
# H2S CONTINGENCY PLAN

**I. INTRODUCTION** H2S is a toxic, poisonous gas that could cause death or injury. The objective of this contingency plan is to provide an organized plan of action for alerting and protecting the public from H2S exposure in the event a potentially hazardous volume is accidentally released to the atmosphere. This plan should be activated immediately if any such release occurs. The Drilling Superintendent is responsible for initiating and carrying out the plan.

**II. INDIVIDUAL RESPONSIBILITIES** It is the responsibility of all personnel on the location to familiarize themselves with the procedures outlined in this contingency plan.

A. All Personnel:

1. Responsible for his assigned safety equipment.
2. Responsible for familiarizing himself with the location of all safety equipment.
3. Responsible for reporting any indications of H2S to those in the area and to a supervisor.

B. Drilling Superintendent:

1. Responsible for thoroughly understanding and seeing that all aspects of this contingency plan are enforced.
2. Responsible for implementing all phases of this contingency plan.
3. Responsible for keeping a minimum of personnel on the location during expected hazardous operations.
4. Responsible for coordinating all well site operations and communications in the event that an emergency condition develops.
5. Responsible for ensuring that all visitors receive an H2S Safety Orientation. A visitor's log will be maintained as well as a list of all personnel on the location after drilling has progressed to the suspected H2S formation.

**III. LOCATION LAYOUT**

A. The location of at least two pre-determined safe areas to assemble at in the event of an emergency. These locations should be located 180 degrees to one another, and in the direction of the prevailing winds.

B. H2S rig monitor with three (3) heads. One located at the bell nipple, one located at the shale shaker, and a third one on the rig floor. Indicate here any other additional H2S detector locations for this well:

Type: Location:

Type: Location:

C. The location and type of all air masks. Self-contained breathing apparatus for use by rig personnel will be kept in the following location(s):

Type: 1-30 Min. Rescue Unit Location: Company Man's Trailer

Type: 1-30 Min. Rescue Unit Location: Tools Pusher's Trailer

Type: 2-30 Min. Rescue Units Location: Briefing Area #1

Type: 2-30 Min. Rescue Units Location: Briefing Area #2

Type: 5-5 Min. Escape Units Location: Rig Floor

If a cascade system is utilized, indicate the locations(s).:

Type: Location:

Type: Location:

D. The location of windsocks or streamer. The wind direction indicators for this well will be located at:

Type: Windsock Location: Briefing Area #1

Type: Windsock Location: Briefing Area #2

Type: Windsock Location: Pits

Type: Windsock Location: Rig Floor

E. The location of any other safety equipment used, such as flare guns or bug blowers:

Type: Hand Held Detector & Tubes Location: Rig Floor

Type: Location:

F. The location of all telephones and/or means of communication are as follows:

Type: Unknown at this time Location:

Type: Location:

G. Warning Signs:

1. "NO SMOKING" signs should be strategically located around the rig and rig location. The following locations are appropriate:
    a. Doghouse
    b. Rig Floor
    c. Substructure
    d. Lower landing of all stairs leading to rig floor
    e. Mud pits
    f. Shale shaker
2. "POISON GAS" signs should also be strategically located around the rig and rig location. The following locations are appropriate:
    a. All entrances leading to the location
    b. Lower landing of all stairs leading to the rig floor
    c. All areas around substructure, including mud pits and shale shaker
    d. Various points along the perimeter of the radius of exposure

**NOTE**: All warning signs should be black and yellow in color and of readable size at a reasonable distance.

**IV. OPERATING PROCEDURES** The following operating procedures will be utilized for drilling in areas with H2S.

**A.** Plan of operating for handling gas kicks and other drilling problems. Any gas kick will be controlled by using approved well control techniques. Upon evidence that ambient H2S concentrations have reached 10 PPM, all non-essential personnel will be evacuated to pre-determined safe areas. Personnel remaining on the rig floor will continue to control the well until the situation indicates the area is safe to re-enter.

B. Special Operations

1. Drill Stem Tests. All drill stem tests must be closed chamber and conducted during daylight hours.
2. Coring. After a core has been cut, circulate bottoms up and monitor for H2S. If hole conditions (and/or detectors) indicate potentially hazardous conditions, put breathing equipment on 10 stands before core barrel reaches the surface. Breathing equipment will be worn by all personnel while core barrel is pulled, broken out and opened up, and until a safe atmosphere is indicated.

**V. OPERATING CONDITIONS** Operating conditions are defined in three categories. A description of each of these conditions and the required action to take are given below.

**A. CONDITION I - Normal Operating Conditions, Potential Danger, Operations Under Control**

Characterized by: Normal drilling operations and test operations in zones which contain or may contain H2S.
Warning Flag: Yellow
Alarm: None
Probable Occurrence: No detectable gas present at surface.
General Action: (1) Know location of safety equipment.
(2) Check safety equipment for proper function. Keep it available.
(3) Be alert for a condition change.
(4) Follow instructions of the supervisor.

B. **CONDITION II - Potential to Moderate Danger to Life**

Characterized by: H2S gas present. Concentration less than 10 PPM.
Warning Flag: Orange
Alarm: Flashing light at 10 PPM H2S.
Intermittent blasts on horn at 10 PPM H2S.
Probable Occurrence: (1) As drill gas.
(2) As trip gas when circulating bottoms up.
(3) When a core barrel is pulled.

(4) When a well kick is circulated out.
(5) Surface pressure, well flow or lost operations.
(6) Equipment failure during testing operations.

General Action: (1) Follow instructions of supervisor.
(2) Put on breathing equipment if directed, or conditions warrant it.
(3) Stay in "SAFE BRIEFING AREA" if instructed and not working to correct the problem.
(4) The Drilling Superintendent will initiate action to reduce the H2S concentration to zero.

**C. CONDITION III – Moderate to Extreme Danger to Life**

Characterized by: H2S present in concentrations at or above 10 PPM. Critical well operations or well control problems. In the extreme, loss of well control.

Warning Flag: Red

Alarm: Flashing light and continuous blast on horn at 10 PPM H2S.

Probable Occurrence: (1) As drill gas.
(2) As trip gas when circulating bottoms up.
(3) When a core barrel is pulled.
(4) When a well kick is circulated out.
(5) Surface pressure, well flow or lost returns problems.
(6) Equipment failure during testing operations.

General Action: (1) Put on breathing equipment. Move to "SAFE BRIEFING AREA" and remain there if not working to correct the problem.
(2) Follow instructions of Driller Superintendent or other supervisor.
(3) The Drilling Superintendent will initiate emergency action as provided in the contingency plan and as appropriate to the actual conditions. If testing operations are in progress the well will be shut in.
(4) The Drilling Superintendent will conduct any necessary operations with an absolute minimum of personnel. All persons in the immediate area will wear a breathing apparatus. All other personnel will restrict their movements to those directed by the superintendent.
(5) If gas containing hydrogen sulfide is ignited, the burning hydrogen sulfide will be converted to sulfur dioxide, which is poisonous.

**VI. EMERGENCY PROCEDURES** The procedures listed below apply to drilling and testing operations.

A. If at any time during Condition I, the Mud Logger, Mud Engineer, or any other person detects H2S, he will notify the Drilling Superintendent. All personnel should keep alert to the Drilling Superintendent's orders.

He will:

1. Immediately begin to ascertain the cause or the source of the H2S and take steps to reduce the H2S concentration to zero. This should include having the mud engineer run a sulfide and Ph determination on the flowline mud if water-base mud is in use. If an oil-base mud is in use, the Mud Engineer should check the lime content of the mud.
2. Order non-essential personnel out of the potential danger area.
3. Order all personnel to check their safety equipment to see that it is working properly and in the proper location. Persons without breathing equipment will not be allowed to work in a hazard area.
4. Notify the contract Supervisor of the condition and action taken.
5. Increase gas monitoring activities with portable H2S detectors and continue operations with caution.
6. Display the orange warning flag.

B. If the H2S concentration exceeds 10 PPM the following steps **will** be taken:

1. Put on breathing equipment.
2. Display red flag.
3. Driller – prepare to shut the well in.
   a. Pick up pipe and get Kelly out of BOP's
   b. Close BOP's if necessary.
4. If testing operations are in progress, the well will be shut-in.
5. Help anyone who may be affected by gas.
6. Evacuate quickly to the "SAFE BRIEFING AREA" if instructed or conditions warrant.

C. In the event a potentially hazardous volume of H2S is released into the atmosphere, the following steps must be taken to alert the public:

1. Remove all rig personnel from the danger area and assemble at a pre-determined safe area, preferably upwind from the well site.
2. Alert the drilling office, public safety personnel, regulatory agencies, and the general public of the existence and location of an H2S release. See List of Emergency Telephone Numbers.

3. Assign personnel to block any public road (and access road to location) at the boundary of the area of exposure. Any unauthorized people within the area should be informed that an emergency exists and be ordered to leave immediately.
4. Request assistance from public safety personnel to control traffic and/or evacuate people from the threatened area.

**VII. TRAINING PROGRAM** All personnel associated with the drilling operations will receive training to insure efficient and correct action in all situations. This training will be in the general areas of: (1) personnel safety, (2) rig operations, and (3) well control procedures.

**A. Personnel Safety Training** – All personnel shall have received H2S training in the following areas:

1. Hazards and characteristics of H2S.
2. Effect on metal components of the system.
3. Safety precautions.
4. Operation of safety equipment and life support systems.
5. Corrective action and shutdown procedures.

**B. Rig Operations** – All rig personnel shall have received training in the following areas:

1. Well control procedures.
2. Layout and operations of the well control equipment.

**NOTE:** Proficiency will be developed through BOP drills which will be documented by the Drilling Superintendent.

**C. Service Company Personnel** – All service personnel shall have been trained by their employers in the hazards and characteristics of H2S and the operation of safety equipment and life support systems.

**D. Visitors** – All first time visitors to the location will be required to attend a safety orientation. The Drilling Superintendent shall be responsible for this orientation and he shall see that every visitor is logged in correctly.

**E. Public** – The public within the area of exposure shall be given an advance briefing by the Drilling Superintendent. This briefing must include the following elements:

1. Hazards and characteristics of hydrogen sulfide. It is an extremely dangerous gas. It is normally detectable by its “rotten egg” odor, but odor is not a reliable means of detection because the sense of smell may be dulled or lost due to intake of the gas. It is colorless, transparent, and flammable. It is heavier than air and may accumulate in low places.

2. The necessity of an emergency action plan. Due to the danger of persons exposed to hydrogen sulfide and the need for expeditious action should an emergency occur, this action plan will be put into effect if and when a leak occurs.
3. The location of hydrogen sulfide within the area of exposure at the drilling location.
4. The manner in which the public will be notified of an emergency is by telephone or in person.
5. Steps to be taken in case of an emergency:
    a. Abandon danger area.
    b. Notify necessary agencies and request assistance for controlling traffic and evacuating people.