

**Caza Operating, LLC  
West Copperline 29 State Com # 2H  
Hydrogen Sulfide Contingency Plan  
For Drilling/Workover/Facility**

**HOBBS OCD**

**JAN 29 2014**

330 FNL & 660' FWL, SEC 29, T23S, R34E, LEA COUNTY, NEW MEXICO

**RECEIVED**

**General H2S Emergency Actions:**

1. All personnel will immediately evacuate to an up-wind and if possible up-hill "safe area"
2. If for any reason a person must enter the hazardous area, they must wear a SCBA (Self Contained Breathing Apparatus)
3. Always use the "buddy system"
4. Isolate the well/problem if possible
5. Account for all personnel
6. Display the proper colors warning all unsuspecting personnel of the danger at hand.
7. Contact the Company personnel as soon as possible if not at the location. ( use the enclosed call list as instructed

**At this point the company representative will evaluate the situation and coordinate the necessary duties to bring the situation under control, and if necessary, the notification of the emergency response agencies and nearby residents.**

**EMERGENCY PROCEDURES FOR AN UNCONTROLLABLE RELEASE OF H2S**

1. All personnel will wear the self-contained breathing apparatus.
2. Remove all personnel to the "safe area". (always use the buddy system).
3. Contact company personnel if not on location.
4. Set in motion the steps to protect and or remove the general public to an upwind "safe area".  
Maintain strict security & safety procedures while dealing with the source.
5. No entry to any unauthorized personnel.
6. Notify the appropriate agencies: City Police-City Street (s)  
State Police- State Rd  
County Sheriff – County Rd.
7. Call the NMOCD & BLM

**FEB 03 2014**

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**PROTECTION OF THE GENERAL PUBLIC ( ROE):**

- 100 ppm at any public area ( any place not associated with this site)
- 500 ppm at any public road ( any road which the general public may travel)
  
- 100 ppm radius of ¼ mile in New Mexico will be assumed if there is insufficient data to do the calculations, and there is a reasonable expectation that H2S could be present in concentrations greater than 100 ppm in the gas mixture

**CALCULATIONS FOR THE 100 PPM (ROE) “Pasquill-Gifford equation”**

**X = [(1.589) ( mole fraction) ( Q- volume in std cu ft)] to the power of (0.6258)**

**CALCULATION FOR THE 500 PPM ROE:**

**X = [(.4546) ( mole fraction) ( Q- volume in std cu ft)] to the power of (0.6258)**

**Example:**

If a well/facility has been determined to have 150 / 500 ppm H2S in the gas mixture and the well/facility is producing at a gas rate of 100 MCFPD then:

150 ppm X= [(1.589) (.00015) ( 100,000 cfd )] to the power of (.6258)  
X= 7 ft

500 ppm X= [(.4546) (.0005) (100,000 cfd )] to the power of (.6258)  
X = 3.3 ft.

**( These calculations will be forwarded to the appropriate District NMOCD office when Applicable)**

**PUBLIC EVACUATION PLAN:**

- 1. Notification of the emergency response agencies of the hazardous condition and implement evacuation procedures.
- A trained person in H2S safety, shall monitor with detection equipment the H2S concentration, wind and area exposure (ROE). This person will determine the outer perimeter of the hazardous area. The extent of the evacuation area will be determined from the data being collected. Monitoring shall continue until the situation has been resolved. ( All monitoring equipment shall be UL approved, for use in class 1 groups A,B,C &D, Division 1, hazardous locations. All monitor will have a minimum capability of measuring H2S , oxygen, and flammable values).

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- Law enforcement shall be notified to set up necessary barriers and maintain such for the duration of the situation as well as aid in the evacuation procedure.
- The company supervising personnel shall stay in communication with all agencies through out the duration of the situation and inform such agencies when the situation has been contained and the effected area(s) is safe to enter.

**PROCEDURE FOR IGNITING AN UNCONTROLABLE CONDITION:**

- 1. Human life and/or property are in danger
- 2. There is no hope of bringing the situation under control with the prevailing conditions at the site.

**INSTRUCTION FOR IGNITION:**

- 1. Two people are required. They must be equipped with positive pressure, self contained breathing apparatus and a "D" ring style full body, OSHA approved safety harness. Non flammable rope will be attached.
- 2. One of the people will be qualified safety person who will test the atmosphere for H<sub>2</sub>S, Oxygen & LFL. The other person will be the company supervisor; he is responsible for igniting the well.
- 3. Ignite up wind from a distance no closer than necessary. Make sure that where you ignite from has the maximum escape avenue available. A 25 mm flare gun shall be used, with a ± 500 ft. range to ignite the gas.
- 4. Prior to ignition, make a final check for combustible gases.
- 5. Following ignition, continue with the emergency actions & procedures as before.

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- A. All personnel shall receive proper H2S training in accordance with Onshore Order III.C.3.a.
- B. Briefing Area: two perpendicular areas will be designated by signs and readily accessible.
- C. Required Emergency Equipment:

- Well control equipment

- a. Flare line 150' from wellhead to be ignited by flare gun or automatic striker.
  - b. Choke manifold with a remotely operated choke.
  - c. Mud/gas separator

- Protective equipment for essential personnel.

Breathing apparatus:

- a. Rescue Packs (SCBA) — 1 unit shall be placed at each breathing area, 2 shall be stored in the safety trailer.
  - b. Work/Escapes packs — 4 packs shall be stored on the rig floor with sufficient air hose not to restrict work activity.
  - c. Emergency Escape Packs — 4 packs shall be stored in the doghouse for emergency evacuation.

Auxiliary Rescue Equipment:

- a. Stretcher
  - b. Two OSHA full body harness
  - c. 100 ft 5/8 inch OSHA approved rope
  - d. 1-20# class ABC fire extinguisher

- H2S detection and monitoring equipment:

The stationary detector with three sensors will be placed in the upper dog house if equipped, set to visually alarm @ 10 ppm and audible @ 14 ppm. Calibrate a minimum of every 30 days or as needed. The sensors will be placed in the following places: Rig floor / Bell nipple / End of flow line or where well bore fluid is being discharged.  
(Gas sample tubes will be stored in the safety trailer)

- Visual warning systems.

- a. One color code condition sign will be placed at the entrance to the site reflecting the possible conditions at the site.
  - b. A colored condition flag will be on display, reflecting the current condition at the site at the time.
  - c. Two wind socks will be placed in strategic locations, visible from all angles.
  - d.

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- **Mud program:**  
The mud program has been designed to minimize the volume of H<sub>2</sub>S circulated to surface. The operator will have the necessary mud products to minimize hazards while drilling in H<sub>2</sub>S bearing zones.
- **Metallurgy:**
  - a. All drill strings, casings, tubing, wellhead, blowout preventer, drilling spool, kill lines, choke manifold and lines, and valves shall be suitable for H<sub>2</sub>S service.
  - b. All elastomers used for packing and seals shall be H<sub>2</sub>S trim.
- **Communication:**  
Communication will be via two way radio in emergency and company vehicles. Cell phones and land lines where available.

**USING SELF CONTAINED BREATHING AIR EQUIPMENT (SCBA):**

- (SCBA) SHOULD BE WORN WHEN ANY OF THE FOLLOWING ARE PERFORMED:
  - Working near the top or on top of a tank
  - Disconnecting any line where H<sub>2</sub>S can reasonably be expected
  - Sampling air in the area to determine if toxic concentrations of H<sub>2</sub>S exist.
  - Working in areas where over 10 ppm on H<sub>2</sub>S has been detected.
  - At any time there is a doubt as the level of H<sub>2</sub>S in the area.
- All personnel shall be trained in the use of SCBA prior to working in a potentially hazardous location.
- Facial hair and standard eyeglasses are not allowed with SCBA.
- Contact lenses are never allowed with SCBA.
- Air quality shall be continuously be checked during the entire operation.
- After each use, the SCBA unit shall be cleaned, disinfected, serviced and inspected
- All SCBA shall be inspected monthly.

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**RESCUE AND FIRST AID FOR VICTIMS OF HYDROGEN SULFIDE (H<sub>2</sub>S) POISONING:**

- Do not panic
- Remain Calm & think
- Get on the breathing apparatus
- Remove the victim to the safe breathing area as quickly as possible. Up wind an uphill from source or cross wind to achieve upwind.
- Notify emergency response personnel.
- Provide artificial respiration and or CPR, as necessary
- Remove all contaminated clothing to avoid further exposure.
- A minimum of two personnel on location shall be trained in CPR and First Aid.

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**Hydrogen Sulfide (H2S) Toxic Effects**

H2S is extremely toxic. The acceptable ceiling for eight hours of exposure is 10 ppm, which is .001% by volume. H2S is approximately 20% heavier than air (Sp. Gr= 1.19)(Air = 1) and H2S is colorless. It forms an explosive mixture with air between 4.3% and 46%. By volume hydrogen sulfide is almost as toxic as hydrogen cyanide and 5-6 times more toxic than carbon monoxide.

**Various Gases**

COMMON NAME	CHEMICAL ABBREV.	SPECIFIC GRVTY.	THRESHOLD LIMITS	HAZARDOUS LIMITS	LETHAL CONCENTRATIONS
Hydrogen Sulfide	H2S	1.19	10ppm 15 ppm	100 ppm/hr	600 ppm
Hydrogen Cyanide	HCN	0.94	10 ppm	150 ppm/hr	300 ppm
Sulfur Dioxide	SO2	2.21	2 ppm	N/A	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	Combustible@ 5%	N/A

**Threshold Limit:** Concentrations at which it is believed that all workers may be repeatedly exposed, day after day without adverse effects.

**Hazardous Limit:** Concentrations that may cause death.

**Lethal Concentrations:** Concentrations that will cause death with short term exposure.

**Threshold Limit- 10 ppm:** NIOSH guide to chemical hazards.

**PHYSICAL EFFECTS OF HYDROGEN SULFIDE:**

CONCENTRATION	PHYSICAL EFFECTS
.001% 10 PPM	Obvious and unpleasant odor. Safe for 8 hr exposure
.005% 50 ppm	Can cause some flu like symptoms and can cause pneumonia
.01% 100 ppm	Kills the sense of smell in 3-15 minutes. May irritate the eyes and throat.
.02% 200 ppm	Kills the sense of smell rapidly. Severly irritates the eyes and throat. Severe flu like symptoms after 4 or more ours. May cause lung damage and or death.
.06% 600 ppm	Loss of consciousness quickly, death will result if not rescued promptly.

