

IMPORTANT HSE TOPICS

HYDROGEN SULPHIDE (H₂S) GAS MONITORS

When Should You Monitor for H₂S?

- » All areas where H₂S is present and may exceed 10 ppm must be checked to ensure H₂S concentrations are below 10 ppm).
- » All personal and remote monitors shall be set to alarm at 10 ppm.
- » Consideration should be given to wearing personal monitors in all areas where H₂S may be encountered, except where remote sensing is present.
- » Consideration should be given to supplement remote sensing with personal monitors if very high H₂S may occur.

What Types of Equipment are to be used to Measure H₂S?

- » **GAS DETECTOR TUBES:** The detector tubes contain chemical granules, which change color when air containing hydrogen sulfide is pulled through the tube by the hand pump. Common manufacturers include Draeger, RAE and Gastec. Only tubes and hand pumps made by the same manufacturer may be used together. A new tube must be used for each test and the user must be trained in their use and limitations.
- » **FIXED CONTINUOUS H₂S MONITORS:** are often installed in operational areas, which have a high risk of H₂S release. These monitors usually consist of a detector, or sensing head, beacon light and a horn installed out in the operational area, and an indicating meter and alarm inside the control room. When H₂S levels exceed 10 ppm, a signal passes from the detector to the meter and an alarm is sounded in the control room and operations area.
- » **PORTABLE CONTINUOUS H₂S MONITORS:** can be worn or carried. These detectors measure H₂S concentration electrically, and have an audio alarm that sounds when levels above 10 ppm are detected. Some types test for more than one gas (e.g., flammable gases, carbon monoxide and oxygen in addition to H₂S).

How Do You Test for H₂S?

Only conduct testing if you have been trained in the use and limitations of monitoring equipment.

When you suspect a gas leak:

- » Wear pressure-demand self-contained breathing apparatus (SCBA) or supplied air-breathing apparatus (SABA).
- » Use portable continuous H₂S monitors or gas detector tubes to find the source of the leak.

When you must enter a CONFINED SPACE* which may contain H₂S or H₂S Critical Tasks (see Appendix A) which require SCBA/SABA (see GS Selection and Use of RPE):

- » Wear pressure-demand self-contained breathing apparatus (SCBA) or supplied air-breathing apparatus (SABA) and a safety belt with a lifeline attached.
- » Test each compartment in the confined space, using a portable continuous monitor or a new tube for each test.
- » Perform gas tests more than once during the operation. Stirred up sludge may release H₂S.
- » Use a sampling pump with the extendible probe to test in confined spaces and in areas that are difficult to get to.
- » You may also need to check for other gases in addition to H₂S.

*Note: a confined space is any enclosed place or area having limited means of entry and exit. This includes tanks, columns, towers, pipelines, sewers, sumps, valve boxes, and excavations.

When you are do any other H₂S Critical Tasks (see Appendix A)?

- » Use a portable continuous monitor that has been calibrated and maintained in accordance with manufacturer's specifications.

What Happens if an H₂S Alarm Sounds?

- » Follow the site Emergency Response Plan for H₂S release (GS Advice for Implementers - Emergency Planning).
- » The plan will differ depending on the operation, but basically each operation employee must know how to:
 1. Sound an alarm to warn other people in the area.
 2. Put on a breathing apparatus to protect yourself and the others immediately.
 3. Evacuate to a safe upwind location after checking the wind direction.
- » Concentrations above 10 ppm require communication with other personnel to warn of an H₂S hazard and to ensure that further testing is performed.

How do you know if Monitors are Working Properly?

Portable and fixed continuous monitors MUST be regularly checked and maintained, or they may fail to sound an alarm when a gas release occurs. Routine maintenance also decreases the chance of a false alarm from the monitor.

- » Monitors must be checked at least quarterly by a qualified person or more frequently if recommended by the manufacturer (faulty monitors should be reported to be fixed immediately).
- » A known concentration of H₂S must be used to calibrate the monitor.
- » A regular schedule must be observed to calibrate the monitors. Keep a record of Calibration dates.
- » When a fixed monitor is being tested, EVERY PERSON in the area should be informed that a Test, and not an actual gas emergency, is in progress.
- » Before each use portable monitors must be checked to ensure batteries and the units are functioning. Only conduct maintenance and repair of these units in non-hazardous locations to prevent accidental ignition of combustible gases.
- » The presence of other gases may lead to false readings: typically high concentrations of sulphur dioxide result in higher than actual H₂S readings on the meter while high concentrations of nitrogen dioxide or chlorine result in lower than actual readings H₂S readings on the meter. Check with the manufacturer of your monitor if these gases are present at your worksite.

Fire and Explosion Hazards

H₂S is a flammable gas and many of the gases and vapours that accompany H₂S are flammable as well. As such, controlling for and monitoring of flammable atmospheres is also important. In particular when workers are in an environment greater than 10 ppm and using supplied-air respiratory protection, measurement of the atmosphere for flammability is still required. This introduces a challenge as high H₂S can poison combustible bead lower explosive limit (LEL) sensors; however, an infrared LEL sensor can be used that is not negatively affected by the presence of H₂S.

Information Training and Supervision:

Employer responsibilities

- » Ensuring the availability of required H₂S monitoring equipment and calibration supplies.
- » Ensuring that monitoring equipment is maintained in accordance with manufacturer's specifications.
- » Developing and implementing an emergency response plan for H₂S at their work site.

Supervisor responsibilities

- » Ensuring the availability of the Guidance Sheets required by the Safety Protocol for Chemical Management (GS Hydrogen Sulphide (H₂S) Gas Monitors).
- » Organizing the work to limit the time workers are exposed to hydrogen sulfide.
- » Educating workers about the hazards of and on hydrogen sulfide through completion of H₂S Alive training.
- » Providing backup personnel that have both of H₂S Alive training and training in local emergency response and rescue personnel if entry into atmospheres with more than 100 ppm.
- » Providing required respiratory protective and gas monitoring equipment

Worker responsibilities

- » Workers must participate in training and monitoring programs in the workplace
- » Workers must use and maintain all controls and equipment used to reduce exposure properly
- » Workers must use respiratory protective and gas monitoring equipment if required.

PRECAUTIONS YOU SHOULD TAKE

- Ask your employer about the risks, what precautions to take and what to do in an emergency;
- Follow the safe working procedures laid down by your employer;
- Keep your H₂S Alive Training current;
- Use the gas monitoring equipment and personal protective equipment provided, i.e. respiratory protection and H₂S monitors,
- Don't enter any area that may contain H₂S before it has been tested.
- Report to your employer or safety representative any damaged or defective H₂S monitoring systems or protective equipment; and at your workplace.

Appendix A: Examples of Critical H2S Tasks

The following table should be used as a guide to operations where high hydrogen sulfide exposures may be expected. However, it is not comprehensive. A risk assessment of the work operation should be performed, taking into account the following:

- » H2S content of the process stream;
- » previous exposure monitoring results;
- » operation factors (e.g., purging, degassing, temperature/pressure of process stream), and;
- » ventilation

Task	H ₂ S Monitors Required	SCBA/SABA Required
Any task where a risk assessment has determined that hazardous H ₂ S concentrations may be present	yes	yes
Any time when H ₂ S concentration in the air is known or suspected to be >10 ppm	yes	yes
Any time there is an indication of equipment failure or product leak	yes	yes
Entering a confined space where H ₂ S may be present or contains sour liquids	yes	yes
Entering caissons, sewer, deep excavations or other low-lying areas where H ₂ S may be present	yes	yes
Routine operation of sewage-treatment facilities	Yes	no
Responding to H ₂ S alarms	yes	yes
Entering buildings with H ₂ S alarms/beacons activated	yes	yes
Well maintenance (valve, pump jack servicing, etc.)	yes	no
Pigging	yes	yes
Breaking equipment integrity or when > 10 ppm H ₂ S in air	yes	yes
Maintenance on equipment without breaking integrity	yes	no
Filter changes	yes	yes
Entering compressor basements	yes	yes
Responding to H ₂ S alarms	yes	yes
Sampling with open containers	yes	yes
Sampling with closed containers	yes	no
Gauging tanks	yes	yes
Maintenance on purged equipment	yes	no
Entering dikes/fire walls	yes	no
Routine operations	yes	no
General trucking sour fluids	yes	no
Uncoupling lines containing sour products	yes	yes
Sulphur truck loading with degassing	yes	no
without degassing	yes	yes
Sulphur rail car loading	yes	yes