

# **HYDROGEN SULFIDE SAFETY TRAINING MANUAL**

**This training manual is intended to be used as an aid to provide you with information about the precautions and guidelines necessary to work safely in or around Hydrogen Sulfide gas. H<sub>2</sub>S is a deadly gas but by following proper techniques and being constantly aware of the hazards involved, personnel using the proper equipment can and do work safely in H<sub>2</sub>S environments on a daily basis.**

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**H<sub>2</sub>S SAFETY EQUIPMENT  
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## WHAT IS HYDROGEN SULFIDE?

HYDROGEN SULFIDE is a highly toxic and colorless gas. When inhaled in high concentrations it can cause almost immediate death. Even low concentrations can affect the eyes as well as the respiratory tract. The principal hazard is death by inhalation. When the amount of gas absorbed into the blood system exceeds that which is readily oxidized, systemic poisoning results, with a general action on the nervous system. Labored respiration occurs shortly and respiratory paralysis will follow immediately at concentrations of 700 ppm and above. Death will occur from asphyxiation unless the exposed person is removed immediately to fresh air and breathing stimulated by artificial respiration.

There are many different hazards associated with this poisonous gas. Exposure to HYDROGEN SULFIDE may result in eye disorders, heart disorders, nerve disorders, and of course, lack of breathing, which can kill you suddenly. Skin absorption of HYDROGEN SULFIDE is not considered significant. Low levels of exposure may cause the following symptoms individually or in combinations, increasing with longer exposure.

1. Fatigue
2. Irritation to eyes
3. Headache
4. Dizziness
5. Excitement
6. Coughing
7. Drowsiness
8. Nausea
9. Sensation of pain in nose, throat, and chest

HYDROGEN SULFIDE gas has an offensive odor, similar to that of rotten eggs, but it rapidly deadens your sense of smell; therefore, odor is a very unreliable means of detecting this poisonous gas. Because of its' rapid action, HYDROGEN SULFIDE is considered one of the most dangerous industrial gasses. It is almost as lethal as hydrogen cyanide, the gas used to execute criminals in some states. HYDROGEN SULFIDE gas is referred to by many different names including the following:

H <sub>2</sub> S	Stink Damp
Sulfurated Hydrogen	Stink Gas
Rotten-Egg Gas	Sour Gas

For purposes of simplicity, this manual will henceforth refer to HYDROGEN SULFIDE as H<sub>2</sub>S.

## HYDROGEN SULFIDE = H<sub>2</sub>S

## WHERE DO YOU FIND H<sub>2</sub>S?

H<sub>2</sub>S occurs in a variety of areas and is usually obtained as a by-product of other operations. Some of those operations include the following:

1. energy production from hydrocarbon and geothermal sources.
2. production of heavy water
3. in tanneries
4. in sewers, sewage treatment and animal waste disposals
5. In mines and work below ground
6. on fishing boats
7. in chemical operations
8. in black powder blasting
9. in the oil and gas industry

H<sub>2</sub>S is recoverable from natural gas and petroleum refining operations and is converted to sulfuric acid or high-quality sulfur or disposed of by burning in flares. When burned, H<sub>2</sub>S burns with a blue flame and produces another poisonous gas, SULFUR DIOXIDE or SO<sub>2</sub>. SO<sub>2</sub> is toxic, very irritating to eyes and lungs, and can cause serious injury or death.

## PROPERTIES

ODOR -- very offensive, commonly referred to as the odor of rotten eggs.

COLOR -- H<sub>2</sub>S is colorless

FLAMMABILITY -- H<sub>2</sub>S is highly flammable and burns with a blue flame

EXPLOSIVE LIMITS -- 4.3% to 46% by volume in air. H<sub>2</sub>S forms explosive mixtures with air or oxygen.

VAPOR DENSITY -- 1.189 (air = 1). H<sub>2</sub>S is heavier than air and will settle in low lying areas unless dispersed.

SOLUBILITY -- H<sub>2</sub>S is water soluble.

CORROSIVE -- H<sub>2</sub>S is highly corrosive to certain metals

IGNITION TEMPERATURE -- 500° F

BOILING POINT -- 76° F

## PHYSICAL EFFECTS OF H<sub>2</sub>S

The way H<sub>2</sub>S affects you depends on three things. They are: (1) how much you are exposed to (dosage or concentration); (2) how long you are exposed to it; and (3) each individual's body tolerance. Studies show that exposure to H<sub>2</sub>S by different individuals may have different affects or symptoms for each individual. In general:

Exposure to H<sub>2</sub>S in low concentrations may cause irritation of the eyes, nose and throat.

Exposure to H<sub>2</sub>S in moderate concentrations causes headaches, dizziness, nausea, vomiting and coughing.

Exposure to H<sub>2</sub>S in high concentrations causes loss of consciousness rapidly and death.

H<sub>2</sub>S is measured in parts-per million (hereafter to be referred to as PPM) or in percentages (%). The number of parts-per-million of H<sub>2</sub>S is equal to the number of parts of H<sub>2</sub>S per million parts of air by volume. In other words, if you had one million marbles in a barrel and those marbles represented H<sub>2</sub>S, one of those marbles would be equal to one part-per-million or .0001%. Half of those marbles would represent 500,000 parts-per-million or 50%. As another example, if 1 inch represents 1 PPM of H<sub>2</sub>S this would be like comparing 1 inch to over 15% miles.

The following information has been obtained from American National Standards Institute (ANSI) Z37.2 - 1972 "Acceptable Concentrations of Hydrogen Sulfide".

0.13 PPM:	minimal perceptible odor . . .
4.60 PPM:	easily detectable, moderate odor
10 PPM:	beginning eye irritation . . .
27.0 PPM:	strong, unpleasant odor, but not intolerable
100 PPM:	coughing, eye irritation, loss of sense of smell after 2 - 15 minutes
200-300 PPM:	marked conjunctivitis (eye inflammation) and respiratory tract irritation after one hour of exposure
500-700 PPM:	Loss of consciousness and possibly death in 30 minutes to one hour
700-1000 PPM:	Rapid unconsciousness, cessation (stopping or pausing) 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 individual is removed to fresh air at once

## "TOXICITY OF VARIOUS GASES"

Common Name	Chemical Formula	Specific Gravity (SG) SG Air = 1	Threshold <sup>1</sup> Limit	Hazardous <sup>2</sup> Limit	Lethal <sup>3</sup> Concentration
Hydrogen Cyanide	HCN	0.94	10 ppm	150 ppm/hr	300 ppm
Hydrogen Sulfide	H <sub>2</sub> S	1.18	10 ppm	250 ppm/hr	600 ppm
Sulfur Dioxide	SO <sub>2</sub>	2.21	5 ppm	-----	1000 ppm
Chlorine	Cl <sub>2</sub>	2.45	1 ppm	4 ppm / hr	1000 ppm
Carbon Monoxide	CO	0.97	50 ppm	400 ppm / hr	1000 ppm
Carbon Dioxide	CO <sub>2</sub>	1.52	5000 ppm	5%	10%
Methane	CH <sub>4</sub>	0.55	90,000 ppm	(9%) Combustible above 5% in air	-----

<sup>1</sup> Threshold Limit - concentration at which it is believed that all worker may be repeatedly exposed day after day without adverse effects.

<sup>2</sup> Hazardous Limit - concentration that may cause death

<sup>3</sup> Lethal Concentration - concentration that will cause death with short term exposure

<sup>4</sup> Threshold Limit = 10 PPM - 1972 ACGIH (American Conference of Governmental Industrial Hygienists).

The above quoted table is from American Petroleum Institute, API-RP-49 "Recommended Practices for Safe Drilling of Wells Containing Hydrogen Sulfide"

## TOXICITY OF HYDROGEN SULFIDE TO MEN

PPM**	0-2 Minutes	2-15 Minutes	15-30 Minutes	30 Minutes to 1 Hour	1-4 Hours	4-8 Hours	8-48 Hours
20-100			Mild conjunctivitis respiratory tract irritation	symptoms worsen fatigue, headache	symptoms worsen		
100-150	coughing, irri- tation of eyes, loss of sense of smell	disturbed res- piration, pain in eyes, sleep- iness	throat irritation	salivation and mucous discharge, sharp in eyes, coughing	increased symptoms		DEATH* +++++
150-200	loss of sense of smell	throat and eye irritation	throat and eye irritation	difficult, blurred vision, light shy	DEATH* +++++		+++++
200-350	irritation of eyes, loss of smell	painful secre- tion of tears, weariness	light shy, nasal catarrh, pain in eyes, difficult breathing	suffocation, poison in blood, DEATH* +++++	+++++		+++++
350-450	loss of sense of smell	difficult res- piration, cough- ing, irritation of eyes, fatigue and nausea	DEATH* +++++	+++++	+++++		+++++
450-700	respiratory dis- turbances, irri- tation of eyes, collapse, uncon- sciousness	coughing, col- lapse, uncon- sciousness, DEATH* +++++	palpitation of heart, DEATH* +++++	+++++	+++++		+++++
Over 700	collapse, uncon- sciousness, DEATH* +++++	+++++	+++++	+++++	+++++		+++++

\*date secured from experiments of dogs which have a susceptibility similar to men.

\*\* PPM - parts per million

Susceptibility varies greatly between individuals.

## **H2S DETECTION AND ALARMS**

### **MECHANICAL DETECTORS**

Most hand operated tube detectors incorporate a pump, detector tube, and a scale to give readings of H<sub>2</sub>S. The pump draws air to be tested through the detector tube to react with lead acetate-silica gel granules. Presence of H<sub>2</sub>S in the air sample is shown by the development of a dark brown stain on the granules. The scale reading opposite the end of the stain is the concentration of H<sub>2</sub>s. By changing the tube to a different level, you can measure higher or lower levels of H<sub>2</sub>S. By changing the type of detector tube used, this detector may also be used for Sulfur Dioxide (SO<sub>2</sub>) detection when H<sub>2</sub>S is being burned in the flare area.

**ANYTIME A SITUATION REQUIRES YOUR USING A HANDHELD DETECTOR YOU ARE REQUIRED TO WEAR THE PROPER BREATHING APPARATUS WHILE DOING SO!!!**

### **ELECTRONIC DETECTORS**

On most permanent installations or where there is a continuous possibility of encountering H<sub>2</sub>S, electronic monitors are usually installed to give an additional measure of protection to the working personnel. These electronic detection units continuously monitor the area in which the sensor heads are located, whether stationary or portable. When the level of H<sub>2</sub>S increases to an established point, an alarm is triggered. There are usually two alarm points: (a) the first at 10 ppm and (b) the second at 20 ppm. The first alarm is usually a visual alarm such as a strobe or flashing light and the second alarm is usually an audible alarm such as a horn or siren. It is very important that you check with your supervisor to find out what the alarms and settings are for your particular location. When the level of H<sub>2</sub>S reaches 20 ppm, you are required by law to wear a protective breathing apparatus. All detectors are subject to malfunction and false alarms. The following list includes some of the reasons for these malfunctions and false alarms:

- 1). wetting or drenching a sensor with water or other fluid
- 2). cutting the power cord to the sensor or monitor
- 3). turning off the power supply to the monitor
- 4). hitting or banging on the sensor or the monitor
- 5). some radio transmissions

**REGARDLESS OF THE CAUSE OF THE ALARM, YOU SHOULD TREAT EVERY ALARM AS THE REAL THING UNTIL PROVEN OTHERWISE!!!**

## **WIND DIRECTION & WIND DIRECTION INDICATORS**

Because H<sub>2</sub>S is heavier than air, it is important that you remain wind conscious at all times. In the event of an H<sub>2</sub>S alarm, you should move upwind, or cross-wind, and if at all possible, uphill. Unless the H<sub>2</sub>S is dispersed, it will remain concentrated, so you must avoid any low-lying areas. In some enclosed areas, it is advisable to install bug-blowers or fans to help disperse the gas. These fans should be explosion-proof so as to prevent igniting the flammable and explosive H<sub>2</sub>S gas. On all H<sub>2</sub>S locations it is mandatory to have wind-socks and wind direction indicators installed. These wind direction indicators should be installed so that they can be easily seen from any where on location.

## **BRIEFING AREAS AND ESCAPE ROUTES**

As well as having an entrance to the location there must also be a secondary escape route. The entrance to and secondary escape route from the location should be set up with the wind in mind also. If the briefing areas and escape routes are always set up according to wind direction, then personnel should be able to evacuate the location from either of the briefing areas. On all H<sub>2</sub>S locations, it is mandatory that there be at least 2 Briefing Areas. These Briefing Areas must be at least 250 feet away from the well bore, and should be situated so that one will be upwind from the well at all times. If the prevailing winds are such that this can not be accomplished with two Briefing Areas, then a third one should be installed. These Briefing areas should have a sign prominently displayed so that they can be seen from anywhere on location. The Briefing Areas are numbered and are to be used as refill stations for the Self-Contained Breathing Apparatus (SCBA). In the event of an H<sub>2</sub>S alarm, all personnel will go to the "safe" Briefing Area, designated by wind direction at that time. All personnel can then be accounted for and briefed by their supervisors. All non-essential personnel will evacuate the location at this time.

## **CONDITION SIGNS**

When arriving at a well site where H<sub>2</sub>S is anticipated, you should first look at the Condition Sign at the location entrance to find out what the well site condition is. There are generally 3 different stages of condition and they are noted on a large sign by displayed colored flags. In most areas the 3 stages are:

STAGE #1 -- GREEN FLAG -- NORMAL OPERATIONS

STAGE #2 -- YELLOW FLAG -- POTENTIAL DANGER -- there is a possibility of encountering H<sub>2</sub>S or it has already been encountered in small quantities ( 1 ppm to 20 ppm).

STAGE #3 -- RED FLAG -- extreme danger -- special operations are being done OR there is a real possibility of encountering H<sub>2</sub>S in harmful quantities. (over 20 ppm).

**DO NOT APPROACH THE LOCATION WITHOUT PROPER AUTHORIZATION AND A BREATHING APPARATUS WHILE THE RED FLAG IS DISPLAYED!!**

You should also note the location of the designated smoking areas. Smoking is only allowed in these areas. When parking your vehicle, be sure to park it so that it's facing away from any possible source of H<sub>2</sub>S and towards an escape route.

## **ESCAPE & RESCUE**

When you do arrive on the well site you should note the location of: windsocks, H<sub>2</sub>S alarms, briefing areas, and escape routes. These factors are very important during H<sub>2</sub>S exposure and escape. You should also check in with the Safety Supervisor or the proper company representative and be assigned a "buddy". While on location you should always know where your "buddy" is and make sure he knows where you are. Always have your assigned breathing apparatus readily accessible and ready for use. If an alarm sounds, don your protective breathing apparatus and go immediately to the "safe" upwind briefing area. The "safe" briefing area is designated by wind direction at that particular time. It will always be the most upwind briefing area. Stay constantly aware of the wind direction so that you can move to another briefing area if it becomes necessary.

It is obvious that you should help anyone having difficulty while you are leaving the area. Before you attempt to help anyone else, make positively sure that you are adequately protected yourself. It is better to have only one victim rather than two. You should attempt to drag the victim by grabbing his shirt collar and supporting his head. If his clothing is unsuitable as a handhold, his arms can be stretched out above his head on the ground and his wrists can be crossed and used to drag the body. Always be sure to support the victims head.

A safety rope can also be attached around a victim and several people from a clear area can pull him out while one person wearing a self-contained breathing apparatus secures the life-line and supports the victims head during the rescue.

## CONTINGENCY PLANS

Before drilling into any possible H<sub>2</sub>S formations, the operator must have a contingency plan developed in case of an emergency. A copy of this plan must be on location and available to all personnel. Some of the material covered in this contingency plan is listed below:

- a) general information and physiological response to H<sub>2</sub>S and SO<sub>2</sub> exposure.
- b) safety procedures, equipment, training and smoking rules.
- c) procedures for operating conditions
  - 1) normal operations
  - 2) potential danger
  - 3) extreme danger
- d) responsibility of personnel for each operating condition
- e) designation of briefing areas  
At least two (2) two briefing areas shall be established at each drilling facility. Of these two areas, the one upwind at any given time is the "safe" briefing area.
- f) designation of escape routes
- g) Evacuation plan
- h) agencies to be notified in case of emergency
- i) a list of medical personnel and facilities with telephone numbers and addresses.
- j) a list of all area residents inside the two (2) mile radius of exposure with telephone numbers
- k) rig layout and local maps

**ALL PERSONNEL SHOULD READ AND BECOME FAMILIAR WITH THE H<sub>2</sub>S CONTINGENCY PLAN AND BE PREPARED TO FOLLOW THE LISTED PROCEDURES IN CASE OF AN ACCIDENTAL RELEASE OF HYDROGEN SULFIDE**

## **PROTECTIVE BREATHING EQUIPMENT**

Anytime a person is working in an environment that has a concentration of more than 20 PPM H<sub>2</sub>S, Federal law requires that he wear protective breathing equipment. There are two common types of protective breathing apparatus suitable for use in H<sub>2</sub>S environments.

- 1) **SELF-CONTAINED BREATHING APPARATUS (SCBA)** This type of apparatus supplies air from a cylinder worn on the back. Typical cylinders will provide from 10 to 30 minutes of air depending on cylinder size and amount of air being consumed.
- 2) **SUPPLIED AIR APPARATUS** This type of apparatus has a hoseline connection so that the wearer can plug into a cascade system. It also has a small egress cylinder attached so that when the wearer needs to disconnect from his hoseline he still has a limited amount of air necessary to reach a "safe" area. These type units restrict the wearer to the area in which his hoseline will reach but are much lighter than the SCBA.

### **FACE SEAL**

In order for the mask to work properly, the person using it must get a proper seal. He should be able to wear the mask without being able to inhale any air from outside the mask. The following is a list of causes that could prevent a good mask seal:

- 1) beard or long facial hair
- 2) long or bushy sideburns
- 3) hair down on forehead
- 4) eye-glass arms protruding past seal on mask
- 5) removal of dentures while wearing mask
- 6) bad facial scars

All air paks used in H<sub>2</sub>S environments must be positive pressure. In other words, there must be a constant flow of air to the mask at all times. A positive pressure mask prevents the wearer from inhaling any of the contaminated air if his seal were to be broken. For this reason it is inadvisable to wear contact lenses while under mask.

To determine the amount of air (in minutes) that a particular air pak is rated for, you can divide the cylinder size by 1.4 (medium work factor). This does not mean that you have exactly that amount of time for use but it is how the manufacturer rates the air pak.

Two of the more common types of air paks are shown below. One is the self-contained breathing apparatus and the other is an air supplied apparatus with an egress cylinder. Both have full face pieces and are suitable for H<sub>2</sub>S service. Always make sure that the air-pak that you will be using is readily accessible and in good repair.

Scott AirPak II a

A Self-Contained Breathing Apparatus rated at 30 minutes of air and suitable for use in H<sub>2</sub>S environments.



Scott Ska-Pak

An air supplied apparatus with a 5 minute egress cylinder and full face piece suitable for H<sub>2</sub>S service.



# WHEN BREATHING STOPS



IF A VICTIM APPEARS TO BE UNCONSCIOUS

TAP VICTIM ON THE SHOULDER AND SHOUT, "ARE YOU OKAY?"



IF THERE IS NO RESPONSE

TILT THE VICTIM'S HEAD, CHIN POINTING UP  
Place one hand under the victim's neck and gently lift. At the same time, push with the other hand on the victim's forehead. This will move the tongue away from the back of the throat to open the airway. IMMEDIATELY LOOK, LISTEN, AND FEEL FOR AIR.

While maintaining the backward head tilt position, place your cheek and ear close to the victim's mouth and nose. Look for the chest to rise and fall while you listen and feel for the return of air. Check for about 5 seconds.



IF THE VICTIM IS NOT BREATHING

GIVE FOUR QUICK BREATHS  
Maintain the backward head tilt, pinch the victim's nose with the hand that is on the victim's forehead to prevent leakage of air, open your mouth wide around the victim's mouth, and blow into the victim's mouth with four quick but full breaths just as fast as you can. When blowing, use only enough time between breaths to lift your head slightly for better inhalation. For an infant, give gentle puffs and blow through the mouth and nose and do not tilt the head back as far as for an adult. If you do not get an air exchange when you blow, it may help to reposition the head and try again.

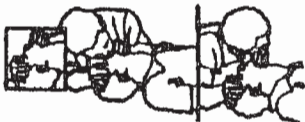
AGAIN, LOOK, LISTEN, AND FEEL FOR AIR EXCHANGE.



IF THERE IS STILL NO BREATHING

CHANGE RATE TO ONE BREATH EVERY 5 SECONDS FOR AN ADULT  
FOR AN INFANT, GIVE ONE GENTLE PUFF EVERY 3 SECONDS.

## MOUTH-TO-NOSE METHOD



The mouth-to-nose method can be used with the sequence described above instead of the mouth-to-mouth method. Maintain the backward head tilt position with the hand on the victim's forehead. Remove the hand from under the neck and close the victim's mouth. Blow into the victim's nose. Open the victim's mouth for the look, listen and feel step.

## SAFETY CHECKLIST FOR ON-SITE PERSONNEL

- 1) Have I checked in with my immediate supervisor and the Safety Supervisor?
- 2) Have I inquired about any current H<sub>2</sub>S problems that may have developed while I was not on location?
- 3) Have I checked my assigned breathing apparatus and is it read for service?
- 4) Have I checked with my assigned 'buddy' and made sure that he is ready for any emergency?
- 5) Have I reviewed the Contingency Plan and am I thoroughly familiar with all H<sub>2</sub>S and BOP procedures?
- 6) Have I attended an on-site H<sub>2</sub>S safety training class?
- 7) Am I familiar with the use and location of the following equipment?
  - a) H<sub>2</sub>S warning signs
  - b) designated smoking areas
  - c) Briefing areas and escape routes
  - d) Oxygen resuscitator and first aid kit
  - e) Stretcher
  - f) Windssocks and wind direction indicators
  - g) telephone service for rig
  - h) list of emergency telephone numbers
  - i) cascade and manifolded breathing air system
  - j) visual and audible H<sub>2</sub>S alarms
  - k) spare breathing apparatus
  - l) safety line and harnesses
- 8) Do I know exactly what I am going to do in the event of a release of poisonous H<sub>2</sub>S gas?
- 9) Is my vehicle parked facing away from any possible source of H<sub>2</sub>S and towards one of the escape routes?

## **SAFETY CHECKLIST FOR SERVICE PERSONNEL**

- 1) Is there an true need for me to be on this location?
- 2) Do I permission from the proper authority and have I checked in with the Safety Supervisor?
- 3) Have I received current H<sub>2</sub>S safety training?
- 4) Have I been assigned a breathing apparatus and am I thoroughly familiar with it?
- 5) If so, is my breathing apparatus fully charged and serviceable?
- 6) Am I familiar with the use and location of the following items?
  - a) H<sub>2</sub>S warning signs and flags
  - b) designated smoking areas
  - c) Briefing areas and escape routes
  - d) Oxygen resuscitator and first aid kit
  - e) Stretcher
  - f) Windsocks and wind direction indicators
  - g) telephone service for rig
  - h) list of emergency telephone numbers
  - i) cascade and manifolded breathing air system
  - j) visual and audible H<sub>2</sub>S alarms
  - k) spare breathing apparatus
  - l) safety line and harnesses
- 7) Have I been assigned a 'buddy' ?
- 8) Do I know exactly what I an going to do in the event of a releases of poisonous H<sub>2</sub>S gas?
- 9) If I have a vehicle, have I parked it so that it is facing away from a possible source of H<sub>2</sub>S and towards an escape route?

## **TEN COMMANDMENTS OF H<sub>2</sub>S**

1. Thou shall learn about this poisonous gas called H<sub>2</sub>S sour gas, stink damp, etc. (it is very poisonous!) that thy days in this land may be long enough for thee to collect thy social security.
2. Thou shall know that H<sub>2</sub>S temporarily destroys the sense of smell after the first whiff or three, so that thee may no longer smell the gas and may falsely think that the gas has blown away, when in fact, it may not have done anything of the sort.
3. Thou shall realize that the maximum H<sub>2</sub>S thou should breathe in an 8 hour period is 0 ppm.
4. Thou shall always remember that lower concentrations of H<sub>2</sub>S produces irritation to the eyes, throat and respiratory tract, and may produce coughing, eye burning, throat irritation and/or sleepiness.
5. Thou shall never forget that concentrations of H<sub>2</sub>S over about 500 ppm may well knock thee out and cause thee to fall with a thud from thy perch perhaps busting thy butt or breaking thy neck, or drowning thee in water or oil.
6. Thou shall come to know in thy heart that H<sub>2</sub>S concentrations over 600 ppm likely will gather thee to thy ancestors - - PDQ!
7. Thou shall covet for thy own use the best approved air mask for H<sub>2</sub>S when thy work requires that thee enter an area where concentration IS or MAY BE above the safe level.
8. Thy mind shall come to know that H<sub>2</sub>S is colorless so that thy eye cannot perceive it, and that it is heavier than air so that it settles in the low places.
9. Remove thy neighbor (or co-worker) to fresh air AT ONCE if he should fall victim to H<sub>2</sub>S. Remember to exercise due caution in the rescue lest thee, too, fall to the smelly gas. Render artificial respiration unto thy fallen neighbor if he be unconscious and not breathing, that the breath of life may be sustained in him. Get the fallen one to a physician with great haste.
10. Demand not that thy God protect thee from thy foolishness when thou tread where angles fear to go, for thy God gave thee a brain and expects thee to use it.