



Training Solutions, Delivered!

HYDROGEN SULFIDE EMPLOYEE TRAINING

(Concise)

**Leader's Guide, Fact Sheet
& Quiz**

Item Number: 4043
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This easy-to-use Leader's Guide is provided to assist in conducting a successful presentation.

PREPARING FOR THE MEETING

Here are a few suggestions for using this program:

- a) Review the contents of the Fact Sheet that immediately follows this page to familiarize yourself with the program topic and the training points discussed in the program. The Fact Sheet also includes a list of Program Objectives that details the information that participants should learn from watching the program.
- b) If required by your organization, make an attendance record to be signed by each participant to document the training to be conducted.
- c) Prepare the area and equipment to be used for the training. Make sure the watching environment is comfortable and free from outside distractions. Also, ensure that participants can see and hear the TV screen or computer monitor without obstructions.
- d) Make copies of the Review Quiz included at the end of this Leader's Guide to be completed by participants at the conclusion of the presentation. Be aware that the page containing the answers to the quiz comes before the quiz itself, which is on the final page.

CONDUCTING THE PRESENTATION

- a) Begin the meeting by welcoming the participants. Introduce yourself and give each person an opportunity to become acquainted if there are new people joining the training session.
- b) Introduce the program by its title and explain to participants what they are expected to learn as stated in the Program Objectives of the Fact Sheet.
- c) Play the program without interruption. Upon completion, lead discussions about your organization's specific policies regarding the subject matter. Make sure to note any unique hazards associated with the program's topic that participants may encounter while performing their job duties at your facility.
- d) Hand out copies of the review quiz to all of the participants and make sure each one completes it before concluding the training session.

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FACT SHEET

LENGTH: 10 MINUTES

PROGRAM SYNOPSIS:

Hydrogen sulfide, a substance found in many workplaces, can be an invisible, silent killer if safe work practices aren't followed. Employees can work safely in areas with the potential of this dangerous gas by following their organization's Hydrogen Sulfide Contingency Plan, knowing how and when to use respiratory protection and knowing the meaning of their facility's hydrogen sulfide warning sounds and signals. This program reviews these three key issues and many other precautions that protect employees from H₂S exposures when followed.

Topics include characteristics of hydrogen sulfide, symptoms of H₂S exposure, use of respiratory protection, warning devices and monitoring systems and evacuation procedures

PROGRAM OBJECTIVES:

After watching the program, the participant will be able to explain the following:

- What the dangerous characteristics of hydrogen sulfide are;
- What the symptoms of H₂S exposure are;
- What respiratory protection is required for various concentration levels of hydrogen sulfide;
- How warning devices and monitoring systems are used to notify employees of hydrogen sulfide levels;
- How to safely evacuate an area where hydrogen sulfide has been released.

PROGRAM OUTLINE:

CHARACTERISTICS OF HYDROGEN SULFIDE

- Hydrogen sulfide is a deadly substance found in many workplaces. Understanding and controlling the hazards it presents is literally a matter of life and death.
- Your organization's Hydrogen Sulfide Contingency Plan contains detailed information designed to control the hazards of hydrogen sulfide.
- Hydrogen sulfide is a highly toxic, colorless gas that is heavier than air. Because it is heavier than air it will settle into low lying areas, creating a hazard if left undetected.
- Hydrogen sulfide is formed when two hydrogen atoms bond to an atom of sulfur. The chemical expression for this is H₂S. H₂S is another name for hydrogen sulfide. Besides H₂S, hydrogen sulfide is also referred to as dihydrogen sulfide, hydrosulfuric acid, sulfuretted hydrogen as well as nicknames such as rotten egg gas, swamp gas, devil's breath and stink damp, just to name a few.
- At low concentrations, hydrogen sulfide has an unpleasant odor similar to rotten eggs. As concentrations increase, its smell may turn very sweet, but you can never depend on detecting this odor for your safety.
- One reason hydrogen sulfide is so dangerous is that it can paralyze your sense of smell. This is called olfactory fatigue and it can occur very rapidly, especially at higher concentrations. Without proper air monitoring equipment, workers may be unaware they are being exposed to hydrogen sulfide.

SYMPTOMS OF EXPOSURE

- Concentrations of hydrogen sulfide are measured in parts per million. This is a measurement of how many molecules of hydrogen sulfide are present for every million molecules of air.
- The inhalation of hydrogen sulfide gas is the most common method of exposure. At concentration levels up to 10 parts per million, exposed workers may experience irritation of the eyes, nose and throat.
- As hydrogen sulfide concentrations increase to between 10 and 50 parts per million, exposed workers may begin to experience headaches, dizziness and coughing. Nausea and vomiting may also occur at these concentrations.
- Exposure at levels between 50 and 100 parts per million can result in the onset of conjunctivitis and respiratory tract irritation after a one-hour exposure.
- Conjunctivitis is the irritation and swelling of the membrane of the eye lids, which results in intense tearing, blurring of vision, light sensitivity and a gritty, scratchy feeling.

- One hundred parts per million is also the IDLH level for hydrogen sulfide. This level, established by the National Institute of Occupational Safety and Health, NIOSH, is the level at which you may suffer immediate, serious and irreversible damage from exposure. IDLH stands for Immediate Danger to Life and Health.
- Exposure at this level can lead to a loss of the sense of smell within two minutes and altered respiration and drowsiness can occur after 15 minutes. These symptoms will worsen with length of exposure.
- As concentration levels reach 500 to 700 parts per million, an exposed worker can lose consciousness and die in 30 to 60 minutes if not removed to fresh air and given proper medical treatment.
- When exposed to concentrations of hydrogen sulfide over 700 parts per million, unconsciousness can be very rapid and death will occur in a matter of minutes.

THE PERMISSIBLE EXPOSURE LIMIT

- The Federal Occupational Safety and Health Administration, OSHA, limits workplace exposure to hydrogen sulfide in its regulation 1910.1000-Air Contaminants.
- Table Z-2 of this regulation lists the “acceptable ceiling concentration” for hydrogen sulfide as 20 parts per million. A ceiling concentration is not a time-weighted average exposure, but rather a maximum level at any time in an eight-hour work shift.
- Table Z-2 also lists an “acceptable maximum peak” above the “acceptable ceiling concentration” of 50 parts per million for a duration of 10 minutes if no other measurable exposure has occurred.

ENGINEERING CONTROLS

- Once hydrogen sulfide concentrations reach the permissible exposure limit defined in your facility’s contingency plan, actions must be taken to reduce employee exposure.
- When possible, implementing engineering controls is always the first choice to reduce employee exposure to hydrogen sulfide.

RESPIRATORY PROTECTION

- If the company cannot reduce the concentration of hydrogen sulfide to less than the permissible exposure limit, exposed workers will be required to wear respiratory protection.
- SCBA stands for “self-contained breathing apparatus” and requires that the user carry a limited air supply on their back.
- SAR stands for “supplied-air respirator.” This type of respirator utilizes purified air supplied from a hose connected to a compressor.

WARNING DEVICES & MONITORING SYSTEMS

- Some work areas always have the possibility of a release of hydrogen sulfide above the permissible exposure limit.
- All areas with the potential for H₂S will also have various devices and monitoring systems to detect the presence of the gas. In some cases, fixed-point monitors will be installed, while in other areas portable or handheld monitors may be used.
- In either case, these monitors will be calibrated to sound a warning when hydrogen sulfide levels reach the predetermined action levels in your facility’s Hydrogen Sulfide Contingency Plan. Many facilities utilize a two-level warning system.
- For example, one type of warning may be given to alert workers when hydrogen sulfide levels approach the permissible exposure limit or a limit specified by your organization. This type of warning may require nonessential workers to leave the area and essential workers to don appropriate respiratory protection.
- Should hydrogen sulfide levels go even higher, such as approaching the IDLH level or other level specified by your organization, an evacuation warning may be given.
- Make sure you understand what visual and/or audible signals are used at your facility and their meaning.

SAFE EVACUATION PROCEDURES

- If an evacuation alarm sounds, you should move upwind swiftly and if possible, uphill. Avoid low lying areas as hydrogen sulfide is heavier than air and will collect in these types of areas.
- If you are not wearing a respirator when an evacuation alarm sounds, hold your breath as long as possible while evacuating. If you have access to a proper respirator, quickly put it on.

- Areas with the potential for hydrogen sulfide releases will have a visible wind indicator such as a wind sock or streamers to help determine wind direction.
- These areas should also have more than one escape route to facilitate a safe evacuation. Employees working in hydrogen sulfide-prone areas should remain conscious of wind direction and escape routes.
- Evacuating employees must report to a designated briefing area so each person can be accounted for. Briefing areas should also be set up at least 250 feet away and upwind from hydrogen sulfide-prone areas.
- During a hydrogen sulfide incident, never attempt to assist a fallen worker unless you are wearing appropriate respiratory protection and are trained to assist.
- In this situation, being a Good Samaritan can easily kill you. The same concentration of hydrogen sulfide that quickly overcame your co-worker will just as quickly overcome you.
- Instead, head straight to the briefing area and report the location of your fallen worker. A properly-outfitted and trained rescue team can then retrieve the fallen worker and quickly get him to fresh air and medical attention.
- After a release of hydrogen sulfide, do not return to the area until it has been monitored and rendered safe to enter.

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ANSWERS TO THE REVIEW QUIZ

1. a

2. c

3. b

4. c

5. b

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REVIEW QUIZ

The following questions are provided to determine how well you understand the information presented in this program.

Name _____ Date _____

1. You should never depend on your sense of smell to detect the odor of hydrogen sulfide.
 - a. True
 - b. False

2. _____ is irritation and swelling of the eyelids that can occur at exposure levels between 50 and 100 parts per million of H₂S.
 - a. Amblyopia
 - b. Blepharospasm
 - c. Conjunctivitis

3. Which type of respirator requires the user to carry a limited air supply on his or her back?
 - a. Full-face chemical-cartridge respirator
 - b. Self-contained breathing apparatus (SCBA)
 - c. Supplied-air respirator (SAR)

4. If an evacuation alarm sounds, you should move swiftly _____.
 - a. Downwind and downhill
 - b. Toward flat ground
 - c. Upwind and uphill

5. Briefing areas used to account for employees during an evacuation should be set up at least 150 feet from H₂S-prone areas.
 - a. True
 - b. False