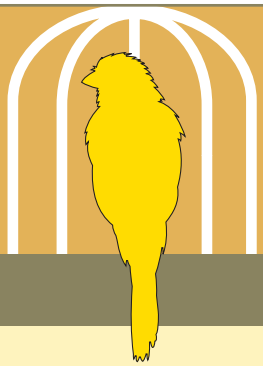
Hydrogen Sulfide

HEALTH AND SAFETY FACT SHEET

CUPE Canadian Union of Public Employees



What is hydrogen sulfide?

Hydrogen sulfide (H_2S) is a dangerous gas. It is created as a by-product in many industrial processes and occurs naturally through the decomposition of organic matter. It has several names including but not limited to: dihydrogen sulfide, sulfur hybrid and hydrosulfuric acid. However, its most common names are stink damp, sour gas or sewer gas.

At lower concentrations, H_2S has a distinctive rotten-egg odour, but smell is a poor warning sign. While initially workers can smell H_2S, they can be quickly acclimated to the smell (known as olfactory fatigue) which quickly numbs the sense of smell. This makes detection of continual exposure through the sense of smell almost impossible.

Why is it a hazard?

H_2S is slightly heavier than air and is therefore especially dangerous in low-lying areas, including confined or enclosed workspaces where it can displace normal atmosphere. In areas where the gas can gather, H_2S becomes immediately dangerous to life or health (IDLH) starting at levels of 100ppm. No worker should enter an area of 100ppm without a self-contained air supply. At elevated temperatures (260^0 C) hydrogen sulfide reacts explosively.

At lower levels, H_2S is a deadly poison and can be lethal within hours of exposure. Most exposure occurs by inhalation. When inhaled, it goes through the lungs and enters the bloodstream. To protect itself, the body tries to break down the hydrogen sulfide as fast as possible into a harmless compound. Poisoning occurs when the amount absorbed in the blood exceeds the rate at which it is eliminated.

Sub-acute exposure (exposure to lower levels) may result in headaches, dizziness, loss of balance, agitation, nausea, diarrhea. Chronic poisoning (repeated exposure to low levels) may result in symptoms that include slowed pulse rate, fatigue, insomnia, cold sweat, eye infections, loss of weight and skin eruptions.

At higher concentrations, workers might notice a sweet smell, but at greater concentrations, hydrogen sulfide can "paralyze" the sense of smell and workers can lose the ability to smell. In addition, some workers are congenitally (by birth) unable to smell hydrogen sulfide. That is why the air should always be monitored by instruments designed to detect hydrogen sulfide.

If caught in time, poisoning can be treated, and its effects may be reversible. Some workers may experience abnormal reflexes, dizziness, insomnia and loss of appetite that lasts for months or even years. Acute poisoning which does not result in death may produce long-term symptoms such as loss of memory, depression and paralysis of facial muscles.

Levels of exposure

Hydrogen sulfide is measured in parts per million (ppm). The levels of allowable exposure by unprotected workers were set in accordance with the American Conference of Governmental Industrial Hygienists (ACGIH). They recommended an 8-hour Threshold Limit Value (TLV) of 1 parts per million (ppm) and STEL (15 minute) of 5 ppm. Jurisdictional requirements for exposure levels can vary, and CUPE members

should check with their specific health and safety acts or regulations.

The safest exposure to hydrogen sulfide is no exposure at all.

Where is hydrogen sulfide found? Are you at risk?

CUPE members who perform work in places where organic material breaks down without oxygen are at greatest risk. These places include sewers, sewage treatment plants and other similar places. However, due to the nature of H_2S gas, workers who perform excavation work in open areas with high organic content (landfills, swamps, etc.) are also at risk.

It is important to note that enclosed and confined spaces are specific danger areas as they may be prone to the rapid build-up of hydrogen sulfide gas. A confined space is defined as any workplace (not necessarily small) which is wholly or partially enclosed and from which immediate escape is difficult (think of sewers, manholes, pits, tunnels, vats, tanks, ovens and even open-topped spaces more than four feet in depth). Depending on its function, a room or a building can also be considered an enclosed space.

Reducing the risk – a program for worker protection

Employers must have a comprehensive prevention and emergency response plan for any work that may expose workers to H_2S. Employers must train workers on work and emergency practices and fully brief them on work policies, including the knowledge of the hazards of H_2S exposure and how to use monitoring equipment.

Workplace air should be monitored, and hydrogen sulfide should be controlled. All areas where toxic gases are detected should be ventilated with a fresh airblower and include warning signs, including descriptions of exposure symptoms. The ventilation system should be non–sparking and inspected every six months. Any areas with sources of gas should be closed, blanked off (capped), locked and tagged.

Employers should permanently install gas monitors that are sensitive to low levels of hydrogen sulfide in key locations near the ground. Such devices should have sound alarms to warn workers when levels reach 10 ppm. If continual monitoring is not feasible, then a process for measuring H_2S levels before entry must be enacted to protect workers from exposure.

In addition, workers should also be equipped with portable monitors that can be clipped onto their belts and carried into confined spaces as a supplement – or used when fixed monitors are not appropriate. These should warn workers with audible alarms and coloured lights and have the capacity to be used continuously for more than the length of a worker's shift without recharging batteries.

H_2S is a deadly hazard. Employers must develop and adopt a confined spaces program whenever and wherever work is performed in confined spaces. Workers should be fully certified and trained before being assigned to enter such spaces (see CUPE's confined space fact sheet for more information).

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