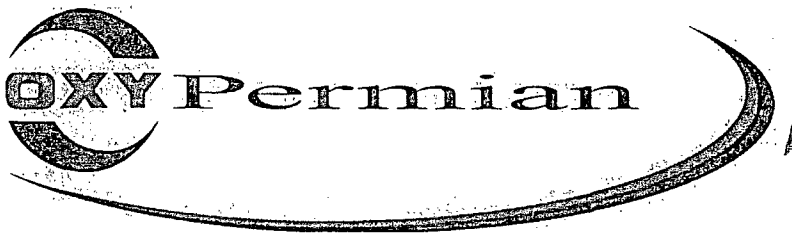

30-025-42541

Permian Drilling
Hydrogen Sulfide Contingency Plan

HOBBS OCD
APR 30 2015
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Scope

This contingency plan establishes guidelines for the public, all company employees, and contract employees who's work activities may involve exposure to hydrogen sulfide (H2S) gas.

Objective

1. Provide an immediate and predetermined response plan to any condition when H2S is detected. All H2S detections in excess of 10 parts per million (ppm) concentration are considered an Emergency.

2. Prevent any and all accidents, and prevent the uncontrolled release of hydrogen sulfide into the atmosphere.

3. Provide proper evacuation procedures to cope with emergencies.

4. Provide immediate and adequate medical attention should an injury occur.

Discussion

Implementation:	This plan with all details is to be fully implemented before drilling out of the surface shoe or 1000' before the anticipated H2S zone.
Emergency response Procedure:	This section outlines the conditions and denotes steps to be taken in the event of an emergency.
Emergency equipment Procedure:	This section outlines the safety and emergency equipment that will be required for the drilling of this well.
Training provisions:	This section outlines the training provisions that must be adhered to prior to drilling.
Drilling emergency call lists:	Included are the telephone numbers of all persons to be contacted should an emergency exist.
Briefing:	This section deals with the briefing of all people involved in the drilling operation.
Public safety:	Public safety personnel will be made aware of any potential evacuation and any additional support needed.
Check lists:	Status check lists and procedural check lists have been included to insure adherence to the plan.
General information:	A general information section has been included to supply support information.

Emergency procedures

A. In the event of any evidence that H2S level is 10 ppm or higher while drilling or tripping, rig personnel should take the following steps:

1. Driller to pick up off bottom, shut down the pumps, space out the tool joint, and shut in the well. .

2. All personnel (including Driller after securing well) to don escape breathing equipment and report to the designated upwind safe briefing / muster area.

3. All personnel on location should be accounted for at the muster area and an emergency search should begin for any missing -- the Buddy System will be implemented for any search.

4. Non-essential personnel should be directed to leave the well site.

5. DSM to call out the rig assigned H2S contractor to send supervisor and air trailer (if they are not already on location).

6. The location entrance should be fully secured, and the proper condition flag should be displayed at the entrance to the location.

7. All personnel to wait at muster area until the H2S supervisor identifies the area / sensor where H2S was detected, and if H2S still present. The H2S supervisor will also report the level of concentration or if there is a faulty sensor or false alarm

8. If H2S is present then the cascade system should be rigged up (if not already rigged up) and preparations made to work under cascade supplied air.

   If no H2S is present, the "H2S All Clear Sign off checklist" should be completed and signed by RM, DSM, and H2S supervisor – after signature all personnel can resume work under normal conditions.

9. RM and Driller may go in and work the pipe every 15 min under cascade supplied air as required after H2S supervisor is on location and cascade system is operational.

   Note: DSM's should remain at muster point to supervise and control the event and serve as back up to RM or Driller, utilizing the "Buddy System".

Note: SCBA use is for emergency response or rescue which does include the initial well evaluation and possible shut in if not already shut in , no work will be preformed utilizing the SCBA air packs.

B. If uncontrollable conditions occur:

1. Take steps to protect and/or remove any public in the down-wind area from the rig – partial evacuation and isolation. Notify necessary public safety personnel and appropriate regulatory entities (i.e. BLM and Texas railroad commission) of the situation.

2. Remove all personnel to the nearest upwind designated safe briefing / muster area or off location.

3. Notify public safety personnel of safe briefing / muster area.

4. An assigned crew member will blockade the entrance to the location. No unauthorized personnel will be allowed entry to the location.

5. Proceed with best plan (at the time) to regain control of the well. Maintain tight security and safety procedures.

C. Responsibility:

1. Designated personnel listed below:

a. Shall be responsible for the total implementation of this plan.
b. Shall be in complete command during any emergency.

Emergency procedures

All personnel:

1. On alarm, don escape unit and report to the nearest upwind designated safe briefing / muster area.
2. Check status of personnel (buddy system).
3. Secure breathing equipment.
4. Await orders from supervisor.

Drill site manager:

1. Don escape unit if necessary and report to nearest upwind designated safe briefing / muster area.
2. Coordinate preparations of individuals to return to work area with rig manager and driller (using the buddy system).

3. Notify and call out H2S supervisor and air trailer if not already on location from the respective H2S contractor assigned to the rig.
4. Assess situation and take control measures as necessary.

Rig Manager:

1. Don escape unit Report to up nearest upwind designated safe briefing / muster area.
2. All personnel on location will be accounted for and emergency search should begin for any missing, (the Buddy System will be implemented).
3. Coordinate preparation of individuals to return to work area with rig manager (using the buddy system).
4. Determine H2S concentration on H2S monitoring system if possible.
5. Assess situation and take control measures if needed.
6. If the DSM is not present the Rig Manager will assume supervision of the event until his return.

Driller:

1. The Driller will pick up off bottom, shut down the pumps, space out the tool joint and shut in the well.
2. Check monitor for point of release if possible.
3. Don escape unit report to nearest upwind designated safe briefing / muster area.
4. Assist Rig Manager in checking status of personnel (in an attempt to rescue, use the buddy system).
5. Assigns least essential person to notify Drill Site Manager and tool pusher by quickest means in case of their absence.
6. Assumes the responsibilities of the Drill Site Manager and rig manager until they arrive should they be absent.

Derrick man
Floor man #1
Floor man #2

1. Will remain in briefing / muster area until instructed by supervisor.

Mud engineer:

1. Report to nearest upwind designated safe briefing / muster area.
2. When instructed, begin check of mud for ph and H2S level. (Garett gas train.)

Safety personnel:

1. The H2S supervisors identifies the area / alarm where H2S was detected, and if H2S still present at

what level of concentration or if faulty sensor or false alarm.

General evacuation plan

1. When the (Drill Site Manager, consultant, rig manager, or driller) determines the H2S gas cannot be limited to the well location and the public will be involved, he will activate the evacuation plan.

2. The Drill Site Manager or designee will notify local government agency that a hazardous condition exists and evacuation needs to be implemented.

3. Contractor safety personnel that have been trained in the use of H2S detection equipment and self-contained breathing equipment will monitor H2S concentrations, wind directions, and area of exposure. They will delineate the outer perimeter of the hazardous gas area. Extension to the evacuation area will be determined from information gathered.

4. Law enforcement personnel (state police, police dept., fire dept., and sheriff's dept.) Will be called to aid in setting up and maintaining road blocks. Also, they will aid in evacuation of the public.

5. After the discharge of gas has been controlled, safety personnel will determine when the area is safe for re-entry, and complete the "H2S All Clear Sign off checklist" and resume work under normal conditions.

Important: Law enforcement personnel will not be asked to come into a contaminated area. Their assistance will be limited to uncontaminated areas. Constant contact will be maintained with them.

Taking a kick

When taking a kick during an H2S emergency, all personnel will follow standard Well control procedures after reporting to briefing area and masking up.

Open-hole logging

All unnecessary personnel off floor. Drill Site Manager and safety personnel should monitor condition, advise status and determine need for use of air equipment.

Running casing or plugging

Following the same "drilling and tripping" procedure as above. Drill Site Manager, Rig Manager and safety personnel will monitor condition, advise status and determine need for use of air equipment.

OXY Permian Drilling Incident Reporting Phone List

Drilling Operations		Office	Cell
Drilling Manager-Permian: Chad Frazier	Houston	713-215-7357	806-891-9473
Drilling Superintendent: Kevin Videtich	Houston	713-350-4761	806-891-2000
Drilling Engineer Supervisor: Adriano Celli	Houston	713-985-6371	713-562-3051
Permian Drilling HES: Mike Miller	Midland		432-634-4882
Permian Drilling HES: Jason Robison	Midland	432-685-5600	832-763-2524

Emergency Response Drills

These drills shall consist of a dry-run covering H2S alarm and muster, well control (BOP), uncontrollable conditions and evacuation. The Drill Site manager will critique performance of personnel roles and responsibilities related to each assigned job. Record of each drill should be added to the morning drilling report, the rig Safety Board and the IADC log. Drills should be held before entering the productive zone and weekly. More drills may be preformed at the discretion of the Drill Site Manager until he feels the crews are proficient.

Training requirements

When working in an area where hydrogen sulfide gas (H2S) is expected, pre-job training requirements must be carried out. All companies will insure that all essential personnel at the well site will have had adequate training in the following:

1. Maintaining compliance with the Permit to Work system.
2. Area surveillance for other personnel and ignition sources prior to beginning any potentially hazardous work.
3. Hazards and characteristics of H2S.
4. Physical effects of hydrogen sulfide on the human body.
5. Toxicity of hydrogen sulfide and sulfur dioxide.
6. H2S detection.
7. Use of SCBA and supplied air equipment.
8. First aid and artificial respiration.
9. Emergency rescue.

Essential personnel will include: Drill Site Manager, Rig manager, Driller, Derrick man, Floor man, and onsite Safety personnel. Additional support personnel may be deemed as essential as needed such as the Mud Engineer etc. by the DLT.

Service Company and Visiting personnel precautions

A. Each service company and visitor will be expected to attend a well site briefing / orientation upon arrival.
B. Each service company and visitor will follow the facial hair policy and will be clean shaven.
C. Each service company must provide for the training and equipment of their employees before they arrive at the well site, all workers will have required PPE and also have a personal H2S monitor which is (intrinsically safe), capable of sensing a minimum H_2S concentration of 10 ppm. These devices are to be electronic, and capable of emitting a visual and audible alarm.

Emergency Equipment Requirements

1. Signs

A. One sign located at each location entrance with the following language:

Caution – potential poison gas
Hydrogen sulfide
No admittance without authorization

2. Wind sock – wind streamers

A. One 36" (in length) wind sock located at protection center, at height visible from rig floor.
B. One 36" (in length) wind sock located at height visible from pit areas.

3. Hydrogen sulfide sensors and alarms

A. H2S sensor with alarms will be located on the Flex 3 rig:

16 H2S Sensors

- 3 sensors between the reserve pit and the steel pits and rig
  1. at the generator side, corner of reserve
  2. middle earth reserve pit between reserve and steel mud pits

3. at the shaker end of reserve pit aligned with #2 shaker

- 2 sensors on steel pits
  1. on handrail reserve pit side middle compartment
  2. rig side handrail at end of sand traps
- 3 sensors at shakers and trip tank
  1. possum belly side handrail shaker 1 and at shaker 3
  2. rig side handrail adjacent stairs on trip tank
- 3 sensors at rig floor and substructure below rig floor
  1. rig floor driller side, inside derrick leg
  2. doghouse side, midway on cross member adjacent bell nipple
  3. draw-works side base of BOP stack on substructure leg
- 2 sensors for muster areas
  1. primary muster point by RM house
  2. alternate muster area by end of pipe wrangler
- 3 sensors for living quarters area
  1. will be placed at each end of living quarters area
  2. between DSM house and RM house
  3. note: area between RM house and Change house is covered by primary muster point

8 Alarms Audio/Visual

- 1 alarm placed rig side handrail of steel pit aligned with #1 mud pump facing rig side
- 1 alarm placed on trip tank handrail adjacent to flow line facing shakers
- 1 alarm placed on the handrail draw works side of driller shack facing rig floor
- 2 alarms in living quarters area
  1. 1 by the RM house facing the rig
  2. 1 by the DSM house facing the rig
- 1 alarm placed in the generator house middle generator support beam
- 1 alarm placed in the MCC house
- 1 alarm placed in the VFD house

* Each safety contractor will be expected to visually inspect and test sensors and alarms each week after rig up.

B. H2S sensor with alarms will be located on the Flex 4 rig:

14 H2S Sensors

- 4 sensors between the earthen reserve pit and the steel active and reserve mud tank
  1. at the earthen reserve pit between the active tank and reserve tank
  2. at the end of the flow line at the earthen reserve pit

3. sensor on handrail above the flow line entry point on the active tank
4. at topside midpoint handrail rig side of reserve tank

- 2 sensors at shakers
  1. rig side handrail at shaker 1 and at shaker 3
- 3 sensors at rig floor and substructure below rig floor
  4. rig floor driller side, inside derrick leg
  5. well side handrail on accumulator walkway adjacent to bell nipple
  6. draw-works side base of BOP stack on substructure leg
- 2 sensors for muster areas
  1. primary muster point by RM house
  2. alternate muster area by end of pipe wrangler
- 3 sensors for living quarters area
  1. will be placed at each end of living quarters area
  2. between DSM house and RM house
  3. note: area between RM house and Change house is covered by primary muster point

8 Alarms Audio/Visual

- 1 at the earthen reserve pit between the active tank and reserve tank
- 1 alarm placed on the active tank side of the mud pump skid handrail aligned with pump #2 facing the active mud tank
- 1 alarm placed on the rig side handrail of shaker skid aligned with shaker #3 facing rig floor
- 1 alarm placed on the handrail draw works side of driller shack facing rig floor

- 2 alarms in living quarters area
  3. 1 by the RM house facing the rig
  4. 1 by the DSM house facing the rig
- 1 placed in the generator trailer on the middle support beam
- 1 placed in the VFD house

* Each safety contractor will be expected to visually inspect and test sensors and alarms each week after rig up.

4. Condition flags

A. One each condition flag to be displayed to denote conditions.
New Mexico: As per BLM

green – normal conditions
yellow – potential danger
red – danger, H2S present

Texas:

yellow – normal conditions
orange – potential danger
red – danger, H2S present

B .Condition flag shall be posted at each location sign entrance.

5. Mud inspection devices:

   Garrett gas train or hatch tester for inspection of sulfide concentration in mud system.

6. Adequate fire extinguishers shall be located at strategic locations

7. The well shall have hydraulic BOP equipment with a remote control on the ground system for the anticipated pressures. Equipment is to be tested on installation and follow Oxy Well Control manual recommendations .

8. Gas buster equipment shall be installed before drilling out of surface pipe.

9. There shall be one combustible gas detector on location at all times.

10. Radio / cell telephone communication will be available at the rig.

    A. Rig floor or trailer
    B. Vehicle

11. Special control equipment such as a rotating head will be used as required.

12. A evacuation plan with evacuation routes should be established prior to well spud for each well and discussed with all rig personnel.

13. Designated areas:

    A. Parking and visitor area: all vehicles are to be parked at a predetermined safe distance from the wellhead with the first movement forward and toward the exit when possible.
    B. There will be a designated smoking area.

C. Two briefing areas on either side of the location at the maximum allowable distance from the well bore so they offset prevailing winds perpendicularly, or at a 45-degree angle if wind direction tends to shift in the area.

Use of self-contained breathing equipment (SCBA)

1. All SCBA's shall be fitted with positive pressure demand regulators, and shall conform to a recognized oil and gas industry standard, such as US National Institute of Occupational Safety and Health (NIOSH) or equivalent.

2 SCBA's shall be inspected monthly to insure that they are properly stored, cleaned, maintained and ready for use, as per the manufacturer recommendation or as conditions warrant. Maintenance will be performed by qualified personnel, certified by the manufacturer of the equipment, shall be responsible for the safe and efficient operation of the system and shall regularly maintain the system in its entirety as per OSHA 29 CFR 1910.134, CGA 7.0 and 7.1.

3. Anyone who may use the SCBA's shall follow the training requirements stated above, (note: such items as facial hair {beard or sideburns} and eyeglasses will not allow proper seal.) Anyone that may be reasonably expected to wear SCBA's should have these items removed before entering a toxic atmosphere. A special mask must be obtained for anyone who must wear eyeglasses or contact lenses.

4. Persons assigned tasks that requires use of self-contained breathing equipment shall be certified physically fit (medically cleared) and FIT tested for breathing equipment usage at least annually.

5. SCBA's should be worn when:

   A. While sampling air in areas to determine if toxic concentrations of H2S exists.

   B. While working in areas where over 10 ppm H2S has been detected.

   C. At any time there is a doubt as to the H2S level in the area to be entered.

Rescue
First aid for H2S poisoning

Do not panic!

Remain calm – think!

1. Don SCBA breathing equipment.

2. Remove victim(s) utilizing buddy system to fresh air as quickly as possible. (go up-wind from source or at right angle to the wind. Not down wind.)

3. Briefly apply chest pressure – arm lift method of artificial respiration to clean the victim's lungs and to avoid inhaling any toxic gas directly from the victim's lungs.

4. Provide for prompt transportation to the hospital, and continue giving artificial respiration if needed.

5. Hospital(s) or medical facilities need to be informed, before-hand, of the possibility of H2S gas poisoning – no matter how remote the possibility is.

6. Notify emergency room personnel that the victim(s) has been exposed to H2S gas.

Besides basic first aid, everyone on location should have a good working knowledge of artificial respiration.

Toxic effects of hydrogen sulfide

Hydrogen sulfide is extremely toxic. The acceptable ceiling concentration for eight-hour exposure is 10 ppm, which is .001% by volume. Hydrogen sulfide is heavier than air (specific gravity – 1.192) and colorless. It forms an explosive mixture with air between 4.3 and 46.0 percent by volume. Hydrogen sulfide is almost as toxic as hydrogen cyanide and is between five and six times more toxic than carbon monoxide. The principal hazard of H_2S inhalation is death caused by paralysis of the respiratory system. The inhaled gas is absorbed into the bloodstream and is then carried to the brain where it affects the respiratory nerve center. Other symptoms of H_2S exposure include headaches, dizziness, drowsiness, increased heart rate, and nausea, with severity being determined by the amount of exposure. Coughing and pain in the eyes, throat, and chest may be attributed to the formation of acid formed when H_2S comes into contact with the moist surfaces of body tissue. Toxicity data for hydrogen sulfide and various other gases are compared in table i. Physical effects at various hydrogen sulfide exposure levels are shown in table ii.

Table i
Toxicity of various gases

Common name	Chemical formula	Specific gravity (sc=1)	Threshold limit (1)	Hazardous limit (2)	Lethal concentration (3)
Hydrogen Cyanide	Hcn	0.94	10 ppm	150 ppm/hr	300 ppm
Hydrogen Sulfide	H2S	1.18	10 ppm	250 ppm/hr	600 ppm
Sulfur Dioxide	So2	2.21	5 ppm	-	1000 ppm
Chlorine	Cl2	2.45	1 ppm	4 ppm/hr	1000 ppm
Carbon Monoxide	Co	0.97	50 ppm	400 ppm/hr	1000 ppm
Carbon Dioxide	Co2	1.52	5000 ppm	5%	10%
Methane	Ch4	0.55	90,000 ppm	Combustible above 5% in air	

1) threshold limit – concentration at which it is believed that all workers may be repeatedly exposed day after day without adverse effects.

2) hazardous limit – concentration that will cause death with short-term exposure.

3) lethal concentration – concentration that will cause death with short-term exposure.

Table ii
Physical effects of hydrogen sulfide

Percent (%)	Ppm	Concentration Grains 100 std. Ft3*	Physical effects
0.001	<10	00.65	Obvious and unpleasant odor.
0.002	10	01.30	Safe for 8 hours of exposure.
0.010	100	06.48	Kill smell in 3 – 15 minutes. May sting eyes and throat.
0.020	200	12.96	Kills smell shortly; stings eyes and throat.
0.050	500	32.96	Dizziness; breathing ceases in a few minutes; needs prompt artificial respiration.
0.070	700	45.36	Unconscious quickly; death will result if not rescued promptly.
0.100	1000	64.30	Unconscious at once; followed by death within minutes.

*at 15.00 psia and 60'f

Status check list

Note: All items on this list must be completed before drilling to production casing point.

1. H2S sign at location entrance.
2. Two (2) wind socks located as required.
3. Eight (8) 30-minute positive pressure air packs (4 at each Briefing area) inspected and ready for use.
4. Cascade system and hose line hook-up as needed.
5. Cascade system for refilling air bottles as needed.
6. Condition flag on location and ready for use.
7. H2S detection system hooked up and tested.
8. H2S alarm system hooked up and tested.
9. 1 – 100' length of nylon rope on location.
10. All rig crew and supervisors trained as required.
11. No smoking sign posted and a designated smoking area identified.

Checked by:_____ Date:_____

Procedural check list during H2S events

Perform each tour:

1. Check fire extinguishers to see that they have the proper charge.

2. Check breathing equipment to ensure that it in proper working order.

3. Make sure all the H2S detection system is operative.

Perform each week:

1. Safety contractor will check each piece of breathing equipment to make sure that demand or forced air regulator is working. This requires that the bottle be opened and the mask assembly be put on tight enough so that when you inhale, you receive air or feel air flow.

2. Safety contractor will check breathing equipment mask assembly to see that straps are loosened and turned back, ready to put on.

3. Safety contractor will check pressure on breathing equipment air bottles to make sure they are charged to full volume. (Air quality checked for proper air grade "D" before bringing to location)

4. Safety contractor will confirm pressure on all supply air bottles.

5. BOP skills (well control drills).

6. Check supply pressure on BOP accumulator stand by source.

7. Perform breathing equipment drills with on-site personnel.

Revised kv 1/2/2015