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SUBPART A - GENERAL REQUIREMENTS

The possibility of exposure to H₂S is not very likely at Berry Bros. However, it is the intent and purpose of BBGCI to make each and every one of its employees aware of H₂S in the event that an un-expected situation should arise and a release of H₂S were to be encountered.

Hydrogen Sulfide (H₂S) is a highly toxic, colorless gas, 1.2 times heavier than air, soluble in water, with the odor of rotten eggs in low concentrations. It is produced in toxic concentrations along with crude oil, water, and gas in certain producing fields. Activities in suspected areas that may lead to exposure include, but are not limited to:

- Drilling Operations
 - Recycled Drilling Mud

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- Water from sour crude wells
- Blowouts
- Tank Gauging
 - Tanks at producing sites
 - Pipeline & Refining operations
- Field Maintenance
 - Tank batteries and wells, etc.
- Inland and offshore

SUBPART B - PURPOSE


The purpose of this plan is to:

- Establish minimum requirements for working in areas identified with the presence of Hydrogen Sulfide.
- Protect our employees from Hydrogen Sulfide exposure.
- Train our employees on general information and techniques used to work in areas identified with the presence of Hydrogen Sulfide.
- Supply our employees with the proper protective equipment while working in areas identified with the presence of Hydrogen Sulfide.
- Demonstrate the company's compliance with all requirements regarding Hydrogen Sulfide.

We understand that the primary hazard when exposed to Hydrogen Sulfide is its inhalation and ingestion as it is a highly toxic material.

SUBPART C - TOXICITY

H₂S is an extremely toxic and irritating gas. The principal potential hazard is asphyxiation by inhalation of the gas. H₂S reduces the oxygen-carrying capacity of the bloodstream, depressing the nervous system. Sufficiently high concentrations can result in immediate collapse and death from respiratory failure and asphyxiation.


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There is no evidence that repeated exposure to H₂S results in cumulative or systemic poisoning, or that repeated exposure increases or decreases a person's susceptibility to this gas.

Exposure to concentrations of H₂S greater than 600 parts per million (ppm) can cause immediate death. The "rotten egg" odor of H₂S is not a reliable warning sign because higher concentrations (approximately 100ppm and greater) temporarily deaden the sense of smell. An exposed person may not detect the presence of H₂S and, consequently, inhale lethal amounts. The only positive means of determining the amount of H₂S present is by testing with an approved H₂S detector. Relying solely on the sense of smell can be fatal. However, if H₂S is detected by smell, immediately evacuate upwind.

SUBPART D - PROPERTIES OF HYDROGEN SULFIDE

- Colorless, deadly, toxic gas.
- Heavier than air.
- Readily dispersed by wind movements and air currents.
- Burns with a blue flame (produces another toxic gas SO₂).
- Odor of rotten eggs in small concentrations.
- Rapidly deadens the sense of smell in large concentrations.
- Highly corrosive to certain metals.
- Explosive limits.
- More deadly than Carbon Monoxide.
- Almost as toxic as Hydrogen Cyanide gas.

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SUBPART E – HEALTH EFFECTS AT DIFFERENT CONCENTRATIONS

H₂S Concentration Levels (PPM)	POTENTIAL EFFECT
10 to 20	Eye irritation, especially hypersensitive workers.
20 to 100	Inflammation, corneal blistering and opacity of the eye, loss of the sense of smell, headache, cough, nausea.
100 to 300	Respiratory difficulty, pulmonary edema, respiratory depression and irritation (within 30 minutes to 8 hours)
300 to 600	Central and peripheral nervous system effects; e.g., tremors, weakness, numbness of extremities, unconsciousness, and convulsions (within several minutes to 8 hours)
600 to 1000	Rapid unconsciousness (from one breath to several minutes) resulting in death if emergency aid is not promptly administered
1000 and greater	Instantaneous cessation of breathing and death.


Note: Effects described at a specific concentration usually occur with increasing severity at higher concentrations.

SUBPART F - TREATMENT

- Remove victim to fresh air immediately. Keep victim warm. If victim is breathing, this may be all that is necessary.
- If victim is not breathing, institute resuscitation if it is available – apply mouth-to-mouth or mouth-to-nose technique while waiting for resuscitation to be brought to the scene.

SUBPART G - MONITORING

H₂S levels are monitored by gas detectors. If the H₂S level exceeds 20ppm, the proper protective measures must be put in place. (PPE) All employees are

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instructed to leave an affected area immediately. Re-entry is allowed only with the appropriate SCBA equipment. Employees must be qualified to dawn a NIOSH certified self-contained breathing apparatus or airline respirators with escape SCBA.

If H₂S is a foreseeable danger at a work site, employees will be properly orientated in safe working practices for H₂S in this area. Berry Bros.' employees will follow the confined space procedures in the confined space program, which includes all of the requirements in 29 CFR 1910.146, and 1910.146(g).

SUBPART H - DETECTION

Because of the very poor warning characteristics of H₂S, instrumentation must be used to provide warning of unsafe concentrations of the gas.

Various types of monitoring equipment are available to determine the presence of H₂S. These include hand pumps with detector tubes, direct reading portable monitors, fixed monitor/alarm systems, and personal monitor/alarm systems.


Monitoring equipment shall be calibrated and tested. The HS&E Department shall be consulted on the use, maintenance, and calibration/test schedule of each specific unit.

Detection Methods

There are four primary methods of detection for the presence of Hydrogen Sulfide:

- Electronic Portable Detectors.
- Air Sampling Gas Detector Tube.
- Fixed Electronic H₂S Sensors.
- Lead Acetate, Ampoules or Coated Strips.

The methods used to determine the presence of Hydrogen Sulfide must be approved by NIOSH.

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SUBPART I - CONTINGENCY PLANS

OSHA has established the Permissible Exposure Limit (PEL) for H₂S at 20 PPM. However, the industry accepted PEL is 10 PPM. In general, workers exposed to concentrations of H₂S greater than 10 PPM must wear respiratory protection.

At all facilities where H₂S is potentially present, an emergency response plan must be developed. The plans must be site specific and include location of SCBA's, describes monitoring systems / alarm points, and identifies safe briefing areas.

Alarms

Alarms usually include lights and sirens. Low alarms are usually identified by flashing amber lights while high alarms are usually identified by an intermittent siren.

Alarm Settings


Land: Low Alarm – 10 PPM
High Alarm – 20 PPM

OCS: Low Alarm – 10 PPM
High Alarm – 20 PPM
High-high Alarm – 50 PPM

Procedures for evacuation

- **Low Alarm (10 PPM)**
 - Non-essential personnel will leave the potentially hazardous areas and report to the upwind safe briefing area.
 - Essential personnel will locate their SCBA and report to their emergency duty station.

- **High Alarm (20 PPM)**
 - Non-essential personnel will don a SCBA and report to the upwind safe briefing area.

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- o Essential personnel will locate and don their SCBA and report to their emergency duty station.

In the event of concentrations higher than 50 PPM, the person-in-charge will consider evacuating if necessary.

The contingency plan should also include a dispersion model.

SUBPART J - OFF-SITE WORK LOCATIONS

All Berry Bros.' employees shall be aware and concerned with an off-site client work site provisions and specific contingency plans. When preparing the JSEA for a job task, inquire about H₂S site-specific contingency plans.

SUBPART J - PERSONAL PROTECTIVE EQUIPMENT

An SCBA shall be utilized when entering an area known or suspected to be greater than 10 ppm by volume of air. See the section entitled "Respiratory Protection" for additional information.

SUBPART K - TRAINING AND ORIENTATION

Hydrogen Sulfide training shall be completed prior to the initial arrival of the employee to the work area, and a refresher course shall be completed no more than one year after the completion of the initial training. Documentation of the training as well as an employee-held card shall be kept at the facility or home office throughout the duration of the employee's presence at the facility. All transfers shall be briefed in a site-specific orientation regardless of their current training status.



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