POLICY

E & B Oilfield Services Inc. has implemented this policy to ensure no employee is exposed to hydrogen sulfide (H_2S) above the permissible exposure limit (PEL).

This policy is available to all employees who request it. Kirk Duncan is the assigned supervisor responsible for ensuring the following engineering controls and work practices are enforced:

Kirk Duncan will provide employees with information and training at the time of their initial assignment to a work area where H_2S is present. Training consists of a minimum of three and a half (3.5) hours of instructor-led classroom training (for all employees with the potential to be exposed above the OEL or the PEL) and will adhere to the ANSI/ASSE Z390.1-2017 Accepted Practices for Hydrogen Sulfide (H_2S) Training Programs. Training will address the characteristics and health effects of H_2S. If exposures are above the action level, employees will be provided with information and training at least annually thereafter. Necessary employee training will be documented to include: the identity of the employee trained; the signature and title of the employee trainer; and the date of the training. In addition, an annual refresher for all employees with the potential to be exposed above the OEL or the PEL is required and will also consist of a minimum of three and a half (3.5) hours of instructor-led classroom training.

Employees will be informed of all regulated areas and will be properly trained in entrance procedures, safety requirements and practices while in regulated areas.

REFERENCES

- 29 Code of Federal Regulations:
  - §1910.133—Eye and Face Protection
  - §1910.134---Respiratory Protection
  - §1910.146—Permit-required Confined Spaces

CHARACTERISTICS OF HYDROGEN SULFIDE

H_2S is produced as a result of the microbial breakdown of organic materials in the absence of oxygen. It is a colorless, extremely poisonous gas that has the characteristic odor of rotten eggs. The sense of smell becomes rapidly fatigued and cannot be relied upon to warn of the continuous presence of H_2S. Large amounts of H_2S are obtained in the removal of sulfur from petroleum and the gas is commonly found during the drilling and production of crude oil and natural gas, plus in wastewater treatment and utility facilities and sewers.

Hydrogen sulfide is:

- Extremely toxic and 100 ppm is the Immediately Dangerous to Life and Health (IDLH) concentration
- Colorless
- Solubility in water at 68°F is 0.4% by weight
- Flammable Gas
- Incompatible and reacts with strong oxidizers, strong nitric acid and metals
- UEL (upper explosive [flammable] limit in air) is 44.0% by volume (at room temperature)
- LEL (lower explosive [flammable] limit in air) is 4.0% by volume (at room temperature)

Additional Considerations:

- Contact and exposure occur through inhalation, skin and/or eye contact
- Target organs are the eyes, respiratory system and central nervous system
- Health effects and symptoms include irritation of the eyes and respiratory system; apnea, coma, convulsions; conjunctivitis, eye pain, lacrimation (discharge of tears), photophobia (abnormal visual intolerance to light), corneal vesiculation (blisters); dizziness, headache, lassitude (weakness, exhaustion), irritability, insomnia; gastrointestinal disturbance
- Affects the nerve centers of the brain which control breathing

Potential Employee Exposure to Hydrogen Sulfide includes:

- Drilling Operations
- Recycled Drilling Mud
- Water from sour crude wells
- Blowouts
- Tank Gauging (tanks at producing, pipeline and refining operations)
- Field Maintenance
- Tank batteries and wells, etc.

RESPIRATORY PROTECTION REQUIREMENTS

The Respiratory Protection Program, in compliance with OSHA §1910.134 and respiratory protective equipment is provided at no cost for all employees with potential for exposure to H_2S. E & B Oilfield Services Inc. will require employees with the potential to be exposed to hydrogen sulfide (H_2S) gas above the OEL or PEL to be trained in the elements of respiratory protection including medical evaluations, fit testing and selected respirator training.

The following National Institute of Occupational Safety and Health (NIOSH) respirator recommendations with their Assigned Protection Factor (APF) will be used under these hazardous conditions:

- H_2S Concentrations up to 100 ppm:
  - Any powered, air-purifying respirator with cartridge(s) providing protection against the compound of concern/ (APF = 50)
  - Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister protecting the compound of concern/ (APF = 10)
  - Any supplied air respirator/ (APF = 50)
  - Any self-contained breathing apparatus with a full facepiece
- Emergency or planned entry into unknown H_2S concentrations or IDLH conditions:
  - Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode/ (APF = 10,000)
  - Any supplied air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus
  - Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister protecting the compound of concern/Any appropriate escape-type, self-contained breathing apparatus/ (APF = 50)

Specific Requirements

- In the event of an emergency where H_2S is released at hazardous levels, employees not wearing sufficient personal protective equipment (PPE) for the situation will be immediately evacuated to a safe area until the hazard is contained.
- Adequate ventilation will be ensured in all enclosed work areas. Employees engaged in the maintenance of ventilation systems, including filter changes, are required to use proper PPE for the task.
- Regular monitoring of air quality in work areas will be provided to ensure that the PEL of H_2S is not being exceeded. Records of all monitoring tests will be made available at the Company office.
- Employees working at job sites where there is a potential for exposure to an H_2S hazardous atmosphere will be supplied with personal monitoring equipment which will be carried outside of clothing on the employee at all times when in the work area.
- The supplied monitors will be capable of sensing a minimum of 10 ppm of H_2S in the atmosphere; and will activate audible and visual alarms when the concentration of H_2S in the atmosphere reaches 10 ppm. When monitor alarms sound, employees will vacate the area and will not re-enter without proper respiratory protection.
- In the event that PEL of H_2S is exceeded within any facility where employees are contracted to work, all work will be stopped and employees evacuated until the facility's management can ensure that H_2S levels are brought down to an acceptable level for safe work.
- The management of any facility where E & B Oilfield Services Inc. contracts to work will provide a list of all operations in the facility where H_2S is emitted. Facility management will provide a copy of the facility's contingency plan provisions.
- Special precautions will be taken when employees are working inside tanks or vessels. Employees will adhere to the E & B Oilfield Services Inc. written Confined Space Program per §1910.146 and employees will be trained under §1910.146(g).
- The medical surveillance program for employees who potentially may be exposed to H_2S at or above the action level or PEL will be provided under the supervision of a licensed physician at no cost to the employee.
- Employees will wear proper PPE at all times while in work areas where H_2S is present. This PPE will include proper eye/face protection per §1910.133 where appropriate.
- All required signs and labels will be posted in areas of potential exposure to H_2S.
- All containers or materials containing H_2S will be appropriately labeled to indicate the contents and the hazards of the contents.
- SDS for H_2S and all hazardous materials at E & B Oilfield Services Inc. are available to employees at the Company office upon request.
- The occupational exposure limit (OEL) or the PEL that the Company limits employee exposure to H_2S is 10 ppm) as an eight (8)-hour time-weighted average (TWA). The OEL followed by ANSI, API and NIOSH is 10 ppm as an eight (8)-hour TWA, as stated as an eight (8)-hour TWA.

  NOTE*:* The OSHA PEL for Construction is 10 ppm as an eight (8) hour TWA and the OEL followed by ANSI, API and NIOSH is 10 ppm as an eight (8) hour TWA. OSHA General industry standards do not offer a PEL for industry; instead, an accepted ceiling concentration (ACC) of 20 ppm is used.

HAZARDS OF HYDROGEN SULFIDE

Hazards of Hydrogen Sulfide (H_2S)

Hydrogen Sulfide (H_2S) presents a potential hazard to employees at the worksite. It usually occurs as an unwanted by-product and can result in employee exposure in many different industries or occupations. To ensure protection against exposure to H_2S, both employees and employers will be aware of its properties, how it affects the body and what to do in emergency situations. E & B Oilfield Services Inc. will ensure that all employees who will be working at the jobsite will be properly trained in H_2S awareness and contingency procedures.

H_2S Characteristics

Hydrogen sulfide is a powerful and deadly gas that is colorless and smells like rotten eggs at low concentrations and has a sweet smell at high concentrations. However, employees will not rely on the smell as a warning as the gas quickly paralyzes the olfactory nerves which allow you to smell. The result will be instant death. Long exposure to low concentrations will also deaden the sense of smell.

H_2S is explosive - it will ignite and explode when subjected to a spark or ordinary flame - in any concentration from four (4) percent to 44% of the air. It is also soluble in water and oil, so it may flow for a considerable distance from its origin before escaping above ground or in an entirely unexpected place. Because the vapor (gas) is heavier than air, it may travel for a long way until ignited and then flash back towards the source. One of the products of burning H_2S is Sulfur Dioxide, also a toxic gas.

If the gas is burned, toxic products such as sulfur dioxide will be formed. Hydrogen sulfide is incompatible with oxidizing agents, such as nitric acid and chlorine trifluoride and may react violently or ignite spontaneously.

Sources of H_2S

H_2S is found widely in industry and few employees are warned of its dangers, or their exposure. It is formed by the decomposition of organic materials, so it is found in natural gas and oil, recycled drilling mud, water from sour crude wells, in mines, wells, fertilizers, sewers and cesspools. It is given off as a by-product in the manufacture of rayon, synthetic rubber, dyes and the tanning of leather.

Hydrogen sulfide is found in large amounts in natural gas and petroleum. Any employee involved in extracting gas and petroleum from the ground, or in storing, transporting, or processing gas is at risk from exposure to H_2S. Hydrogen sulfide exists in solution in crude oil and employees are exposed when the gas begins to "pass off" as it reaches the surface or comes into contact with air. This can occur at any point, including all stages of the refining operation and it is accelerated by heat or hot weather.

Fundamentally, employers and employees will be alert to the fact that working with a "closed system" does not always ensure safety. Operations involving the opening of valves or pumps on otherwise closed systems or working on such equipment that is not isolated or locked out are particular sources of danger. When a normally closed system is opened, the potential exists for releasing hazardous chemicals into the employees' breathing zones in unknown concentrations.

Health Effects on the Body

Hydrogen Sulfide is extremely toxic. When you breathe in H_2S, it goes directly through your lungs and into your bloodstream. To protect itself, your body "oxidizes" (breaks down) the H_2S as rapidly as possible into a harmless compound.

If you breathe in so much H_2S that your body cannot oxidize all of it, the H_2S builds up in the blood and you become poisoned. It may cause death instantaneously in high airborne concentrations. The nervous centers in your brain that control breathing may be paralyzed. Your lungs stop working and you are asphyxiated - just as though someone had come up and put their hands around your neck and strangled you.

A single breath of hydrogen sulfide at about 1000 ppm may paralyze the respiratory system and result in coma and death. An employee can be overcome by H_2S and lose consciousness in a few seconds; luckily if he is rescued in time and is given artificial respiration within a few minutes, the employee may recover. Either artificial mouth-to-mouth or an oxygen supply system of resuscitation will work if it is done in time, because, with an adequate source of oxygen and no further H_2S intake, the body will quickly break down the H_2S still in the blood.

Low levels may be extremely irritating to the lungs, nose, throat and eyes. Hydrogen Sulfide can be detected by smell at levels as low as 0.13 parts H_2S per million parts air (ppm). Odor cannot be used as a warning because the gas can deaden the sense of smell within two (2) to 15 minutes in exposures of approximately 100 ppm. Convulsions may also occur. Prolonged exposure at about 250 ppm H_2S may cause the lung tissue to swell and fill up with water (pulmonary edema). This effect may occur after the exposed employee recovers from the irritant effects of the gas. Exposures of 20 to 50 ppm hydrogen sulfide for one (1) hour may cause inflammation of the cornea and the delicate lining of the eye and eyelid (a condition called keratoconjunctivitis). Exposures for long periods at 50 ppm may cause severe irritation of the nose, throat and lungs. Employees exposed to lower concentrations of H_2S may develop headaches, eye disorders and chronic bronchitis.

Acute (Short-term) Effects

Gas is a silent threat – often invisible to the body's senses. Inhalation is the primary route of exposure to hydrogen sulfide. Though it may be easily smelled by some people at small concentrations, continuous exposure to even low levels of H_2S quickly weakens the sense of smell (olfactory desensitization). Exposure to high levels of the gas can deaden the sense of smell instantly. Although the scent of H_2S is characteristic, the smell is not a dependable indicator of H_2S gas presence or for indicating increasing concentrations of the gas.

H_2S irritates the mucous membranes of the body and the respiratory tract, among other things. Following exposure, short-term, or acute, symptoms may include headache, nausea, convulsions and eye and skin irritation. Injury to the central nervous system can be immediate and serious after exposure. At high concentrations, only a few breaths are needed to induce unconsciousness, coma, respiratory paralysis, seizures and even death.

Chronic (Long-term) Effects

Hydrogen Sulfide can also cause a wide range of sub-acute and chronic effects. At low concentrations of 10-100 ppm), headache, dizziness, nausea and vomiting may develop, together with irritation of the eyes and respiratory tract (the lungs and trachea and bronchi, or air pipes from the nose and mouth to the lungs). The eyes become red, sore, inflamed and sensitive to light. Respiratory system effects include cough, pain in the nose and throat and pain on breathing.

If exposure at low levels continues, the employee may develop a state of chronic poisoning. In addition to eye and respiratory tract irritation, there will be a slowed pulse rate, fatigue, insomnia, digestive disturbances and cold sweats. More dangerous, if exposure at the level of 100 ppm (which results in eye and respiratory tract irritation and drowsiness after 15 minutes) lasts for several hours, it may result in death within the next 48 hours. Symptoms of chronic exposures at low levels are conjunctivitis (eye infections), headache, attacks of dizziness, diarrhea and loss of weight.

Chronic H_2S intoxication is marked by headaches, eye disorders, chronic bronchitis and a grey-green line on the gums. Reports of nervous system disorders including paralysis, meningitis and neurological problems have been reported, but not confirmed.

A study of employees and community residents of a California refinery engaged in extracting sulfur from crude oil, which is rich in H_2S, complained of headaches, nausea, vomiting, depression, personality changes, nosebleeds and breathing difficulties. When compared to a non-exposed group of people, the exposed people showed abnormalities of color discrimination, eye-hand coordination, balance and mood disturbances.

Hydrogen Sulfide can penetrate the skin and cause toxicosis in people exposed to large concentrations over long periods. The speed of onset of acute H_2S poisoning and the potency of H_2S are almost the same as for cyanide gas. In rats, exposure to H_2S has caused teratogenic (biological monstrosities and malformations) effects.

Those having prolonged exposure to high enough levels of H_2S gas to cause unconsciousness may continue to experience headaches, reduced attention span and motor functions. Pulmonary effects of H_2S gas exposure may not be apparent for up to 72 hours following removal from the affected environment. Delayed pulmonary edema, a buildup of excess fluid in the lungs, may also occur following exposure to high concentrations.

H_2S does not accumulate in the body, but repeated/prolonged exposure to moderate levels can cause low blood pressure, headache, loss of appetite and weight loss. Prolonged exposure to low levels may cause painful skin rashes and irritated eyes. Repeated exposure over time to high levels of H_2S may cause convulsions, coma, brain and heart damage and even death.

Symptoms of H_2S exposure

H_2S is classified as a chemical asphyxiant, similar to carbon monoxide and cyanide gases. It inhibits cellular respiration and uptake of oxygen, causing biochemical suffocation. Exposure levels to H_2S and symptoms of that exposure are divided into different toxicity levels, shown in the chart below.

10 ppm	Beginning eye irritation
50-100 ppm	Slight conjunctivitis and respiratory tract irritation after 1-hour exposure
100 ppm	Coughing, eye irritation, loss of sense of smell after 2-15 minutes. Altered respiration, pain in the eyes and drowsiness after 15-30 minutes followed by throat irritation after one (1) hour. Several hours of exposure results in the gradual increase in the severity of these symptoms and death may occur within the next 48 hours.
200-300 ppm	Marked conjunctivitis and respiratory tract irritation after one (1) hour of exposure
500-700 ppm	Loss of consciousness and possibly death in 30 minutes to one (1) hour.
700-1000 ppm	Rapid unconsciousness, cessation of respiration and death.
1000-2000 ppm	Unconsciousness at once, with early cessation of respiration and death in a few minutes. Death may occur even if the individual is removed to fresh air at once.

Use and operation of H_2S monitoring systems and detection methods used on-site

Employees working at job sites where there is a potential for exposure to hazardous atmospheres will be supplied with personal monitoring equipment that will be carried outside of clothing on the employee at all times when in the work area. The monitors supplied will be capable of sensing H_2S in the atmosphere and will activate audible and visual alarms when the concentration of H_2S in the atmosphere exceeds 10 ppm or 20 ppm.

The acceptable ceiling concentration for H_2S exposure is 10 ppm and 50 ppm is the acceptable maximum peak above the acceptable ceiling concentration for an eight (8) hour shift with a one-time 10-minute exposure only if no other measured exposure exists.

Alternatively, stationary monitors may be installed. Personal or stationary monitors will be capable of sounding an audible alarm or warning. Kirk Duncan will administer the monitor maintenance program for E & B Oilfield Services Inc.. Monitors will be calibrated and maintained per the manufacturer's instructions.

Proper use and maintenance of PPE

See E & B Oilfield Services Inc. Policy on respiratory protection. Employees working in areas where the possibility of exposure to toxic gases exists will be provided NIOSH-approved full-face SCBA respiratory equipment and trained in their use and maintenance according to the Company Respiratory Protection Program which is administered by Kirk Duncan. Demonstrated proficiency in using PPE is required by the program.

Locations and use of safety equipment

Personal hazardous atmosphere detection monitors and respiratory protective equipment will be immediately available to each employee at all times in the work area. Safety equipment will be kept immediately available to all employees on the jobsite.

All employees of E & B Oilfield Services Inc. will be notified of the location of safety equipment on each jobsite before commencement of work. Only employee trained in the proper use of any required safety equipment will be allowed on the jobsite.

Recognition and response to H_2S warnings at the workplace

E & B Oilfield Services Inc. employees will be trained on site-specific emergency action plans to include evacuation procedures. Employees will be required to respond immediately to audio or visual warnings issued either by personal monitoring equipment or established workplace general warning signals. Workplace site-specific contingency plans of the plant owner will be reviewed with employee and provisions of the plan followed. When a warning signal is sounded, employees will immediately put on SCBA respiratory protection, vacate the area and do not re-enter. Employees will notify or contact necessary employee and are not permitted to return to the work area until clearance is given for re-entry. Evacuation plans will be established for each worksite before the commencement of work. Kirk Duncan, or the foreman in charge of the job site, will be responsible for supervision of evacuation procedures, checking for proper use of respiratory protection, ensuring all employees are cleared of the hazard area, notification of the facility management and assembly and headcount of evacuated employee at designated safe areas.

Proper rescue and first aid to be used in an H_2S exposure

First aid kit and oxygen will be kept in the supervisor's work vehicle and available to all employees. A litter for transport of incapacitated employees will be provided by E & B Oilfield Services Inc. and kept on-site if one is not available from the facility.

In the event an employee is exposed to H_2S, the employee will immediately be evacuated to a safe briefing area, emergency medical services will be notified and oxygen will be administered, along with cardiopulmonary resuscitation (CPR) if required. Oxygen will be administered regardless of the condition of the victim to ensure a reduction of the absorption concentration of H_2S. If an employee is rendered unconscious due to H_2S exposure, assigned employee wearing proper SCBA will respond to perform rescue operations of the victim.

Locations of safe briefing areas

Safe briefing areas will be designated outside the work zone for each work location where the possibility of hazardous atmospheres exist. At least two (2) briefing areas will be designated for each worksite. Employees will be notified of these areas before the commencement of work. Kirk Duncan will be responsible for evaluation and designation of safe briefing areas for E & B Oilfield Services Inc..

Wind direction awareness and routes of egress

Wind direction will be monitored by Kirk Duncan at the beginning of each shift to determine safe egress routes for employees in the event of an evacuation. Wind direction will be regularly checked and noted throughout the work shift for wind shift which will necessarily facilitate a change of egress routes for evacuation. Evacuation routes will be determined for each work area before commencement of work and routes will be clearly marked and posted in conspicuous areas in the workplace. In the event of an emergency evacuation, Kirk Duncan will be responsible for determination and notification of the proper egress route to be used for employee safety.

Confined space and enclosed facility entry procedures

Whenever employees enter a confined space, such as a tank, strict work practices will be followed, including the Company permit entry system.

Kirk Duncan will ensure that the E & B Oilfield Services Inc. Confined Space Entry program is adhered to, that the air is continually monitored for the presence of H_2S and that an employee be stationed as a monitor outside of a confined space. Supplied air respirators, lifelines and rescue equipment will be immediately available.

See E & B Oilfield Services Inc. Policy on Permit Required Confined Spaces. These procedures will be enforced in all confined work situations.

GAS DETECTORS/MONITORS

E & B Oilfield Services Inc. will ensure each employee will use a portable gas detector as required in all areas where hydrogen sulfide may be present and the employees will be properly trained in the operation and maintenance of issued gas-detection equipment.

The gas monitor will be calibrated per the manufacturer's recommendations. Each monitor will contain a current calibration sticker on the monitor providing the date of calibration.

At the beginning of each day, a bump test is required to be completed on the monitor when in use per the requesting owner client and manufacturer's guidelines. This is to ensure the monitor and alarms are functioning correctly. Employees will be trained in how to bump-test issued gas-detection equipment as well as how to accurately calibrate issued gas-detection equipment. A full calibration is required if a monitor fails a bump test.

Bump Test: Briefly expose the portable detector to a known concentration of gas high enough to set off the alarm. Note the reading to ensure that it is correct. A bump test is not calibration, but a quick way to ensure that the most important functions of the instrument are intact.

Personal alarm monitors will be set to alarm initially at 10 ppm H_2S and each contractor will wear an H_2S personal alarm monitor when working in all potential H_2S areas.

Chemicals with Potential Spill or Release List

Product or Brand Name	Manufacturer	Hazardous Ingredient

TRAINING RECORD

Trainer:	
Signature:	
Date:	
Content of Training	
Attendees	
Print Name:	**Signature:**