

Correspondence

Case No. 12897

February 2002

2/5/02 Draft

19.15.2. ___ Hydrogen Sulfide Gas (Hydrogen Sulfide)

A. In General. Hydrogen Sulfide Gas (known by its chemical abbreviation "H₂S" or as "sulfurated hydrogen" or "hydrosulfuric acid") is a flammable, poisonous gas that occurs naturally as a component of crude petroleum and natural gas. The gas presents severe threats to human health and can be fatal in high concentrations. The gas has a distinct and characteristic odor of rotten eggs.

B. Applicability. This Section applies to any person, operator or facility subject to the jurisdiction of the Division, including, but not limited to, any person, operator or facility engaged in drilling, stimulating, completing, working over or producing any oil, natural gas or carbon dioxide well, or any person, operator or facility engaged in gathering, transporting, storing, processing, or refining of crude oil, natural gas or carbon dioxide.

C. Definitions (specific to this Section).

1. API. "API" means the American Petroleum Institute, 300 Corrigan Tower Building, Dallas, Texas, 75201.

2. Dispersion Technique. A "dispersion technique" is a mathematical representation of the physical and chemical transportation characteristics, dilution characteristics, and transformation characteristics of H₂S gas in the atmosphere.

3. Escape Rate. The "escape rate" is the maximum volume (Q) that is used to designate the possible rate of escape of a gaseous mixture containing H₂S. The escape rate is calculated using the maximum daily rate of the gaseous mixture produced or the best estimate thereof. For a natural gas well, the escape rate shall be calculated by using the current daily absolute open flow rate against atmospheric pressure. For an oil well, the escape rate shall be calculated by multiplying the producing gas/oil ratio by the maximum daily production rate or best estimate thereof. For an oil or natural gas well drilled in an undeveloped area (a wildcat well), the escape rate may be determined by using offset wells completed in the interval(s) in question, or using some other reasonable means to calculate the escape rate. For facilities or operations not mentioned, the escape rate shall be calculated using the actual flow of gaseous mixture through the facility or operation.

4. LEPC. The acronym "LEPC" means the local emergency planning committee established pursuant to the Emergency Planning and Community Right-to-Know Act, 42 U.S. C. § 11001.

5. NACE. The acronym "NACE" refers to the National Association of Corrosion Engineers.

6. PPM. The abbreviation "ppm" means "parts per million."

7. Potentially Hazardous Volume (hereinafter referred to as a "potentially hazardous volume" or by the acronym "PHV") means the volume of hydrogen sulfide gas of such concentration that:

a. the 100 ppm radius of exposure includes any public area as defined herein (except for facilities directly involved in oil and gas production, such as producing oil and gas wells, pipelines, tank batteries, production equipment, gas plants, refineries);

b. the 300 ppm radius of exposure includes any public road; or

c. the 100 ppm radius of exposure is in excess of 3,000 feet.

8. Public Area. A "public area" is any dwelling, office, place of business, church, school, hospital, school bus stop, government building, public road, any portion of a park, city, town, village, or other similar populated area.

9. Public Road. A "public road" is any state, municipal or county road or highway, postal route or other public road. A public road is not a private road or a road whose access to members of the general public is restricted.

10. Radius of Exposure. The radius of exposure (hereinafter referred to as "radius of exposure" or "ROE") is an imaginary circle constructed around a point of escape whose radius is calculated using the following Pasquill-Gifford derived equation, or by such other method(s) as may be approved by the Division:

a. For determining the 100-ppm radius of exposure where the hydrogen sulfide concentration in the gaseous mixture is less than 10 percent:

$$X = [(1.589)(\text{hydrogen sulfide concentration})(Q)]^{(0.625)}, \text{ or}$$

b. For determining the 300-ppm radius of exposure where the hydrogen sulfide concentration in the gaseous mixture is less than 10 percent: $X = [(0.77)(\text{hydrogen sulfide concentration})(Q)]^{(0.6258)}$

Where: X= radius of exposure in feet; hydrogen sulfide concentration = decimal equivalent of the mole or volume fractions of hydrogen sulfide in the gaseous mixture; Q= maximum volume of gas determined to be available for escape in cubic feet per day (corrected for standard conditions of 14.73 psia and 60°F).

c. For determining the 100 ppm or the 300 ppm radius of exposure in gaseous mixtures containing hydrogen sulfide concentrations of 10 percent or greater, a dispersion technique that takes into account representative wind speed, direction, atmospheric stability, complex terrain, and other dispersion features shall be utilized. Such techniques may include, but shall not be limited to one of a series of computer models outlined in the Environmental Protection Agency's "Guidelines on Air Quality Models (EPA-450/2-78-027R)."

d. Where multiple sources of hydrogen sulfide are present (e.g. wells, treatment equipment, flow lines, etc.), the radius of exposure may encompass a larger area than would otherwise be calculated using a radius of exposure computation for each component part.

e. For a well being drilled in an area where insufficient data exists to calculate a radius of exposure, but where hydrogen sulfide could reasonably be expected to be present in concentrations in excess of 100 ppm in the gaseous mixture, a 100 ppm radius of exposure equal to 3,000 feet shall be assumed.

D. Determination of Hydrogen Sulfide Risk.

1. Determination of Hydrogen Sulfide Concentration.

a. Each person, operator or facility to which this Section applies shall determine the hydrogen sulfide concentration within its operations or systems. A representative sample for each system or operation may be used for testing provided that the person, operator or facility can demonstrate that the concentration derived from a test of the representative sample is reasonably representative of the hydrogen sulfide concentration within the operation or system.

b. Tests shall be conducted in accordance with applicable ASTM and GPA standards or by other methods approved by the Division.

2. Tested Concentrations Below 100 ppm. If the testing described in the previous Paragraph determines that the hydrogen sulfide concentration in a given operation or system is less than 100 ppm, no further actions are required pursuant to this Section.

3. Tested Concentrations Above 100 ppm; Calculation of the Radius of Exposure.

a. If the testing described in Paragraph 1 of this Subsection determines that the concentration of hydrogen sulfide in a gaseous mixture is 100 ppm or greater, then the person, operator or facility must calculate the radius of exposure pursuant to this Section.

b. The person, operator or facility shall provide the results of all radius of exposure determinations to the Division within 180 days of commencing operations or, for existing facilities, within 180 days of the effective date of this Section. The Division may disapprove the test methodology and require additional testing if the test methodology did not conform to the requirements of this Section.

4. Recalculation. If operational or production alterations are made that result in a 25% or greater increase in the hydrogen sulfide concentration in a given operation or facility, new testing shall be conducted and the radius of exposure shall be recalculated and the results submitted to the Division and retained.

E. H₂S Contingency Plan.

1. In General. The H₂S Contingency Plan is a written document that provides a plan of action that will be used to alert and protect persons at risk in the event of a potentially significant release of hydrogen sulfide gas.

2. When Required. An H₂S Contingency Plan must be prepared whenever a potentially hazardous volume of hydrogen sulfide is present.

3. Submission. An H₂S Contingency Plan must be submitted to the Division, and may be submitted separately or along with the Application for Permit to Drill (APD).

4. Input From Emergency Response Authorities and the Division. The H₂S Contingency Plan shall be developed with input from the Division, the New Mexico Department of Public Safety (and/or as appropriate the New Mexico State police), and the Local Emergency Planning Committee, except that where the 300 ppm radius of exposure encompasses any public road, input shall also be sought from the county sheriff and (as applicable) the city (municipal) police, and where the 100 ppm radius of exposure encompasses a public area, input shall also be sought from police and fire departments near the well, operation or facility. The H₂S Contingency shall identify the agency from which input was received pursuant to this paragraph, identify the person at the agency contacted (with telephone number) and briefly describe the nature of the input provided.

5. Elements. The H₂S Contingency Plan will consist of different elements depending on the risks present.

a. Elements Required for Each Plan:

i. A detailed description of each Action to be taken in the event of a release of a potentially hazardous volume of hydrogen sulfide;

ii. A call list including the following as applicable:

aa. local supervisory personnel;

bb. county sheriff;

cc. the Department of Public Safety and State Police;

dd. city (municipal) police;

ee. the appropriate Division district office; and

ff. other public agencies as appropriate.

iii. A plat or map detailing the area within the radius of exposure; and

iv. A list of the names and telephone numbers of all personnel to be contacted when a release is reported or suspected.

b. Where the 300 ppm radius of exposure encompasses any public road, the following additional elements shall be included in the H₂S Contingency Plan:

i. Instructions and procedures for alerting and coordinating with emergency response authorities in the event of a release of a potentially hazardous volume of hydrogen sulfide at any public road;

ii. A plat or map detailing the area of exposure, including the locations of public roads within the radius of exposure;

iii. A plan to divert traffic and safely get existing traffic off the road and out of danger.

c. Where the 100 ppm radius of exposure encompasses any public area, the following additional elements shall be included in the H₂S Contingency Plan:

i. Detailed plans of action to alert and protect persons in the event of a release of a potentially hazardous volume of hydrogen sulfide, including instructions and procedures for alerting persons at risk and emergency response authorities in the event of a release of a potentially hazardous volume of hydrogen sulfide;

ii. A call list including all the persons set forth in subsubparagraph E(5)(a)(ii), above, and the following:

aa. ambulance services;

bb. hospitals;

cc. county and city fire departments;

dd. doctors;

ee. contractors for supplemental or emergency equipment; and

ff. other public agencies as appropriate.

iii. A statement describing how emergency response actions will be coordinated with the Division and the New Mexico State Police, consistent with the New Mexico Hazardous Materials Emergency Response Plan (HMER);

iv. A plat or map detailing the area of exposure, including the locations of private dwellings or residences, public facilities such as schools, businesses, public roads or other similar areas where the public may be reasonably expected to be present within the radius of exposure;

v. The names and telephone numbers of all persons living within the radius of exposure of 100 ppm hydrogen sulfide and contact persons for each public area, such as churches, schools, and businesses;

vi. Provisions for advance briefing of affected and responsible persons within the radius of exposure. Such advance briefing shall include the hazards and characteristics of hydrogen sulfide, the necessity for an H₂S Contingency Plan, the possible sources of hydrogen sulfide with the radius of exposure, instructions for reporting a gas leak, the manner in which persons will be notified in the event of an emergency, and steps to be taken in an emergency; and

vii. Additional support information, if applicable, such as the location of emergency evacuation routes, the location of safety and life support equipment, the location of hydrogen sulfide containing facilities, the location of nearby telephones and/or other means of communication, and special instructions for conditions at a particular installation such as local terrain and the effect of various weather conditions.

d. Additional Requirements. The Division may impose additional requirements or modify requirements based on site-specific conditions, population density or special circumstances.

6. Submission. When the 100 ppm radius of exposure includes any public area, the H₂S Contingency Plan shall be submitted to the Division and Local Emergency Planning Committee. Otherwise, H₂S Contingency Plans shall not be submitted, but shall be reasonably accessible in the event of a release, maintained on file and provided to the Division upon request.

7. Failure to Submit Plan. Failure to submit an H₂S Contingency Plan when required may result in denial of an Application to Drill, cancellation of an allowable or other appropriate enforcement action.

8. Annual Review, Amendment. An H₂S Contingency Plan shall be reviewed on an annual basis or earlier if activation of a plan reveals a deficiency. If the 100 ppm radius of exposure includes any public area, any amendments shall be submitted to the Division and the Local Emergency Planning Committee; otherwise, amendments shall not be submitted, but shall be maintained on file and provided to the Division upon request.

9. Retention and On-Site Inspection. An H₂S Contingency Plan shall be reasonably accessible in the event of a release and maintained on file at all times and shall be available for inspection by the Division during normal business hours.

10. Activation Levels. An H₂S Contingency Plan shall be activated in the event of a release of a potentially hazardous volume of H₂S above the respective thresholds (i.e. 300 ppm radius at any public road, 100 ppm radius at any public area, etc.) or if a sustained concentration of H₂S exceeds 50 ppm at the property line of any facility, well or operation.

F. Protection from Hydrogen Sulfide During Drilling, Workover and Servicing Operations.

1. API Standards. All drilling, completion, workover and well servicing operations shall be conducted with due consideration of the guidelines published by the American Petroleum Institute (API) entitled "Recommended Practice for Oil and Gas Well Servicing and Workover Operations Involving Hydrogen Sulfide," RP-68, and "Recommended Practices for Safe Drilling of Wells Containing Hydrogen Sulfide," RP-49, most recent edition.

2. Minimum Standards. At a minimum, and possibly in addition to the foregoing API standards, each drilling, completion, workover and well servicing operation shall also be conducted in accordance with the following:

a. Before Commencing Operations. An H₂S Contingency Plan (where required) shall be completed before commencement of operations. In addition, hydrogen sulfide training shall be completed and all related safety equipment and warning systems shall be operational.

b. Egress Routes. Passable egress routes shall be maintained at all times during operations.

c. Detection and Monitoring. Hydrogen sulfide detection and monitoring equipment shall be provided as follows:

i. Each drilling and completion site shall have hydrogen sulfide detection and monitoring that automatically activates visible and audible alarms when the ambient air concentration of hydrogen sulfide reaches 10 ppm. There shall be a sensing point located at the shale shaker, rig floor, and bell nipple for a drilling site and the cellar, rig floor, and circulating tanks or shale shaker for a completion site.

ii. The detection system shall be calibrated and tested monthly. Each test of the hydrogen sulfide monitoring system shall be recorded on the driller's log or its equivalent.

iii. For workover and well servicing operations, one operational sensing point shall be located as close to the well bore as practical. Additional sensing points may be necessary for large and/or long-term operations.

iv. Hydrogen sulfide detection and monitoring equipment must be provided during drilling when drilling is within 500 feet of the zone anticipated to contain hydrogen sulfide and continuously thereafter through all subsequent drilling. Detection and monitoring equipment is not required for drilling from the surface to within 500 feet of the zone anticipated to contain hydrogen sulfide.

d. Wind Indicators and Signs.

i. Equipment to indicate wind direction shall be present and visible at all times. At least two devices to indicate wind direction shall be installed at separate elevations and visible from all principal working areas at all times.

ii. Danger or caution sign(s) shall be displayed along all accesses to the site. The sign(s) shall read "DANGER - POISON GAS - HYDROGEN SULFIDE" and in smaller lettering: "Do Not Approach If Red Flag is Flying" or equivalent language approved by the Division. Each sign shall be painted with high visibility red, black and white, or yellow paint with black lettering. The sign(s) shall be legible and large enough to be read by all persons entering the well site and shall be placed a minimum of 200 feet but no more than 300 feet from the well site and at a location which allows vehicles to turn around at a safe distance prior to reaching the site.

iii. When hydrogen sulfide is detected in excess of 10 ppm at any detection point, red flag(s) shall be displayed.

e. If Hydrogen Sulfide Encountered During Operations. If hydrogen sulfide was not anticipated at the time the APD was approved but is encountered during drilling in excess of 100 ppm in the gaseous mixture, the operator shall immediately ensure control of the well, suspend drilling operations (unless detrimental to well control), and obtain materials and safety equipment to bring the operations into compliance with this Section. The operator shall notify the Division of the event and the mitigating steps that have or are being taken as soon as possible, but no later than 24 hours following discovery.

3. Operating Practices In Hydrogen Sulfide Concentrations of 100 ppm or Greater. Operating practices in areas known to contain a concentration of hydrogen sulfide gas of 100 ppm or greater in the gaseous mixture shall be subject to the following requirements:

a. If Hydrogen Sulfide Is Encountered During Use of Air, Gas, Mist or Other Non-Mud Circulating Media. If hydrogen sulfide gas in excess of 100 ppm is encountered while drilling with air, gas, mist or other non-mud circulating mediums for aerated mud, the well shall be killed with a water- or oil-based mud, and mud shall be used thereafter as the circulating medium for continued drilling.

b. Flare System. For drilling and completion operations, a flare system shall be installed to safely gather and burn hydrogen sulfide-bearing gas, unless exempted pursuant to Subsection K. of this Section. Flare outlets shall be located as far from the well bore as feasible (but not less than 150 feet from the well). Flare lines shall be as straight as practical. The flare system shall be equipped with a suitable and safe means of ignition. Where noncombustible gas is to be flared, the system shall be provided supplemental fuel to maintain ignition.

c. Remote Controlled Choke.

i. A remote controlled choke shall be installed during drilling and during completion and well servicing operations when the 100-ppm H₂S radius of exposure includes a public area, unless exempted pursuant to Subsection K. of this Section.

ii. A remote controlled valve may be used in lieu of use of a remote controlled choke, but only for completion operations.

iii. A remote controlled choke or remote controlled valve shall have, at a minimum, a pressure and hydrogen sulfide-rated well control choke and kill system including manifold and blowout preventer pursuant to specifications API-16C and API-RP 53. The blowout preventer stack shall have at least one spool for the kill and choke lines, two pipe rams, one blind ram, one annular device and a rotating head. Mud-gas separators shall also be used. These systems shall be tested and maintained pursuant to the specifications referenced or other Division Rules, if more stringent. Variations to blowout preventer stack arrangements may be granted by the Division for good cause shown.

d. Mud Program. A mud program, including de-gassing and flaring, capable of handling H₂S conditions and well control shall be utilized.

e. Well Testing. Except with prior approval by the Division, the drill-stem testing shall be conducted only during daylight hours and formation fluids shall not be permitted to flow to the surface (closed chamber only). An operator shall notify the Division 24 hours in advance of a drill-stem test if an H₂S Contingency Plan is required pursuant to this Section.

G. Protection from Hydrogen Sulfide at Producing Wells, Tank Batteries and Associated Production Facilities, Refineries, Gas Plants, and Compressor Stations.

1. American Petroleum Institute (API) Standards. Operations at producing wells, tank batteries and associated production facilities shall be conducted according to the guidelines published by the American Petroleum Institute (API) in its publication entitled "Recommended Practices for Oil and Gas Producing and Gas Processing Plant Operations Involving Hydrogen Sulfide," RP-55, latest edition.

2. Minimum Standards. At a minimum, production from wells, operation of tank batteries and associated production equipment shall also be conducted in accordance with the following. Where API standards referred to in the previous paragraph are less stringent than the following, the more stringent standards shall apply.

a. Gaseous Mixtures Containing 100 ppm or more. Producing wells containing 100 ppm or more of hydrogen sulfide in the gaseous mixture, tank batteries and associated production facilities at such sites, shall be subject to the following:

i. H₂S Contingency Plan. A determination must be made of the radius of exposure pursuant to this Section and, if required based on the calculated radius of exposure, a H₂S Contingency Plan will also be required.

ii. Signage. A danger sign or signs shall be posted within 50 feet of each facility to alert the public of the potential hydrogen sulfide danger. If fenced, a danger sign at the gate(s) shall suffice. Danger signs shall be posted at each flow line and gathering line on the well pad that contains hydrogen sulfide gas. The sign(s) shall read "DANGER - POISON GAS - HYDROGEN SULFIDE" or equivalent language approved by the Division. Each sign shall be painted with high visibility red, black and white, or yellow paint with black lettering. The sign(s) shall be legible and large enough to be read by all persons entering the well site and shall be placed a minimum of 200 feet but no more than 300 feet from the well site and at a location which allows vehicles to turn around at a safe distance prior to reaching the site. A sign shall be placed at each point where a flow line or gathering

line crosses a public road. Each sign shall be legible and shall contain the name of the owner or operator and an emergency telephone number.

iii. Fencing. Fencing and gate(s) shall be required when producing wells, associated tank batteries and associated production facilities are located within a 1/4 mile of a residence, school, church, park, playground, school bus stop, or place of business. The fence shall consist of a 5-foot chain link topped by two stands of barbed wire or other methods approved by the Division. Gate(s) shall be locked when unattended.

iv. Wind Direction Indicators. Wind direction indicator(s) shall be required at every facility (tank battery, water injection station, production satellite) where H₂S concentration in a gaseous state exceeds 100 PPM.

v. Secondary Well Control. Wells where the 100-ppm H₂S radius of exposure incorporates a public area shall possess a secondary means of immediate well control through the use of appropriate Christmas tree and/or downhole completion equipment. Such equipment shall allow downhole accessibility (reentry) under pressure for permanent well control operations.

vi. Automatic Safety Valve or Shutdown. If the 100-ppm radius of exposure involves a public area, an automatic safety valve or shutdown shall be installed at the facility or wellhead or other appropriate shut-in control shall be installed. The automatic safety valve shall be set to activate upon a release of a potentially hazardous volume of hydrogen sulfide.

b. Tanks or vessels containing 300 ppm or more of hydrogen sulfide in the gaseous mixture shall be subject to the following additional requirements:

1. Each stair or ladder leading to the top of any storage tank shall be chained and/or marked to restrict entry. For any tank battery that requires fencing pursuant to this Section, a danger sign posted at the gate(s) may be substituted for chaining and signage.

2. A danger sign shall be posted on or within 50 feet of any storage tank to alert persons of the potential hydrogen sulfide danger. For any storage tank for which fencing is required, a danger sign posted at the locked gates shall suffice. The sign(s) shall read "DANGER - POISON GAS - HYDROGEN SULFIDE" or equivalent language approved by the Division. Each sign shall be painted with high visibility red, black and white, or yellow paint with black lettering. The sign(s) shall be legible and large enough to be read by all persons entering the well site and shall be placed a minimum of 200 feet but no more than 300 feet from the well site and at a location which allows vehicles to turn around at a safe distance prior to reaching the site.

3. Modification or Repair. The Division may require modification or repair of a producing well, associated tank battery or associated production facilities if the sustained ambient concentration of hydrogen sulfide is 1 ppm or greater at any public area.

4. Compliance Schedule. Each existing producing well and associated tank battery not currently meeting the requirements and minimum standards set forth herein shall be brought into compliance within one (1) year of the effective date of this Section. Each producing well and tank battery constructed following the effective date of this Section shall be designed, constructed and operated to meet the requirements set forth herein.

H. Personnel Protection and Training. All persons responsible for the implementation of any H₂S Contingency Plan shall be provided training in hydrogen sulfide hazards, detection, personal protection and contingency procedures.

I. Standards for Equipment That May Be Exposed to Hydrogen Sulfide. All equipment shall be chosen with consideration for both the H₂S working environment and anticipated stresses. NACE Standard MR0175 (latest edition) shall be used for metallic equipment selection or, if applicable, adequate protection by chemical inhibition or other methods that controls or limits the corrosive effects of H₂S shall be used.

J. Hydrogen Sulfide Injection. Injection of fluids containing hydrogen sulfide where the injection fluids are a gaseous mixture, or would be a gaseous mixture in the event of a release to the atmosphere, and where the 100 ppm radius of exposure from the injection point includes any public area, excluding public roads, shall not be allowed unless first approved by the division after public hearing.

K. Exemptions. An exemption to the requirements of this Section may be granted by petitioning the Director. Any such petition shall provide specific information as to the circumstances that warrant approval of the exemption requested and the proposed alternative methods by which the requirements of this Section are to be satisfied. The Director, after considering all relevant factors, may approve an exemption if it is determined that the proposed alternative meets or exceeds the requirements of this Section and otherwise protects the health, safety and welfare of potentially affected persons.

L. Release. Upon a release of hydrogen sulfide the following actions must be taken:

1. Activation of the H₂S Contingency Plan. The H₂S Contingency Plan shall be activated immediately upon a H₂S release where the potential exists for exposure to a potentially hazardous volume of H₂S, or where a concentration of H₂S greater than 50 ppm exists at the property line of any well, facility or operation.

2. Notification of the Division. Upon release of hydrogen sulfide requiring activation of the H₂S Contingency Plan, the Division shall be notified as soon as practicable, preferably within one hour of discovery of the release or as soon as possible in cases where prompt response should supercede notification. A full report of the incident shall be submitted to the Division on Form C-141 no later than fifteen (15) days following the release.

M. Additional Standards. The Division may require more stringent standards on a case-by-case basis than those set forth in this Section, or require corrective actions if necessary, to maintain control of a well or any other facility, or to safeguard public health or safety.

Ross, Stephen

From: Price, Wayne
Sent: Tuesday, February 05, 2002 11:23 AM
To: Ross, Stephen; Anderson, Roger
Subject: FW: Hydrogen Sulfide H2S



MR017502.pdf

Enclosed is a copy of NACE MR0175!

-----Original Message-----

From: Jeff Littleton [mailto:Jeff.Littleton@mail.nace.org]
Sent: Tuesday, February 05, 2002 10:42 AM
To: 'Price, Wayne'
Cc: Cliff Johnson; Linda Goldberg
Subject: RE: Hydrogen Sulfide H2S

Hi Wayne:

Thank you for considering the role NACE MRO175 might play in the New Mexico's oil H2S regs. MRO175 is referenced in U.S. state and federal regulations more than any other standard. Please find attached a .pdf file of the current version.

If you have any questions about the standard or if you have problems opening the attachment, please be sure to let me know. You can also contact our Government Affairs Manager Cliff Johnson at cliff.johnson@mail.nace.org or Tel: 281-228-6213.

Thanks again for your interest,
Jeff

Jeff Littleton
Executive Director
NACE International -- The Corrosion Society
Tel: 281-228-6205
Fax: 281-228-6305
Email: jeff.littleton@mail.nace.org
Web: www.nace.org

-----Original Message-----

From: Price, Wayne [mailto:WPrice@state.nm.us]
Sent: Tuesday, February 05, 2002 11:03 AM
To: 'jeffl@mail.nace.org'
Subject: Hydrogen Sulfide H2S

Dear Jeff:

The New Mexico Oil Conservation Division (OCD) is in the process of re-writing our H2S rule for public safety. We are contemplating on referencing NACE MR0175 in the new rule. Would it be possible to obtain a complementary copy of the standard.

Thanks!

Wayne Price

19.15.2. Hydrogen Sulfide Gas (Hydrogen Sulfide)

A. In General. Hydrogen Sulfide Gas (known by its chemical abbreviation "H₂S" or as "sulfurated hydrogen" or "hydrosulfuric acid") is a flammable, poisonous gas that occurs naturally as a component of crude petroleum and natural gas. The gas presents severe threats to human health and can be fatal in high concentrations. The gas has a distinct and characteristic odor of rotten eggs.

B. Applicability. This Section applies to any person, operator or facility subject to the jurisdiction of the Division, including, but not limited to, any person, operator or facility engaged in drilling, stimulating, completing, working over or producing any oil, natural gas or carbon dioxide well, or any person, operator or facility engaged in gathering, transporting, storing, processing, or refining of crude oil, natural gas or carbon dioxide.

C. Definitions (specific to this Section).

1. API. "API" means the American Petroleum Institute, 300 Corrigan Tower Building, Dallas, Texas, 75201.

2. Dispersion Technique. A "dispersion technique" is a mathematical representation of the physical and chemical transportation characteristics, dilution characteristics, and transformation characteristics of H₂S gas in the atmosphere.

3. Escape Rate. The "escape rate" is the maximum volume (Q) that is used to designate the possible rate of escape of a gaseous mixture containing H₂S. The escape rate is calculated using the maximum daily rate of the gaseous mixture produced or the best estimate thereof. For a natural gas well, the escape rate shall be calculated by using the current daily absolute open flow rate against atmospheric pressure. For an oil well, the escape rate shall be calculated by multiplying the producing gas/oil ratio by the maximum daily production rate or best estimate thereof. For an oil or natural gas well drilled in an undeveloped area (a wildcat well), the escape rate may be determined by using offset wells completed in the interval(s) in question, or using some other reasonable means to calculate the escape rate. For facilities or operations not mentioned, the escape rate shall be calculated using the actual flow of gaseous mixture through the facility or operation.

4. LEPC. The acronym "LEPC" means the local emergency planning committee established pursuant to the Emergency Planning and Community Right-to-Know Act, 42 U.S.C. § 11001.

5. PPM. The abbreviation "ppm" means "parts per million."

6. Potentially Hazardous Volume (hereinafter referred to as a "potentially hazardous volume" or by the acronym "PHV") means the volume of hydrogen sulfide gas of such concentration that:

a. the 100 ppm radius of exposure includes any public area as defined herein (except for facilities directly involved in oil and gas production, such as producing oil and gas wells, pipelines, tank batteries, production equipment, gas plants, refineries);

b. the 300 ppm radius of exposure includes any public road; or

c. the 100 ppm radius of exposure is in excess of 3,000 feet.

7. Public Area. A "public area" is any dwelling, office, place of business, church, school, hospital, school bus stop, government building, public road, any portion of a park, city, town, village, or other similar populated area.

8. Public Road. A "public road" is any state, municipal or county road or highway, postal route or other public road. A public road is not a private road or a road whose access to members of the general public is restricted.

9. Radius of Exposure. The radius of exposure (hereinafter referred to as "radius of exposure" or "ROE") is an imaginary circle constructed around a point of escape whose radius is calculated using the following Pasquill-Gifford derived equation, or by such other method(s) as may be approved by the Division:

a. For determining the 100-ppm radius of exposure where the hydrogen sulfide concentration in the gaseous mixture is less than 10 percent:

$$X = [(1.589)(\text{hydrogen sulfide concentration})(Q)]^{(0.625)}, \text{ or}$$

b. For determining the 300-ppm radius of exposure where the hydrogen sulfide concentration in the gaseous mixture is less than 10 percent: $X = [(0.77)(\text{hydrogen sulfide concentration})(Q)]^{(0.6258)}$

Where: X= radius of exposure in feet; hydrogen sulfide concentration = decimal equivalent of the mole or volume fractions of hydrogen sulfide in the gaseous mixture; Q= maximum volume of gas determined to be available for escape in cubic feet per day (corrected for standard conditions of 14.73 psia and 60°F).

c. For determining the 100 ppm or the 300 ppm radius of exposure in gaseous mixtures containing hydrogen sulfide concentrations of 10 percent or greater, a dispersion technique that takes into account representative wind speed, direction, atmospheric stability, complex terrain, and other dispersion features shall be utilized. Such techniques may include, but shall not be limited to one of a series of computer models outlined in the Environmental Protection Agency's "Guidelines on Air Quality Models (EPA-450/2-78-027R)."

d. Where multiple sources of hydrogen sulfide are present (e.g. wells, treatment equipment, flow lines, etc.), the radius of exposure may encompass a larger area than would otherwise be calculated using a radius of exposure computation for each component part.

e. For a well being drilled in an area where insufficient data exists to calculate a radius of exposure, but where hydrogen sulfide could reasonably be expected to be present in concentrations in excess of 100 ppm in the gaseous mixture, a 100 ppm radius of exposure equal to 3,000 feet shall be assumed.

D. Determination of Hydrogen Sulfide Risk.

1. Determination of Hydrogen Sulfide Concentration.

a. Each person, operator or facility to which this Section applies shall determine the hydrogen sulfide concentration within its operations or systems. A representative sample for each system or operation may be used for testing provided that the person, operator or facility can demonstrate that the concentration derived from a test of the representative sample is reasonably representative of the hydrogen sulfide concentration within the operation or system.

b. Tests shall be conducted in accordance with applicable ASTM and GPA standards or by other methods approved by the Division.

2. Tested Concentrations Below 100 ppm. If the testing described in the previous Paragraph determines that the hydrogen sulfide concentration in a given operation or system is less than 100 ppm, no further actions are required pursuant to this Section.

3. Tested Concentrations Above 100 ppm; Calculation of the Radius of Exposure.

a. If the testing described in Paragraph 1 of this Subsection determines that the concentration of hydrogen sulfide in a gaseous mixture is 100 ppm or greater, then the person, operator or facility must calculate the radius of exposure pursuant to this Section.

b. The person, operator or facility shall provide the results of all radius of exposure determinations to the Division within 180 days of commencing operations or, for existing facilities, within 180 days of the effective date of this Section. The Division may disapprove the test methodology and require additional testing if the test methodology did not conform to the requirements of this Section.

4. Recalculation. If operational or production alterations are made that result in a 25% or greater increase in the hydrogen sulfide concentration in a given operation or facility, new testing shall be conducted and the radius of exposure shall be recalculated and the results submitted to the Division and retained.

E. H₂S Contingency Plan.

1. In General. The H₂S Contingency Plan is a written document that provides a plan of action which will be used to alert and protect persons at risk in the event of a potentially significant release of hydrogen sulfide gas.

2. When Required. An H₂S Contingency Plan must be prepared whenever a potentially hazardous volume of hydrogen sulfide is present.

3. Submission. An H₂S Contingency Plan must be submitted to the Division, and may be submitted separately or along with the Application for Permit to Drill (APD).

4. Input From Emergency Response Authorities and the Division. The H₂S Contingency Plan shall be developed with input from the Division, the New Mexico Department of Public Safety (and/or as appropriate the New Mexico State police), and the Local Emergency Planning Committee, except that where the 300 ppm radius of exposure encompasses any public road, input shall also be sought from the county sheriff and (as applicable) the city (municipal) police, and where the 100 ppm radius of exposure encompasses a public area, input shall also be sought from police and fire departments near the well, operation or facility. The H₂S Contingency shall identify the agency from which input was received pursuant to this paragraph, identify the person at the agency contacted (with telephone number) and briefly describe the nature of the input provided.

5. Elements. The H₂S Contingency Plan will consist of different elements depending on the risks present.

a. Elements Required for Each Plan:

i. A detailed description of each Action to be taken in the event of a release of a potentially hazardous volume of hydrogen sulfide;

ii. A call list including the following as applicable:

aa. local supervisory personnel;

bb. county sheriff;

cc. the Department of Public Safety and State Police;

dd. city (municipal) police;

ee. the appropriate Division district office; and

ff. other public agencies as appropriate.

iii. A plat or map detailing the area within the radius of exposure; and

iv. A list of the names and telephone numbers of all personnel to be contacted when a release is reported or suspected.

b. Where the 300 ppm radius of exposure encompasses any public road, the following additional elements shall be included in the H₂S Contingency Plan:

i. Instructions and procedures for alerting and coordinating with emergency response authorities in the event of a release of a potentially hazardous volume of hydrogen sulfide at any public road;

ii. A plat or map detailing the area of exposure, including the locations of public roads within the radius of exposure;

iii. A plan to divert traffic and safely get existing traffic off the road and out of danger.

c. Where the 100 ppm radius of exposure encompasses any public area, the following additional elements shall be included in the H₂S Contingency Plan:

i. Detailed plans of action to alert and protect persons in the event of a release of a potentially hazardous volume of hydrogen sulfide, including instructions and procedures for alerting persons at risk and emergency response authorities in the event of a release of a potentially hazardous volume of hydrogen sulfide;

ii. A call list including all the persons set forth in subsubparagraph E(5)(a)(ii), above, and the following:

aa. ambulance services;

bb. hospitals;

cc. county and city fire departments;

dd. doctors;

ee. contractors for supplemental or emergency equipment; and

ff. other public agencies as appropriate.

iii. A statement describing how emergency response actions will be coordinated with the Division and the New Mexico State Police, consistent with the New Mexico Hazardous Materials Emergency Response Plan (HMER);

iv. A plat or map detailing the area of exposure, including the locations of private dwellings or residences, public facilities such as schools, businesses, public roads or other similar areas where the public may be reasonably expected to be present within the radius of exposure;

v. The names and telephone numbers of all persons living within the radius of exposure of 100 ppm hydrogen sulfide and contact persons for each public area, such as churches, schools, and businesses;

vi. Provisions for advance briefing of affected and responsible persons within the radius of exposure. Such advance briefing shall include the hazards and characteristics of hydrogen sulfide, the necessity for an H₂S Contingency Plan, the possible sources of hydrogen sulfide within the radius of exposure, instructions for reporting a gas leak, the manner in which persons will be notified in the event of an emergency, and steps to be taken in an emergency; and

vii. Additional support information, if applicable, such as the location of emergency evacuation routes, the location of safety and life support equipment, the location of hydrogen sulfide containing facilities, the location of nearby telephones and/or other means of communication, and special instructions for conditions at a particular installation such as local terrain and the effect of various weather conditions.

d. Additional Requirements. The Division may impose additional requirements or modify requirements based on site-specific conditions, population density or special circumstances.

6. Submission. When the 100 ppm radius of exposure includes any public area, the H₂S Contingency Plan shall be submitted to the Division and Local Emergency Planning Committee. Otherwise, H₂S Contingency Plans shall not be submitted, but shall be reasonably accessible in the event of a release, maintained on file and provided to the Division upon request.

7. Failure to Submit Plan. Failure to submit an H₂S Contingency Plan when required may result in denial of an Application to Drill, cancellation of an allowable or other appropriate enforcement action.

8. Annual Review, Amendment. An H₂S Contingency Plan shall be reviewed on an annual basis or earlier if activation of a plan reveals a deficiency. If the 100 ppm radius of exposure includes any public area, any amendments shall be submitted to the Division and the Local Emergency Planning Committee; otherwise, amendments shall not be submitted, but shall be maintained on file and provided to the Division upon request.

9. Retention and On-Site Inspection. An H₂S Contingency Plan shall be reasonably accessible in the event of a release and maintained on file at all times and shall be available for inspection by the Division during normal business hours.

10. Activation Levels. An H₂S Contingency Plan shall be activated in the event of a release of a potentially hazardous volume of H₂S above the respective thresholds (i.e. 300 ppm radius at any public road, 100 ppm radius at any public area, etc.) or if a sustained concentration of H₂S exceeds 50 ppm at the property line of any facility, well or operation.

F. Protection from Hydrogen Sulfide During Drilling, Workover and Servicing Operations.

1. API Standards. All drilling, completion, workover and well servicing operations shall be conducted with due consideration of the guidelines published by the American Petroleum Institute (API) entitled "Recommended Practice for Oil and Gas Well Servicing and Workover Operations Involving Hydrogen Sulfide," RP-68, and "Recommended Practices for Safe Drilling of Wells Containing Hydrogen Sulfide," RP-49, most recent edition.

2. Minimum Standards. At a minimum, and possibly in addition to the foregoing API standards, each drilling, completion, workover and well servicing operation shall also be conducted in accordance with the following:

a. Before Commencing Operations. An H₂S Contingency Plan (where required) shall be completed before commencement of operations. In addition, hydrogen sulfide training shall be completed and all related safety equipment and warning systems shall be operational.

b. Egress Routes. Passable egress routes shall be maintained at all times during operations.

c. Detection and Monitoring. Hydrogen sulfide detection and monitoring equipment shall be provided as follows:

i. Each drilling and completion site shall have hydrogen sulfide detection and monitoring that automatically activates visible and audible alarms when the ambient air concentration of hydrogen sulfide reaches 10 ppm. There shall be a sensing point located at the shale shaker, rig floor, and bell nipple for a drilling site and the cellar, rig floor, and circulating tanks or shale shaker for a completion site.

ii. The detection system shall be calibrated and tested monthly. Each test of the hydrogen sulfide monitoring system shall be recorded on the driller's log or its equivalent.

iii. For workover and well servicing operations, one operational sensing point shall be located as close to the well bore as practical. Additional sensing points may be necessary for large and/or long-term operations.

iv. Hydrogen sulfide detection and monitoring equipment must be provided during drilling when drilling is within 500 feet of the zone anticipated to contain hydrogen sulfide and continuously thereafter through all subsequent drilling. Detection and monitoring equipment is not required for drilling from the surface to within 500 feet of the zone anticipated to contain hydrogen sulfide.

d. Wind Indicators and Signs.

i. Equipment to indicate wind direction shall be present and visible at all times. At least two devices to indicate wind direction shall be installed at separate elevations and visible from all principal working areas at all times.

ii. Danger or caution sign(s) shall be displayed along all accesses to the site. The sign(s) shall read "DANGER - POISON GAS - HYDROGEN SULFIDE" and in smaller lettering: "Do Not Approach If Red Flag is Flying" or equivalent language approved by the Division. Each sign shall be painted with high visibility red, black and white, or yellow paint with black lettering. The sign(s) shall be legible and large enough to be read by all persons entering the well site and shall be placed a minimum of 200 feet but no more than 300 feet from the well site and at a location which allows vehicles to turn around at a safe distance prior to reaching the site.

iii. When hydrogen sulfide is detected in excess of 10 ppm at any detection point, red flag(s) shall be displayed.

e. If Hydrogen Sulfide Encountered During Operations. If hydrogen sulfide was not anticipated at the time the APD was approved but is encountered during drilling in excess of 100 ppm in the gaseous mixture, the operator shall immediately ensure control of the well, suspend drilling operations (unless detrimental to well control), and obtain materials and safety equipment to bring the operations into compliance with this Section. The operator shall notify the Division of the event and the mitigating steps that have or are being taken as soon as possible, but no later than 24 hours following discovery.

3. Operating Practices In Hydrogen Sulfide Concentrations of 100 ppm or Greater. Operating practices in areas known to contain a concentration of hydrogen sulfide gas of 100 ppm or greater in the gaseous mixture shall be subject to the following requirements:

a. If Hydrogen Sulfide Is Encountered During Use of Air, Gas, Mist or Other Non-Mud Circulating Media. If hydrogen sulfide gas in excess of 100 ppm is encountered while drilling with air, gas, mist or other non-mud circulating mediums for aerated mud, the well shall be killed with a water- or oil-based mud, and mud shall be used thereafter as the circulating medium for continued drilling.

b. Flare System. For drilling and completion operations, a flare system shall be installed to safely gather and burn hydrogen sulfide-bearing gas, unless exempted pursuant to Subsection K. of this Section. Flare outlets shall be located as far from the well bore as feasible (but not less than 150 feet from the well). Flare lines shall be as straight as practical. The flare system shall be equipped with a suitable and safe means of ignition. Where noncombustible gas is to be flared, the system shall be provided supplemental fuel to maintain ignition.

c. Remote Controlled Choke.

i. A remote controlled choke shall be installed during drilling and during completion and well servicing operations when the 100-ppm H₂S radius of exposure includes a public area, unless exempted pursuant to Subsection K. of this Section.

ii. A remote controlled valve may be used in lieu of use of a remote controlled choke, but only for completion operations.

iii. A remote controlled choke or remote controlled valve shall have, at a minimum, a pressure and hydrogen sulfide-rated well control choke and kill system including manifold and blowout preventer (hereinafter referred to as "BOP") pursuant to specifications API-16C and API-RP 53. The BOP stack shall have at least one spool for the kill and choke lines, two pipe rams, one blind ram, one annular device and a rotating head. Mud-gas separators shall also be used. These systems shall be tested and maintained pursuant to the specifications referenced or other Division Rules, if more stringent. Variations to BOP stack arrangements may be granted by the Division for good cause shown.

d. Mud Program. A mud program, including de-gassing and flaring, capable of handling H₂S conditions and well control shall be utilized.

e. Well Testing. Except with prior approval by the Division, the drill-stem testing shall be conducted only during daylight hours and formation fluids shall not be permitted to flow to the surface (closed chamber only). An operator shall notify the Division 24 hours in advance of a drill-stem test if an H₂S Contingency Plan is required pursuant to this Section.

G. Protection from Hydrogen Sulfide at Producing Wells, Tank Batteries and Associated Production Facilities, Refineries, Gas Plants, and Compressor Stations.

1. American Petroleum Institute (API) Standards. Operations at producing wells, tank batteries and associated production facilities shall be conducted according to the guidelines published by the American Petroleum Institute (API) in its publication entitled "Recommended Practices for Oil and Gas Producing and Gas Processing Plant Operations Involving Hydrogen Sulfide," RP-55, latest edition.

2. Minimum Standards. At a minimum, production from wells, operation of tank batteries and associated production equipment shall also be conducted in accordance with the following. Where API standards referred to in the previous paragraph are less stringent than the following, the more stringent standards shall apply.

a. Gaseous Mixtures Containing 100 ppm or more. Producing wells containing 100 ppm or more of hydrogen sulfide in the gaseous mixture, tank batteries and associated production facilities at such sites, shall be subject to the following:

i. H₂S Contingency Plan. A determination must be made of the radius of exposure pursuant to this Section and, if required based on the calculated radius of exposure, a H₂S Contingency Plan will also be required.

ii. Signage. A danger sign or signs shall be posted within 50 feet of each facility to alert the public of the potential hydrogen sulfide danger. If fenced, a danger sign at the gate(s) shall suffice. Danger signs shall be posted at each flow line and gathering line on the well pad that contains hydrogen sulfide gas. The sign(s) shall read "DANGER - POISON GAS - HYDROGEN SULFIDE" or equivalent language approved by the Division. Each sign shall be painted with high visibility red, black and white, or yellow paint with black lettering. The sign(s) shall be legible and large enough to be read by all persons entering the well site and shall be placed a minimum of 200 feet but no more than 300 feet from the well site and at a location which allows vehicles to turn around at a safe distance prior to reaching the site. A sign shall be placed at each point where a flow line or gathering

line crosses a public road. Each sign shall be legible and shall contain the name of the owner or operator and an emergency telephone number.

iii. Fencing. Fencing and gate(s) shall be required when producing wells, associated tank batteries and associated production facilities are located within a 1/4 mile of a residence, school, church, park, playground, school bus stop, or place of business. The fence shall consist of a 5-foot chain link topped by two stands of barbed wire or other methods approved by the Division. Gate(s) shall be locked when unattended.

iv. Wind Direction Indicators. Wind direction indicator(s) shall be required at every facility (tank battery, water injection station, production satellite) where H₂S concentration in a gaseous state exceeds 100 PPM.

v. Secondary Well Control. Wells where the 100-ppm H₂S radius of exposure incorporates a public area shall possess a secondary means of immediate well control through the use of appropriate Christmas tree and/or downhole completion equipment. Such equipment shall allow downhole accessibility (reentry) under pressure for permanent well control operations.

vi. Automatic Safety Valve or Shutdown. If the 100-ppm radius of exposure involves a public area, an automatic safety valve or shutdown shall be installed at the facility or wellhead or other appropriate shut-in control shall be installed. The automatic safety valve shall be set to activate upon a release of a potentially hazardous volume of hydrogen sulfide.

b. Tanks or vessels containing 300 ppm or more of hydrogen sulfide in the gaseous mixture shall be subject to the following additional requirements:

1. Each stair or ladder leading to the top of any storage tank shall be chained and/or marked to restrict entry. For any tank battery that requires fencing pursuant to this Section, a danger sign posted at the gate(s) may be substituted for chaining and signage.

2. A danger sign shall be posted on or within 50 feet of any storage tank to alert persons of the potential hydrogen sulfide danger. For any storage tank for which fencing is required, a danger sign posted at the locked gates shall suffice. The sign(s) shall read "DANGER - POISON GAS - HYDROGEN SULFIDE" or equivalent language approved by the Division. Each sign shall be painted with high visibility red, black and white, or yellow paint with black lettering. The sign(s) shall be legible and large enough to be read by all persons entering the well site and shall be placed a minimum of 200 feet but no more than 300 feet from the well site and at a location which allows vehicles to turn around at a safe distance prior to reaching the site.

3. Modification or Repair. The Division may require modification or repair of a producing well, associated tank battery or associated production facilities if the sustained ambient concentration of hydrogen sulfide is 1 ppm or greater at any public area.

4. Compliance Schedule. Each existing producing well and associated tank battery not currently meeting the requirements and minimum standards set forth herein shall be brought into compliance within one (1) year of the effective date of this Section. Each producing well and tank battery constructed following the effective date of this Section shall be designed, constructed and operated to meet the requirements set forth herein.

H. Personnel Protection and Training. All persons responsible for the implementation of any H₂S Contingency Plan shall be provided training in hydrogen sulfide hazards, detection, personal protection and contingency procedures.

I. Standards for Equipment That May Be Exposed to Hydrogen Sulfide. Proper materials and/or appropriate protective measures for equipment exposed to hydrogen sulfide shall be utilized. Records shall be retained and shall be made available to the Division upon request. The Division may require additional requirements on any facility that may pose a threat to public health and/or the environment.

J. Hydrogen Sulfide Injection. Injection of fluids containing hydrogen sulfide where the injection fluids are a gaseous mixture, or would be a gaseous mixture in the event of a release to the atmosphere, and where the 100 ppm radius of exposure from the injection point includes any public area, excluding public roads, shall not be allowed unless first approved by the division after public hearing.

K. Exemptions. An exemption to the requirements of this Section may be granted by petitioning the Director. Any such petition shall provide specific information as to the circumstances that warrant approval of the exemption requested and the proposed alternative methods by which the requirements of this Section are to be satisfied. The Director, after considering all relevant factors, may approve an exemption if it is determined that the proposed alternative meets or exceeds the requirements of this Section and otherwise protects the health, safety and welfare of potentially affected persons.

L. Release. Upon a release of hydrogen sulfide the following actions must be taken:

1. Activation of the H₂S Contingency Plan. The H₂S Contingency Plan shall be activated immediately upon a H₂S release where the potential exists for exposure to a potentially hazardous volume of H₂S, or where a concentration of H₂S greater than 50 ppm exists at the property line of any well, facility or operation.

2. Notification of the Division. Upon release of hydrogen sulfide requiring activation of the H₂S Contingency Plan, the Division shall be notified as soon as practicable, preferably within one hour of discovery of the release or as soon as possible in cases where prompt response should supercede notification. A full report of the incident shall be submitted to the Division on Form C-141 no later than fifteen (15) days following the release.

M. Additional Standards. The Division may require more stringent standards on a case-by-case basis than those set forth in this Section, or require corrective actions if necessary, to maintain control of a well or any other facility, or to safeguard public health or safety.