confined space if control measures are not in place.

- Participate in training programs provided by the employer.

Getting copies of OHS Act, Regulation & Code:

Queen's Printer

www.qp.gov.ab.ca

Edmonton (780) 427-4952
Calgary (403) 297-6251

Workplace Health and Safety

www.whs.gov.ab.ca/law/index.html

Call any Government of Alberta office toll-free
Dial 310-0000,
then the telephone number you want to reach

How to contact us:

Province-Wide Contact Centre

Edmonton
(780) 415-8690

Other Locations
1-866-415-8690

Deaf or hearing impaired
- Edmonton (780) 427-9999
- Other locations 1-800-232-7215

Internet Web Site

www.whs.gov.ab.ca

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