PURPOSE

The purpose of this program is to assure that all Company employees are protected while performing job tasks in which a potential Hydrogen Sulfide exposure could occur.

1. HAZARD DETERMINATION
2. The Company has determined that employee exposure to hydrogen sulfide gas on the temporary job site, may include, but not be limited to the following:

1. Exposure to accidental release of hydrogen sulfide gas coincidental to work being performed on piping, on mud lines, in mud pits, shell shakers, or any part of the mud handling system.
2. While performing service activities where work is being conducted on vessel connections, wellheads, stacks, riser or other tower/vessel components.
3. While conducting work activities in areas where the natural occurrence of hydrogen sulfide gas could be expected.
4. While performing any work related activity on a site where hydrogen sulfide gas is likely to be released. Areas where H2S might be found, includes, but may not be limited to:
* Oil and gas exploration
* Oil and gas production
* Oil and gas processing
* Petroleum refineries
* Chemical plants
1. The Company realizes that employees may incur an additional risk of exposure to hydrogen sulfide as a result of accidental releases, or the accumulation of harmful concentrations of hydrogen sulfide above the permissible exposure limit from sources such as, but not limited to:
* Storage Tanks
* Field Maintenance
* Drilling Operations
* Water from Sour Crude Wells
* Tank Batteries and Wells, etc.

C. Hydrogen sulfide goes by many different names on the temporary job site. You should familiarize yourself with them all. No matter what name, hydrogen sulfide is a very deadly gas. Some of the most common names appear below:

* H2S
* Sewer Gas
* Sour Crude
* Stink Damp
* Swamp Gas
* Rotten Egg Gas
1. PROPERTIES AND TOXICITY INFORMATION
2. GENERAL
3. Employees should consider any release of hydrogen sulfide into the atmosphere as reason to take immediate action to protect themselves. Hydrogen sulfide is an extremely toxic gas, and can affect you depending upon these four factors:
* Duration: The length of time you are exposed to hydrogen sulfide gas (without regard to respiratory equipment) will greatly increase your susceptibility.
* Frequency: Employees who work in areas where hydrogen sulfide gas is present can increase susceptibility to the effects of this deadly gas when it is necessary to perform job related activities in the area on a concurrent basis. On the job site, employees can shorten actual work hours or increase break times, for instance, to control the frequency of exposure.
* Intensity (Concentration): Localized levels of hydrogen sulfide are easily detected with a properly calibrated direct-reading instrument.
* Individual Susceptibility: Since it is difficult to always be certain that every employee is in excellent physical condition, it would unreasonable to assume that an employee could withstand unprotected exposure to hydrogen sulfide. It is because of this uncertainty that The Company recommends the use of the appropriate respiratory protection.
1. Some existing health conditions can also make you more susceptible to the effects of hydrogen sulfide, and must be taken seriously. These include, but may not be limited to:
* Anemia
* Diabetes
* Emphysema
* Eye Infections
* Hepatitis B Virus
* Grand Mal Epilepsy
* Perforated Ear Drum
* Human Immunodeficiency Syndrome (HIV)
1. Hydrogen sulfide can paralyze your breathing system, causing your lungs to shut down. Even in small amounts it is dangerous to your health, and may smell like rotten eggs. However, employees should never trust smell to detect hydrogen sulfide, as it quickly deadens the sense of smell.
2. NIOSH establishes a threshold limit of 10 ppm for exposure to hydrogen sulfide, without regard to respiratory or other protective equipment, based on an 8 hour time-weighted average (TWA).
3. The level which is considered IDLH, (immediately dangerous to life and health) is 100 ppm.
4. For the purpose of this program, employees will consider the below chart, indicative of the health effects associated with exposure to hydrogen sulfide, and at what levels signs and symptoms develop:
* 0.13 ppm: Minimal perceptible odor
* 4.60 ppm: Easily detectable, moderate odor
* 10 ppm: Beginning eye irritation
* 27.0 ppm: Strong, unpleasant odor, but not intolerable
* 100 ppm: Coughing, eye irritation, and loss of sense of smell after 2-15 minutes
* 200-300 ppm: Marked conjunctivitis (eye inflammation) and respiratory tract irritation after one hour of exposure
* 500-700 ppm: Loss of consciousness and possible death in 30 minutes to one hour
* 700-1000 ppm: Rapid unconsciousness, effects nerve centers of the brain which control breathing, and death
* 1000-2000 ppm: Unconsciousness at once, with early cessation of breathing and death in a few minutes. Death may occur even if the employee is removed to fresh air at once.
1. PROPERTIES OF HYDROGEN SULFIDE
2. Hydrogen sulfide is toxic, colorless gas with an offensive odor (rotten eggs) at low concentrations.
3. Hydrogen sulfide has other characteristics, which make it difficult to work in. These include, but may not be limited to:
* Heavier than air, so it tends to settle in low-lying and non-well ventilated areas. Even when using mechanical ventilation, employees should ensure that gas is not being directed to an area where it can settle on the platform or to other lower lying areas on the job site, where other individuals will be working. Additionally, because hydrogen sulfide is heavier than ambient air (approximately 19%), it can travel along the ground. In sufficient enough concentrations, it may find an ignition source before wind currents can break it up.
* Soluble in liquids and therefore mixes easily with drilling mud and other drilling fluids. On still foggy days, hydrogen sulfide can accumulate at dangerous levels.
* Causes corrosion, deformation and/or fracturing of certain metals (stress cracking) in pressurized lines, and especially at electrical contacts.
* Extremely flammable, in a range of 4.0% to 44% (NIOSH), by volume in air. If we were to interpret this, we could say with all assurances that hydrogen sulfide presents a serious danger of explosive or fire, if any percentages between 4.0% and 44% are detected in your work area. Employees, for the purpose of this policy, will not work in any hydrogen sulfide contaminated location where detectable levels, measured by a direct reading calibrated instrument, reveals levels in excess of .04% or less (preferably 0%).
* When ignited, hydrogen sulfide produces a toxic by product called Sulfur Dioxide SO2 (NIOSH threshold limit of 2 ppm). Remember, sulfur dioxide is created when hydrogen sulfide is ignited. If work practices are adjusted to where no spark creating tools or procedures are adhered to, and employees avoid working in areas where hydrogen sulfide levels are within the flammable range, such a catastrophic event can be avoided.
1. PERSONAL PROTECTIVE EQUIPMENT
2. Air-purifying respirators (APR): Employees are restricted from wearing air-purifying respirators while performing job related activities in an area where hydrogen sulfide exists above The Company imposed level (5 ppm). Once the 5 ppm level is reached, employees should remain clear of the area until levels have been restored to 0 ppm. Since air-purifying respirators do not protect you from accidental releases of hydrogen sulfide above the permissible exposure limit (20 ppm), they would be useless in the event of a substantial release.
3. Supplied-Air Respirators (SAR): When employees will perform job related duties where hydrogen sulfide is known to exist or are expected to be above the permissible exposure limit, NIOSH certified self-contained breathing apparatus or air-supplied respirators, connected to a remote breathing air supply, in positive pressure mode will be used. The Company will provide for respiratory protection for its' employees, at no cost to employee, under these conditions:
4. The Company will occasionally rely upon the customer to provide Grade D or better breathable air from a supply provided by the customer. When such is the case, employees shall seek out the customer's safety representative and obtain orientation regarding the correct connections for air-lines as well as proper use of the equipment.
5. The Company may utilize the services of a third party supplier to both provide breathing air cylinders and masks while supplementing the company's respirator training and performing a fit test in accordance with 29 CFR1910.134 Amended CFR Part 84.
6. Self-Contained Breathing Apparatus (SCBA): It is the Company’s policy that any employee who works on a job site where breathing air stations are set up for emergency use during a hydrogen sulfide expulsion, receive orientation regarding the proper operation of the customer's SCBA soon after arrival to the job site.
7. OTHER PERSONAL PROTECTIVE EQUIPMENT
8. Eye Protection: The full face piece mask featured on the air-line supplied respirator and SCBA should provide adequate eye protection.
9. Skin Protection: Employees may wear "slicker suits" made of polyvinyl chloride (PVC), styrebutadiene or butyl rubber, and neoprene safety-toe boots to provide total skin protection. However, employees should continually monitor heat exposure to readily detect heat-related fatigue. When skin protection is not a priority factor, then “Tyvek” attire may be worn.
10. Hands: Employees should wear durable "impervious" gloves made of rubber as mentioned above.
11. Ears: Employees should wear "form-fitting" ear plugs and place the slicker suit hood over the head, securing with the draw string.
12. SITE SPECIFIC PROCEDURES
13. Land Jobs:
* Observe condition signs and posting.
* Look for audio/visual alarm locations.
* Observe other personnel and their activity.
* Seek out the customer safety representative.
* Note where the roadways enter and exit the area.
* Take note of areas of higher elevation than the work area.
* Observe and note the wind direction (wind socks or streamers are visual wind direction indicators).
1. Offshore Jobs:
* Observe signs and posting.
* Look for audio/visual alarms.
* Check wind-socks and/or streamers.
* Seek out the customer safety representative.
* Look for and identify the location of emergency use SCBA station.
* Observe the number of levels to the platform, therefore when your work area has been identified, you will be able to approximate your distance from breathing air stations and stairs, which lead to upper levels.
* Note the activity of other platform personnel (make a closer assessment prior to job start).
1. All Site Locations:
* Upon sounding of an H2S alarm, employees must evacuate the area and don either an SCBA or airline respirator.
1. Pre-Startup
2. Take the instrumentation provided by the company or the customer's safety representative to perform atmospheric testing in the area where you will be working. Always take current readings without regard to previous measurements taken by another person. If work area meets criteria of a confined space, employees must comply with the requirements set forth per 29 CFR 1910.146 and customer permitting requirements.
3. If detected levels exceed 5 ppm, use engineering controls to reduce the concentration to 0 ppm.
4. If detected levels are below 5 ppm, but not quite at zero, call the office for instructions. If there is no potential of additional exposure, it may be alright to start work under these conditions. Remember, however, that the lower explosive limit of hydrogen sulfide is 4.0%, so you want to ensure that no additional work practice controls need to be implemented in the event of a release.
5. Start work under continual atmospheric testing protocol.
6. H2S Emergencies
7. Individuals suffer through significant psychological changes during an emergency. Most often than not, it is due to poor preparation. By taking all of the appropriate steps, company employees provide themselves with a better chance of survival during a hydrogen sulfide emergency.
8. Company employees shall be made aware and are required to follow the customer's site specific instructions for emergency action and evacuation/abandonment where applicable.
9. Some key points to remember in a hydrogen sulfide emergency are listed below. Employees should remember them in order of importance in an effort to develop repetitive emergency behavior to be used in the event of an actual emergency:
* Do not panic: Not easy in the face of a disaster. But with proper pre-planning, once the "mild panic" subsides, you will be challenged mentally to derive at your next course of action. By going over procedures in your mind repetitiously these are the things you are likely to think of doing when the time arises.
* Go immediately to a location where breathing equipment is available. Make all attempts to hold your breath until you get to an area free from the hazard and can put the breathing equipment on.
* Put on the breathing apparatus as quickly as you can.
* Sound an alarm and alert facility management personnel (if not already done).
* Rescue victim(s) from the contaminated area (take to fresh air if possible).
* NOTE: Rescue should only begin after you have donned your respiratory equipment and you have been trained to do so. Employees should adhere in all instances to the principle of SELF-RESCUE.
* Revive victim(s) if necessary; if no one else has started to do so (see First Aid).
* Get medical attention for affected individuals in the work crew.
1. Offshore Emergencies
2. The recommended safe guideline for abandonment of a platform is when the hydrogen sulfide level in a "safe area" has exceeded 20 ppm as a general rule. However, the site personnel will order abandonment when such is necessary.
3. If an abandonment order is given, employees shall follow the emergency procedures discussed during site safety orientation.
4. An H2S "Red" emergency occurs when there is an abrupt hydrogen sulfide discharge, this level of contamination would be reached quickly, and there would be no question about the need for area evacuation or total abandonment. Because of the location of the toxic gas expulsion or weather conditions, the entire facility could likely have been enveloped by hydrogen sulfide. Fire might even be present or at least pose an additional threat.
5. An H2S "Blue" emergency occurs when a significant expulsion of hydrogen sulfide has occurred, but conditions have limited involvement to only specific areas or sectors of the platform. The levels of hydrogen sulfide exceed safe breathing levels and require the use of breathing air systems only in the affected sectors. Working only under mask is required, but at upwind areas of the facility away from the area of involvement.
6. An H2S "Yellow" alert means that there is a limited expulsion of hydrogen sulfide, and the level (20 ppm) does not exceed conditions that require the use of breathing system. Evacuation or abandonment of uncontaminated areas is not immediately necessary, but all personnel and support operations should be alerted of the potential danger and be ready to go to a condition blue.
7. An H2S "Green" alert means that no hydrogen sulfide is present in the atmosphere, or it is being successfully dispersed through a downwind flare. There is still a potential of a hydrogen sulfide expulsion, and periodic monitoring should continue.
8. FIRST AID

The recommended first aid measure for an individual who is exposed to hydrogen sulfide is to remove the victim to a source of fresh air at once. If trained to do so, follow standard First-Aid/CPR procedures for victim not breathing and/or no pulse.

1. MONITORING
2. Company employees are to use properly calibrated direct-reading instrumentation to detect and monitor for the presence of hydrogen sulfide which feature an alarm to alert the user when concentrations are 10 ppm, but less than 50 ppm.
3. Test instrumentation shall meet the following requirements:
* Is reliable within 10%.
* Is accurate within 20%.
* Is capable of triggering alarms.
* Has an operating range of up to 100 ppm.
* Warrants an over estimate bias less than 5%.
* Has an auxiliary power supply in fixed locations.
* Has a warm-up time of no more than 5 minutes.
* Has zero drift less than 5% of full scale in 24 hours.
* Has a response time of no more than 20 seconds at 50 ppm or more.
* Both the device and the alarm must be intrinsically safe (non-sparking) in hazardous environments.
1. The company may use non-stationary monitors (hand held) such as ampoules. When used employees should follow the below:
* Crush the ampoule and press flat in the middle to obtain a uniform saturation of the covering;
* Suspend the ampoule by its string in the air to test in accordance with the manufacturer's instructions;
* Note the color change; and
* Compare to the color chart to determine the level (chart measures from 1 to 20ppm).
1. The company may utilize sensitized tape to measure from 1 to 20 ppm. The sensitized tape should be used as follows:
* Leave a clean piece of tape exposed in the small window on tape carrier;
* Look for color change; and
* Compare the shade of darkness to coinciding level displayed on the tape carrier to determine concentration.
1. The company may also opt to use the Sensedyne "pump" to take sample from surrounding air. When used the operator will do the following:
* Break both ends of the tube;
* Place one end of the tube into the pump or into the Rubber extension at the end of the pump (ensure that pump handle is pushed all the way in);
* Slowly draw air through the tube;
* Note the color change;
* The number on the side of the tube where the color stops is indicative of the approximate concentration.
1. EMPLOYEE TRAINING
2. The Company will train employees in hydrogen sulfide safety at the least annually.
3. Training topics will include, but not be limited to:
* Hazard recognition
* Properties, toxicity and characteristics of hydrogen sulfide
* Emergency procedures
* First aid
* Engineering controls
* Respiratory protection
* General hydrogen sulfide safety awareness
* Sources of hydrogen sulfide
* Detection methods
* Medical surveillance
* Signs and symptoms of exposure
* Acute and chronic health effects associated with exposure

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| **Reviewed and Approved** |
| Quality Manager or President |   |   |
|   | Date |