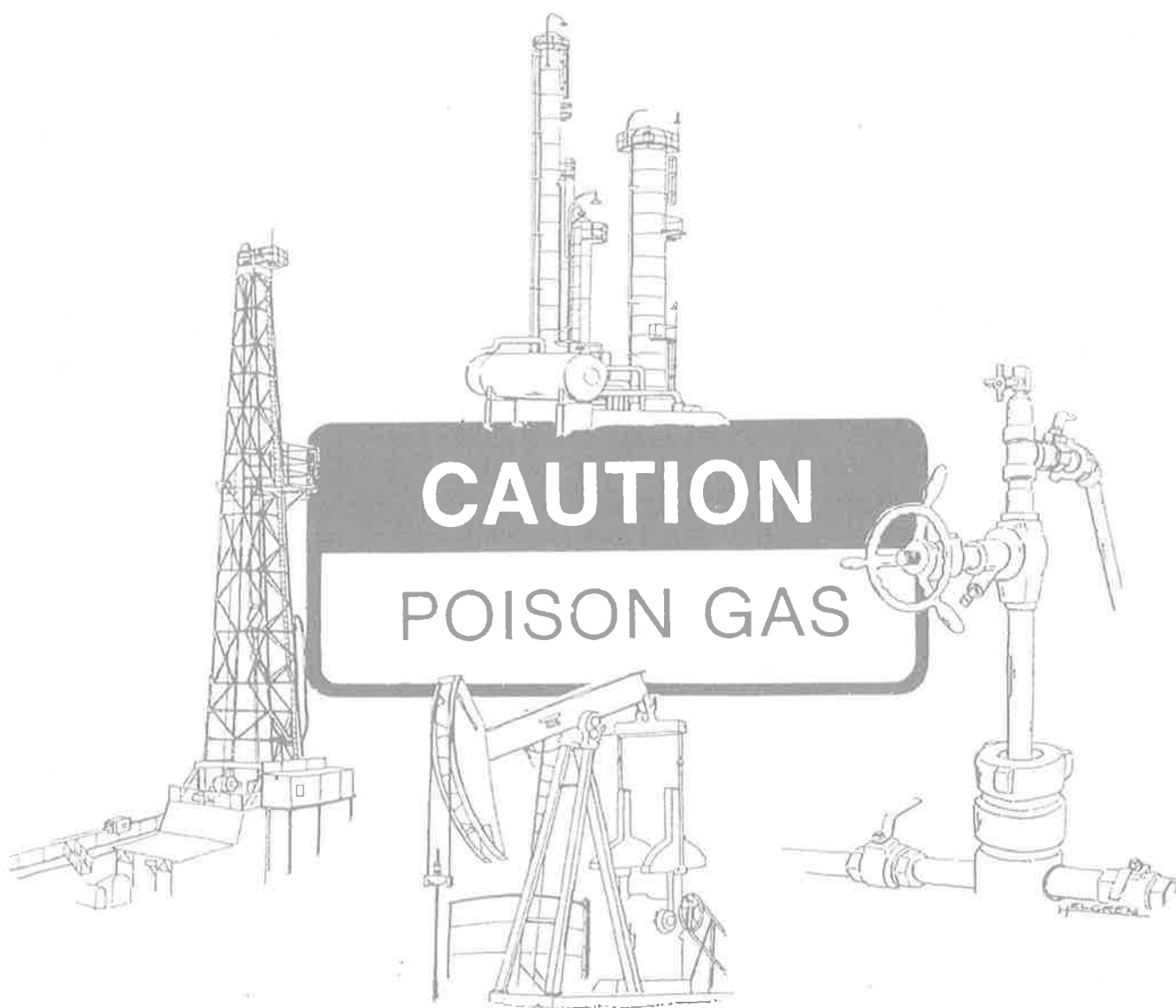


STATEWIDE RULE 36

HYDROGEN SULFIDE SAFETY



RAILROAD COMMISSION OF TEXAS
O I L & G A S D I V I S I O N

THE RAILROAD COMMISSION DOES NOT DISCRIMINATE
ON THE BASIS OF RACE, COLOR, NATIONAL ORIGIN,
SEX, RELIGION, AGE OR DISABILITY.

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CALLING (512) 463-7288 OR (TDD) 1-800-735-2989
IF SPECIAL ASSISTANCE IS REQUIRED.

Revised May, 2012

STATEWIDE RULE 36 HYDROGEN SULFIDE SAFETY

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INTRODUCTION

Hydrogen sulfide is a very deadly gas that can kill within minutes. Hydrogen sulfide gas is encountered in many oil and gas producing formations in the state of Texas and, therefore, can be present at drilling locations, producing wells, tank batteries, production facilities, gas plants, sweetening plants, pipelines, etc.

The purpose of this manual is to acquaint you with the hazards of hydrogen sulfide, the characteristics of hydrogen sulfide, the safety precautions necessary, and the requirements of statewide rule 36 relative to drilling, production, and transportation of hydrogen sulfide gas.

Rule 36 is designed for the protection of the general public from the hazards of hydrogen sulfide gas in oil and gas operations and does not pertain to industrial safety as such. The commission, however, believes that education and safety training are the best defense against the hazards of hydrogen sulfide, and that industry workers must be able to protect themselves if they are to help protect the general public.

ABBREVIATIONS

B.O.P.	-	BLOWOUT PREVENTOR
DST	-	DRILL STEM TEST
H₂S	-	HYDROGEN SULFIDE
PPM	-	PARTS PER MILLION
PSI	-	POUNDS PER SQUARE INCH
PSIA	-	POUNDS PER SQUARE INCH ABSOLUTE
R.O.E.	-	RADIUS OF EXPOSURE
SO₂	-	SULFUR DIOXIDE
S.G.	-	SPECIFIC GRAVITY

1% = 10,000 PPM or .01 Mol. Fraction

RAILROAD COMMISSION OF TEXAS
FIELD OPERATIONS - OIL AND GAS DIVISION

AUSTIN OFFICE

MAILING ADDRESS: P.O. BOX 12967, AUSTIN, TEXAS 78711-2967

DEPUTY DIRECTOR, FIELD OPERATIONS

Ramon Fernandez, Jr., P.E.
512-463-6830

ASSISTANT DIRECTOR, FIELD OPERATIONS

William Miertschin
512-463-8561

ENGINEERS

COMPLAINTS, ENFORCEMENT, STATE-FUNDED PLUGGING

Clay Woodul – 512-463-7037 - Region 1 (Dist. 4, 7B, 8, 8A)
Mark England – 512-463-3587 – Region 2 (Dist. 05/06, 7C, 9)
Travis Baer - 512-463-6808 – Region 3 (1, 2, 3, 10)

H₂S, (RULE 36/H-9 FORMS)

Kimberly Dally 512-463-6835
Michelle Marak 512-463-6829

STATE-FUNDED PLUGGING, CONTRACTS, INVOICES, SALVAGE

Jimmy Zambrano – 512-463-7070 – (Dist. 1, 2, 3, 4, 8, 8A)
Joe Collins – (Dist. 5, 6, 7B, 7C, 9, 10)

DISTRICT OFFICES AND DIRECTORS

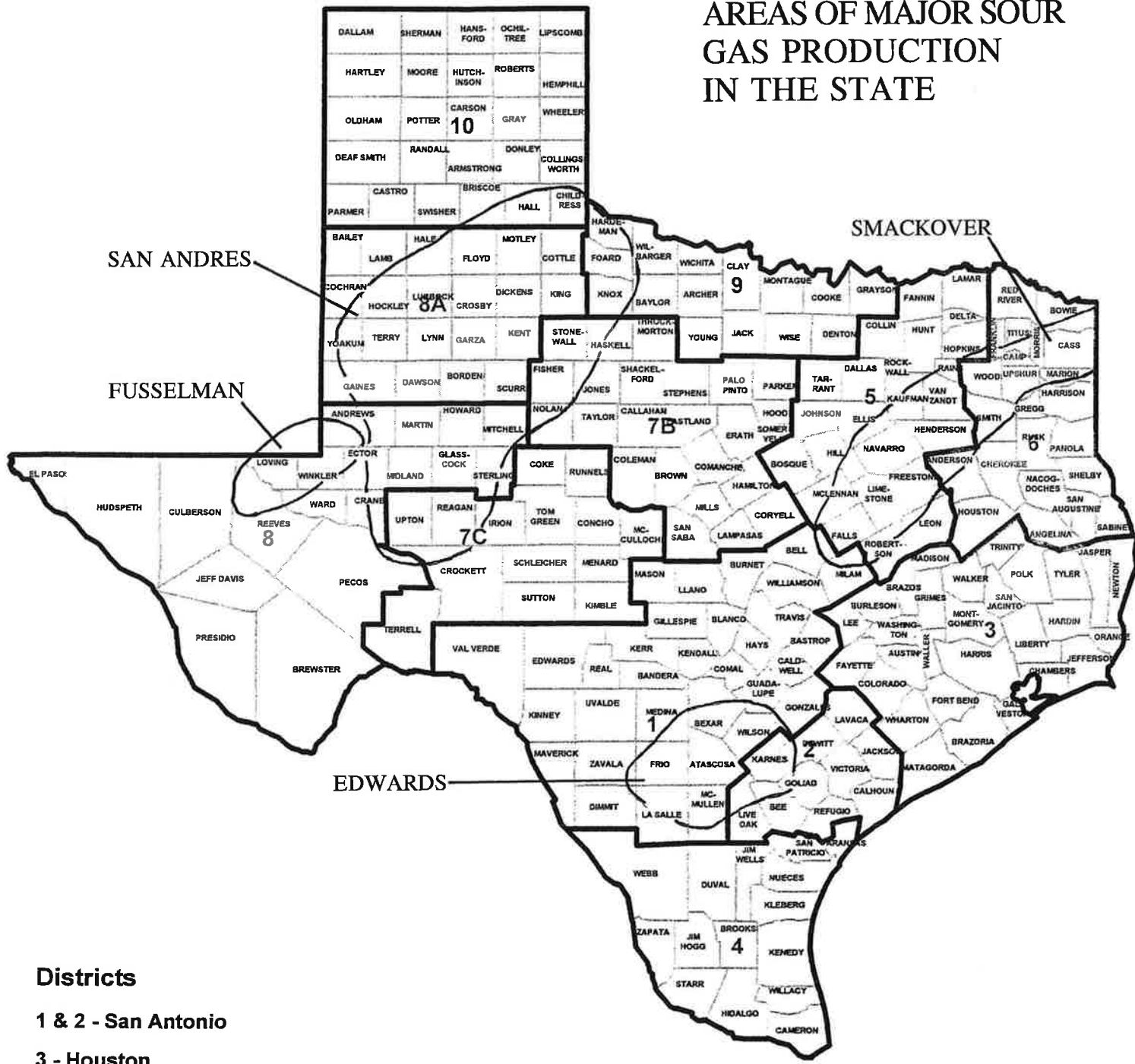
<u>Districts 1 & 2</u> San Antonio 78205-1689	210-227-1313	Tom Melville, District Director James Huie, Asst. District Director 115 East Travis Street Ste., 1610
<u>District 3</u> Houston 77008-3135	713-869-5001	Charles Teague, District Director Pete Fisher, Asst. District Director 1706 Seamist Drive, Suite 501
<u>District 4</u> Corpus Christi 78410	361-242-3113	Arnold Ott, District Director William Thompson, Acting Asst. Dist Dir. 10320 IH 37
<u>District 5 & 6</u> Kilgore 75662	903-984-3026	Vacant, District Director Mike Vanderworth, Asst. District Director 2005 N. State Highway 42
<u>District 7B</u> Abilene 79603	325-677-3545	Joe Cress, District Director Darlene Wilson, Asst. District Director 3444 North First Street
<u>District 7C</u> San Angelo 76903	325-657-7450	Barry Wood, District Director Brian Floyd, Acting Asst. Dist. Dir. 622 S. Oakes St., Suite J
<u>District 8 & 8A</u> Midland 79705	432-684-5581	Santos Gonzales, District Director Sue Hannaman, Asst. District Director Conoco Towers 10 Desta Dr. Suite 500 E
<u>District 9</u> Wichita Falls 76310	940-723-2153	Walter Gwyn, District Director Kim Peterson, Asst. District Director 500 Kell Blvd.
<u>District 10</u> Pampa 79065	806-665-1653	Cole Fraley, District Director Vacant, Asst., District Director City Hall Building 200 West Foster, Room 300

SECTION I

HYDROGEN SULFIDE

OIL AND GAS DIVISION DISTRICT BOUNDARIES

AREAS OF MAJOR SOUR GAS PRODUCTION IN THE STATE



- Districts**
- 1 & 2 - San Antonio
 - 3 - Houston
 - 4 - Corpus Christi
 - 5 & 6 - Kilgore
 - 7B - Abilene
 - 7C - San Angelo
 - 8 & 8A - Midland
 - 9 - Wichita Falls
 - 10 - Pampa

CHARACTERISTICS OF H₂S

1. Colorless gas at room temperature
2. Boiling Point = -76° F (-60° C)
3. Soluble in liquid
4. Density = 1.19 x Air (Heavier than air)
5. Ignition Temperature = 500° F (260° C)
6. Flame is practically invisible
7. One combustion by-product is SO₂, which is also toxic.
8. Explosive at mixtures between 4.3% and 46%
9. Noxious at low concentrations (Smells similar to rotten eggs).
10. Corrosive to High Carbon Steel.

H₂S is also known by such names as:

**Sour Gas
Poison Gas
Rotten Egg Gas
Acid Gas
Sewer Gas
Sulfur Gas**

PHYSICAL EFFECTS OF HYDROGEN SULFIDE*			
CONCENTRATION			
PERCENT (%)	PPM	GRAINS/100 std. ft. 3**	PHYSICAL EFFECTS
0.001	10	.65	Obvious and unpleasant odor. Safe for 8 hours exposure.
0.01	100	6.48	Kills smell in 3 to 15 minutes; may sting eyes and throat.
0.02	200	12.96	Kills smell shortly; stings eyes and throat.
0.05	500	32.96	Dizziness; breathing ceases in a few minutes; need prompt respiration.
0.07	700	45.36	Unconscious quickly; death will result if not rescued promptly.
0.10	1000	64.80	Unconscious at once; followed by death within minutes.

* **Caution:** Hydrogen Sulfide is a colorless and transparent gas and is flammable. It is heavier than air and may accumulate in low places.

** At 15.00 psia and 60° F

TOXIC EFFECTS OF HYDROGEN SULFIDE

Hydrogen Sulfide is extremely toxic. The acceptable ceiling concentration for eight-hour exposure is 20 ppm, which is .002% by volume. Hydrogen Sulfide is heavier than air (specific gravity = 1.19) and colorless. It forms an explosive mixture with air between 4.3 and 46.0 percent by volume. Hydrogen Sulfide is almost as toxic as Hydrogen Cyanide and is between five and six times more toxic than Carbon Monoxide.

TOXICITY OF VARIOUS GASES					
COMMON NAME	CHEMICAL FORMULA	SPECIFIC GRAVITY (SG) SG = 1	THRESHOLD ¹ LIMIT	HAZARDOUS ² LIMIT	LETHAL ³ CONCENTRATION
HYDROGEN CYANIDE	HCN	0.94	10 ppm	150 ppm/hr	300 ppm
HYDROGEN SULFIDE	H ₂ S	1.19	10 ppm ⁴ 20 ppm ⁵	250 ppm/hr	600 ppm
SULFUR DIOXIDE	SO ₂	2.21	5 ppm		1,000 ppm
CHLORINE	CL ₂	2.45	1 ppm	4 ppm/hr	1,000 ppm
CARBON MONOXIDE	CO	0.97	50 ppm	400 ppm/hr	1,000 ppm
CARBON DIOXIDE	CO ₂	1.52	5,000 ppm	5%	10%
METHANE	CH ₄	0.55	90,000 ppm	Combustible above 5% in air	

- 1 Threshold Limit - Concentration at which it is believed that all workers may be repeatedly exposed day after day without adverse effects.
- 2 Hazardous Limit - Concentration that may cause death.
- 3 Lethal Concentration - Concentration that will cause death with short-term exposure.
- 4 Threshold Limit = 10 ppm - 1972 ACGIH (American Conference of Governmental Industrial Hygienists).
- 5 Threshold Limit = 20 ppm - 1966 ANSI acceptable ceiling concentration for eight-hour exposure (based on 40-hour week) is 20 ppm. OSHA Rules and Regulations (Federal Register, Vol. 37, No. 202, Part II, dated October 18, 1972).

SECTION II

RULE 36

RULE 36 COMPLIANCE REQUIREMENTS DRILLING & PRODUCTION			
PROVISION	CASE 1	CASE 2	CASE 3
H ₂ S Concentration Test	X	X	X
H-9	X	X	X
Training	X	X	X
District Office Notification	X	X	X
Drill Stem Tests Restricted	X*	X*	X
BOP Test	X*	X*	X
Materials		X	X
Warning and Marker		X	X
Security		X	X
Contingency Plan			X
Control and Equipment Safety			X
Monitors		X**	X**
Mud (ph Control or Scavenger)			X*
Wind Indicators		X**	X
Protective Breathing Equipment		X**	X
Choke Manifold, Secondary Remote Control, and Mud-Gas Separator			X
Flare Stacks			X*

CASE 1 - 100 ppm R.O.E. is less than 50'

CASE 2 - 100 ppm R.O.E. is 50' or greater, but less than 3000' and contains no public area.

CASE 3 - 100 ppm R.O.E. is 50' or greater and includes a public area or 500 ppm R.O.E. includes a public road. Also if 100 ppm R.O.E. is 3000' or greater regardless of public area.

*Requirements in District 5 and 6 only.

**Requirements for Drilling or Workover operations, and gas plant only.

STATEWIDE RULE 36

§3.36 Oil, Gas, or Geothermal Resource Operation in Hydrogen Sulfide Areas

(Amended Effective November 24, 2004)

(a) **Applicability.** Each operator who conducts operations as described in paragraph (1) of this subsection shall be subject to this section and shall provide safeguards to protect the general public from the harmful effects of hydrogen sulfide. This section applies to both intentional and accidental releases of hydrogen sulfide.

(1) Operations including drilling, working over, producing, injecting, gathering, processing, transporting, and storage of hydrocarbon fluids that are part of, or directly related to, field production, transportation, and handling of hydrocarbon fluids that contain gas in the system which has hydrogen sulfide as a constituent of the gas, to the extent as specified in subsection (c) of this section, general provisions.

(2) This section shall not apply to:

(A) operations involving processing oil, gas, or hydrocarbon fluids which are either an industrial modification or products from industrial modification, such as refining, petrochemical plants, or chemical plants;

(B) operations involving gathering, storing, and transporting stabilized liquid hydrocarbons;

(C) operations where the concentration of hydrogen sulfide in the system is less than 100 ppm.

(b) Definitions.

(1) **Industrial modification**--This term is used to identify those operations related to refining, petrochemical plants, and chemical plants. The term does not include field processing such as that performed by gasoline plants and their associated gathering systems.

(2) **Stabilized liquid hydrocarbon**--The product of a production operation in which the entrained gaseous hydrocarbons have been removed to the degree that said liquid may be stored at atmospheric conditions.

(3) **Radius of exposure**--That radius constructed with the point of escape as its starting point and its length calculated as provided for in subsection (c)(2) of this section.

(4) **Area of exposure**--The area within a circle constructed with the point of escape as its center and the radius of exposure as its radius.

(5) **Public area**--A dwelling, place of business, church, school, hospital, school bus stop, government building, a public road, all or any portion of a park, city, town, village, or other similar area that can expect to be populated.

(6) **Public road**--Any federal, state, county, or municipal street or road owned or maintained for public access or use.

(7) **Sulfide stress cracking**--The cracking phenomenon which is the result of corrosive action of hydrogen sulfide on susceptible metals under stress.

(8) **Facility modification**--Any change in the operation such as an increase in throughput, in excess of the designed capacity, or any change that would increase the radius of exposure.

(9) **Public infringement**--This shall mean that a public area and/or a public road, or both, has been established within an area of exposure to the degree that such

infringement would change the applicable provisions of this rule to those operations responsible for creating the area of exposure.

(10) Potentially hazardous volume of hydrogen sulfide--A volume of hydrogen sulfide gas of such concentration that:

(A) the 100 ppm radius of exposure is in excess of 50 feet and includes any part of a "public area" except a public road; or

(B) the 500 ppm radius of exposure is greater than 50 feet and includes any part of a public road; or

(C) the 100 ppm radius of exposure is greater than 3,000 feet.

(11) Contingency plan--A written document that shall provide an organized plan of action for alerting and protecting the public within an area of exposure prior to an intentional release, or following the accidental release of a potentially hazardous volume of hydrogen sulfide.

(12) Reaction-type contingency plan--A preplanned, written procedure for alerting and protecting the public, within an area of exposure, where it is impossible or impractical to brief in advance all of the public that might possibly be within the area of exposure at the moment of an accidental release of a potentially hazardous volume of hydrogen sulfide.

(13) Definition of referenced organizations and publications.

(A) ANSI--American National Standard Institute, 1430 Broadway, New York, New York 10018, Table I, Standard 253.1-1967.

(B) API--American Petroleum Institute, 300 Corrigan Tower Building, Dallas, Texas 75201, Publication API RP-49, Publication API RP-14E, Sections 1.7(c), 2.1(c) 4.7.

(C) ASTM--American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103, Standard D-2385-66.

(D) GPA--Gas Processors Association, 1812 First Place, Tulsa, Oklahoma 74120, Plant Operation Test Manual C-1, GPA Publication 2265-68.

(E) NACE--National Association of Corrosion Engineers, P.O. Box 1499, Houston, Texas 77001, Standard MR-01-75.

(F) DOT--Department of Transportation, Office of Pipeline Safety, 400 Seventh Street, S.W., Washington, D.C. 20590, Title 49, Code of Federal Regulations, Parts 192 and 195.

(G) OSHA--Occupational Safety and Health Administration, United States Department of Labor, 200 Constitution Avenue, NW, Washington D.C. 20270, Title 29, Code of Federal Regulations, Part 1910.145(c)(4)(i).

(H) RRC--Railroad Commission of Texas, Gas Utilities Division, P.O. Drawer 12967, Capitol Station, Austin, Texas 78711, Gas Utilities Dockets 446 and 183.

(c) General provisions.

(1) Each operator shall determine the hydrogen sulfide concentration in the gaseous mixture in the operation or system.

(A) Tests shall be made in accordance with standards as set by ASTM Standard D-2385-66, or GPA Plant Operation Test Manual C-1, GPA Publication 2265-68, or other methods approved by the commission.

(B) Test of vapor accumulation in storage tanks may be made with industry accepted colorimetric tubes.

(2) For all operations subject to this section, the radius of exposure shall be determined, except in the cases of storage tanks, by the following Pasquill-Gifford equations, or by other methods that have been approved by the commission.

(A) For determining the location of the 100 ppm radius of exposure: $x = [(1.589) (\text{mole fraction } H_2S)(Q)]$ to the power of (.6258).

(B) For determining the location of the 500 ppm radius of exposure: $x = [(0.4546) (\text{mole fraction } H_2S)(Q)]$ to the power of (.6258). Where x = radius of exposure in feet; Q = maximum volume determined to be available for escape in cubic feet per day; H_2S = mole fraction of hydrogen sulfide in the gaseous mixture available for escape.

(3) The volume used as the escape rate in determining the radius of exposure shall be that specified in subparagraph (A) - (E) of this paragraph, as applicable.

(A) The maximum daily volume rate of gas containing hydrogen sulfide handled by that system element for which the radius of exposure is calculated.

(B) For existing gas wells, the current adjusted open-flow rate, or the operator's estimate of the well's capacity to flow against zero back-pressure at the wellhead shall be used.

(C) For new wells drilled in developed areas, the escape rate shall be determined by using the current adjusted open-flow rate of offset wells, or the field average current adjusted open-flow rate, whichever is larger.

(D) The escape rate used in determining the radius of exposure shall be corrected to standard conditions of 14.65 pounds per square inch (psia) and 60 degrees Fahrenheit.

(E) For intentional releases from pipelines and pressurized vessels, the operator's estimate of the volume and release rate based on the gas contained in the system elements to be de-pressured.

(4) For the drilling of a well in an area where insufficient data exists to calculate a radius of exposure, but where hydrogen sulfide may be expected, then a 100 ppm radius of exposure equal to 3,000 feet shall be assumed. A lesser-assumed radius may be considered upon written request setting out the justification for same.

(5) Storage tank provision: storage tanks which are utilized as a part of a production operation, and which are operated at or near atmospheric pressure, and where the vapor accumulation has a hydrogen sulfide concentration in excess of 500 ppm, shall be subject to the following.

(A) No determination of a radius of exposure shall be made for storage tanks as herein described.

(B) A warning sign shall be posted on or within 50 feet of the facility to alert the general public of the potential danger.

(C) Fencing as a security measure is required when storage tanks are located inside the limits of a townsite or city, or where conditions cause the storage tanks to be exposed to the public.

(D) The warning and marker provision, paragraph (6)(A)(i), (ii), and (iv) of this subsection.

(E) The certificate of compliance provision, subsection (d)(1) of this section.

(6) All operators whose operations are subject to this section, and where the 100 ppm radius of exposure is in excess of 50 feet, shall be subject to the following.

(A) Warning and marker provision.

(i) For above-ground and fixed **surface facilities**, the operator shall post, where permitted by law, clearly visible warning signs on access roads or public streets, or roads which provide direct access to facilities located within the area of exposure.

(ii) In **populated areas** such as cases of townsites and cities where the use of signs is not considered to be acceptable, then an alternative warning plan may be approved upon written request to the commission.

(iii) For **buried lines** subject to this section, the operator shall comply with the following.

(I) A marker sign shall be installed at public road crossings.

(II) Marker signs shall be installed along the line, when it is located within a public area or along a public road, at intervals frequent enough in the judgment of the operator so as to provide warning to avoid the accidental rupturing of line by excavation.

(III) The marker sign shall contain sufficient information to establish the ownership and existence of the line and shall indicate by the use of the words "Poison Gas" that a potential danger exists. Markers installed in compliance with the regulations of the federal Department of Transportation shall satisfy the requirements of this provision. Marker signs installed prior to the effective date of this section shall be acceptable provided they indicate the existence of a potential hazard.

(iv) In satisfying the sign requirement of clause (i) of this subparagraph, the following will be acceptable.

(I) Sign of sufficient size to be readable at a reasonable distance from the facility.

(II) New signs constructed to satisfy this section shall use the language of "Caution" and "Poison Gas" with a black and yellow color contrast. Colors shall satisfy Table I of American National Standard Institute Standard 253.1-1967. Signs installed to satisfy this section are to be compatible with the regulations of the federal Occupational Safety and Health Administration.

(III) Existing signs installed prior to the effective date of this section will be acceptable if they indicate the existence of a potential hazard.

(B) Security provision.

(i) Unattended fixed surface facilities shall be protected from public access when located within 1/4 mile of a dwelling, place of business, hospital, school, church, government building, school bus stop, public park, town, city, village, or similarly populated area. This protection shall be provided by fencing and locking, or removal of pressure gauges and plugging of valve opening, or other similar means. For the purpose of this provision, surface pipeline shall not be considered as a fixed surface facility.

(ii) For well sites, fencing as a security measure is required when a well is located inside the limits of a townsite or city, or where conditions cause the well to be exposed to the public.

(iii) The fencing provision will be considered satisfied where the fencing structure is a deterrent to public access.

(C) Materials and equipment provision.

(i) For new construction or modification of facilities (including materials and equipment to be used in drilling and workover operations) completed or contemplated subsequent to the effective date of this section, the metal components shall be those metals which have been selected and manufactured so as to be resistant to hydrogen sulfide stress cracking under the operating conditions for which their use is intended, provided that they satisfy the requirements described in the latest editions of NACE Standard MR-01-75 and API RP-14E, sections 1.7(c), 2.1(c), 4.7. The handling and installation of materials and equipment used in hydrogen sulfide service are to be performed in such a manner so as not to induce susceptibility to sulfide stress cracking. Other materials which are nonsusceptible to sulfide stress cracking, such as fiberglass and plastics, may be used in hydrogen sulfide service provided such materials have been manufactured and inspected in a manner which will satisfy the latest published, applicable industry standard, specifications, or recommended practices.

(ii) Other materials and equipment (including materials and equipment used in drilling and workover operations) which are not included within the provision of clause (i) of this subparagraph may be used for hydrogen sulfide service provided:

(I) such materials and equipment are proved, as the result of advancements in technology or as the result of control and knowledge of operating conditions (such as temperature and moisture content), to be suitable for the use intended and where such usage is technologically acceptable as good engineering practice; and

(II) the commission has approved the use of said materials and equipments for the specific uses after written application.

(iii) Existing facilities (including materials in present common usage for drilling and workover operations in hydrogen sulfide areas) which are in operation prior to the effective date of this section, and where there has been no failure of existing equipment attributed to sulfide stress cracking, shall satisfy the requirements of this section.

(iv) In the event of a failure of any element of an existing system as the result of hydrogen sulfide stress cracking, the compliance status of the system shall be determined by the commission after the operator has submitted to the commission a detailed written report on the failure.

(7) All operations subject to subsection (a) of this section shall be subject to the additional control and equipment safety provision, paragraph (8) of this subsection, and the contingency plan provision, paragraph (9) of this subsection, if any of the following conditions apply:

(A) the 100 ppm radius of exposure is in excess of 50 feet and includes any part of a "public area" except a public road;

(B) the 500 ppm radius of exposure is greater than 50 feet and includes any part of a public road;

(C) the 100 ppm radius of exposure is greater than 3,000 feet.

(8) Control and equipment safety provision. Operators subject to this provision shall install safety devices and maintain them in an operable condition or shall establish safety procedures designed to prevent the undetected continuing escape of hydrogen sulfide. For intentional releases of a potentially hazardous volume of hydrogen sulfide gas, the gas must be flared unless permission to vent is obtained from the commission or its delegate. Venting will be allowed only upon a showing that the venting will not pose an unreasonable risk of harm to the public.

(9) Contingency plan provision.

(A) All operators whose operations are subject to this provision shall develop a written contingency plan complete with all requirements before hydrogen sulfide operations are begun.

(B) The purpose of the contingency plan shall be to provide an organized plan of action for alerting and protecting the public prior to an intentional release, or following the accidental release of a potentially hazardous volume of hydrogen sulfide.

(C) The contingency plan shall be activated prior to an intentional release, or immediately upon the detection of an accidental release of a potentially hazardous volume of hydrogen sulfide.

(D) Conditions that might exist in each area of exposure shall be considered when preparing a contingency plan.

(E) The plan shall include instructions and procedures for alerting the general public and public safety personnel of the existence of an emergency.

(F) The plan shall include procedures for requesting assistance and for follow-up action to remove the public from an area of exposure.

(G) The plan shall include a call list which shall include the following as they may be applicable:

(i) local supervisory personnel;

(ii) county sheriff;

(iii) Department of Public Safety;

(iv) city police;

(v) ambulance service;

(vi) hospital;

(vii) fire department;

(viii) doctors;

(ix) contractors for supplemental equipment;

(x) district Railroad Commission office;

(xi) the appropriate regional office of the Texas Commission on Environmental Quality or its successor agencies;

(xii) other public agencies.

(H) The plan shall include a plat detailing the area of exposure. The plat shall include the locations of private dwellings or residential areas, public facilities, such as schools, business locations, public roads, or other similar areas where the public might reasonably be expected within the area of exposure.

(I) The plan shall include names and telephone numbers of residents within

the area of exposure, except in cases where the reaction plan option has been approved by the commission in accordance with subparagraph (L) of this paragraph.

(J) The plan shall include a list of the names and telephone numbers of the responsible parties for each of the possibly occupied public areas, such as schools, churches, businesses, or other public areas or facilities within the area of exposure.

(K) The plan shall include provisions for advance briefing of the public within an area of exposure. Such advance briefing shall include the following elements:

- (i) the hazards and characteristics of hydrogen sulfide;
- (ii) the necessity for an emergency action plan;
- (iii) the possible sources of hydrogen sulfide within the area of exposure;
- (iv) instructions for reporting a gas leak;
- (v) the manner in which the public will be notified of an emergency;
- (vi) steps to be taken in case of an emergency.

(L) In the event of a high density of population, or the case where the population density may be unpredictable, a reaction type of plan, in lieu of advance briefing for public notification, will be acceptable. The reaction plan option must be approved by the commission.

(M) The plan shall include additional support information, if applicable, such as:

- (i) location of evacuation routes;
- (ii) location of safety and life support equipment;
- (iii) location of hydrogen sulfide containing facilities;
- (iv) location of nearby telephones and/or other means of communication; and
- (v) special instructions for conditions at a particular installation such as local terrain and the effect of various weather conditions.

(N) The Railroad Commission District Office shall be notified as follows if the contingency plan is activated:

- (i) 12 hours in advance of an intentional release or as soon as a decision is made to release if such decision could not reasonably have been made more than 12 hours prior to the release;
- (ii) immediately in the case of an accidental release;
- (iii) as soon as possible before or after an unplanned intentional release made in an emergency situation to prevent a possible uncontrolled release.

(O) The retention of the contingency plan shall be as follows.

- (i) The plan shall be available for commission inspection at the location indicated on the certificate of compliance.
- (ii) The plan shall be retained at the location which lends itself best to activation of the plan.

(P) In the event that, due to particular situations, a contingency plan cannot be developed consistent with the provisions of this paragraph, relating to the contingency plan, then the operator may develop an adjusted plan to fit the situation, and submit same with the certificate of compliance. Approval of the certificate of compliance so submitted will constitute approval of the contingency plan.

(Q) The plan shall be kept updated to insure its current applicability.

(10) Injection provision.

(A) Injection of fluids containing hydrogen sulfide shall not be allowed under the conditions specified in this provision unless first approved by the commission after public hearing:

(i) where injection fluid is 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 is in excess of 50 feet and includes any part of a public area except a public road; or, if the 500 ppm radius of exposure is in excess of 50 feet and includes any part of a public road; or if the 100 ppm radius of exposure is 3,000 feet or greater;

(ii) where the hydrogen sulfide content of the gas or gaseous mixture to be injected has been increased by a processing plant operation.

(B) Each project involving the injection of gas or gaseous mixtures containing hydrogen sulfide which does not require a public hearing prior to receiving commission approval specified in this provision shall nevertheless be subject to the other provisions of this section to the extent that such provisions are applicable to such project.

(11) In addition to any other requirements of this section, drilling and workover operations, and gasoline plant sites where the 100 ppm radius of exposure is 50 feet or greater shall be subject to the following.

(A) Protective breathing equipment shall be maintained in two or more locations at the site.

(B) Wind direction indicators shall be installed at strategic locations at or near the site and be readily visible from the site.

(C) Automatic hydrogen sulfide detection and alarm equipment that will warn of the presence of hydrogen sulfide gas in concentrations that could be harmful shall be utilized at the site.

(12) **Drilling provision.** Drilling and workover operations where the 100 ppm radius of exposure includes a public area or is 3,000 feet or greater shall be subject to the following additional provisions.

(A) Protective breathing equipment shall be maintained at the well site and shall be sufficient to allow for well control operations.

(B) The operator shall provide a method of igniting the gas in the event of an uncontrollable emergency.

(C) The operator shall install a choke manifold, mud-gas separator, and flare line, and provide a suitable method for lighting the flare.

(D) Secondary remote control of blowout prevention and choke equipment to be located away from the rig floor at a safe distance from the wellhead.

(E) Drill stem testing of hydrogen sulfide zones is permitted only in daylight hours.

(F) The Railroad Commission district office shall be notified of the intention to conduct a drill stem test of a formation containing hydrogen sulfide in sufficient concentration to meet the requirements of this provision.

(G) A certificate of compliance shall be required on each well subject to this provision even if well is located on certificated lease.

(H) Full compliance with all the requirements of this provision must be satisfied before the well is drilled to a depth that is within 1,000 feet of the hydrogen

sulfide zone. Alternate depths may be approved in advance by the appropriate commission district office.

(I) API Publication RP-49 is referenced as a suggested guideline for drilling and workover of wells subject to this provision.

(J) Blowout preventers and well control systems shall be pressure tested at or near compliance depth or at depth of nearest bit change prior to reaching compliance depth. The appropriate Railroad Commission district office must be notified at least four hours prior to the test.

(13) Training requirement provision.

(A) Each operator whose operations contain hydrogen sulfide in excess of 100 ppm shall train its employees working in the affected areas in hydrogen sulfide safety.

(B) Each operator shall require all service companies working in affected areas to utilize only those service company personnel who have been trained in accordance with the provisions of subparagraphs (C) and (D) of this paragraph. Written certification to the operator by the service company that only those service company personnel who have been trained in accordance with the training requirement provision will be utilized in affected areas complies with this provision. For this provision, service company shall mean any company actually performing work at well sites, gasoline plant sites, or on pipelines, where such work could allow the escape of hydrogen sulfide gas.

(C) The training of all personnel working in the affected areas shall include the following elements:

- (i) hazards and characteristics of hydrogen sulfide;
- (ii) safety precautions;
- (iii) operation of safety equipment and life support system.

(D) On-site supervisory personnel shall be additionally trained in the following:

- (i) effect of hydrogen sulfide on metal components in the system;
- (ii) corrective action and shutdown procedures, and when drilling a well, blowout prevention, and well control procedures;
- (iii) must have full knowledge of the requirements of the contingency plan, when such plan is required.

(E) Training schedules and course outlines shall be provided to the commission personnel upon request for the purpose of commission review to determine compliance with the provisions of subparagraphs (C) and (D) of this paragraph.

(14) Accident notification. Operators shall immediately notify the appropriate Railroad Commission District Office of any accidental release of hydrogen sulfide gas of sufficient volume to present a hazard and of any hydrogen sulfide related accident.

(d) Reports required.

(1) Certificate of compliance provision. A certificate of compliance shall be submitted for operations subject to any provision of this section. The following shall apply to the certificate of compliance provision of the section.

(A) The certificate of compliance shall certify that operator has complied or will comply with applicable provisions of this section.

(B) The certificate of compliance shall be filed in triplicate in the commission district office where the operation is located.

(C) The certificate of compliance shall certify that existing operations subject to this section to be in compliance will be in compliance as specified in an attached schedule, or, for new or modified facilities, will be in compliance upon completion.

(D) An approved certificate of compliance will permit an operator to perform all activities described in the certificate without additional filing of approval; provided that, consistent with subsection (c)(12)(G) of this section, a certificate of compliance will be required on each well subject to the provisions of subsection (c)(12)(G) of this section.

(E) A new or amended certificate of compliance shall be required if there is a change in public exposure caused by public infringement of an existing radius of exposure resulting in a change in the applicable provisions of this section, not described by the existing certificate. The operator shall file the new or amended certificate within 30 days after such infringement.

(F) A new or amended certificate of compliance shall be required if there is modification of an existing operation or facility which increases the radius of exposure in a public area, or results in a change in the applicable provisions of this section not described by the existing certificate. The operator shall file the new or amended certificate at least 30 days prior to initiating the operation or construction.

(G) The operator shall file a certificate of compliance 30 days prior to commencement of a drilling or workover operation on wells where a certificate of compliance is required for that well by provisions of this section (wells drilled on noncertificated leases or wells with a 100 ppm radius of exposure greater than 3,000 feet).

(H) In case of extenuating circumstances, an operator may file a certificate of compliance with an attached written explanation for those cases where waiver of 30-day prior filing is requested. In such cases, the approval of the certificate of compliance will constitute authority to proceed.

(I) The certificate of compliance shall be prepared and executed by a party who, through training and experience, is qualified to make such certification.

(J) The certificate of compliance will be in effect until conditions are altered in a manner that would require amending the "certificate." The operator shall notify the commission within 30 days following cessation or abandonment of operations in a certificated area.

(K) The certificate of compliance required by the provisions of this order for an existing system are due in the district office as soon as is reasonably possible, and no later than September 1, 1976, and as applicable for new or modified operations.

(L) A certificate of compliance may cover a single operation or multiple operations located in an area, a field, or a group of fields within a commission district. The description of the type of operation as indicated on the form must be sufficiently complete to the degree that it is obvious what element of an operation is to be covered by the certificate. All Railroad Commission identification numbers for each element of the system must be shown on the certificate and must be identified as to the type of operation.

(M) Certificates are nontransferable, and a new operator of a system or any acquired element of a system or operation shall be required to certificate that operation. Operator of a certificated system shall notify the commission in writing when the system or any operating part has been transferred to another operator. An amended certificate shall be required should any change occur that would add or delete a Railroad Commission identification number covered by the certificate.

(N) Each operator shall maintain a current master list of all his operations for which a certificate of compliance is in effect and shall submit such list for inspection upon request by the commission.

(2) Completion report provision.

(A) The operator shall report on the initial completion report for new oil or gas wells the hydrogen sulfide concentrations of the wellhead gas for all wells where the hydrogen sulfide concentration is equal to or exceeds 100 ppm.

(B) The drilling of a well in an area which would require the submission of a certificate of compliance (Form H-9) shall have noted on the drilling application (Form W-1) that such certification has been filed.

(3) Releases of, and accidents related to, hydrogen sulfide. The operator shall furnish a written report to the district office within ten days of any accidental release of hydrogen sulfide gas of sufficient volume to present a hazard and of any hydrogen sulfide related accident, whether it be from an accidental or intentional release.

(e) Exception provision. Any application for exception to the provisions of this section should specify the provisions to which exception is requested, and set out in detail the basis on which the exception is to be requested.

SOURCE: The provisions of this §3.36 adopted January 1, 1976; amended to be effective September 1, 1976, 1 TexReg 1517; amended to be effective September 15, 1985, 10 TexReg 2069; amended to be effective April 7, 1995, 20 TexReg 2285; amended to be effective November 24, 2004, 29 TexReg 10728

OUTLINE OF RULE 36

RULE 36 & H₂S SAFETY

RULE 36 IS A SAFETY RULE DESIGNED TO PROTECT THE GENERAL PUBLIC FROM THE HAZARDS OF H₂S RESULTING FROM INTENTIONAL AND ACCIDENTAL RELEASES.

PROPERTIES OF H₂S

1. Rotten Egg Odor - Odor threshold 0.13 PPM.
2. Colorless
3. Heavier than air - S.G. 1.19
4. Dissolves in water to form acid - PH OF 3
5. Very corrosive on certain metals - Causes Hydrogen Sulfide Stress Cracking.
6. Will kill sense of smell at high concentrations and at low concentrations over a period of time.
7. Sweet tasting gas
8. Very Deadly - At concentrations above 500 PPM, can kill within minutes. Can also kill at lower concentration if exposed long enough.
9. Kill by respiratory paralysis - Can't hold breath
10. H₂S converts to SO₂ (Sulfur Dioxide) when burned.

Rule 36 is a progressive rule relative to compliance. The level of compliance required is determined by 100 PPM & 500 PPM R.O.E.

RADIUS OF EXPOSURE - Distance from release to where H₂S concentration in air will dilute to below 100 PPM or 500 PPM. R.O.E. for pipeline will be parallel lines.

LEVELS OF COMPLIANCE

1. If concentration is less than 100 PPM - EXEMPT from rule. 100 PPM = .01% or Percent X 10,000 = PPM.
2. If 100 PPM R.O.E. is less than 50 feet, EXEMPT from all but the training provisions unless facility is a lease storage tank. if vapors in tank are 500 PPM or greater, tanks will require signs and maybe fence even if R.O.E. is less than 50 feet.
3. If 100 PPM R.O.E. is greater than 50 feet, and less than 3,000 feet, but does not include a public area & 500 PPM R.O.E. does not include a public road.
 - A. SIGNS -- Facilities & buried pipelines.
 - B. SECURITY PROVISION -- If located within 1/4 mile of a public area or inside city limits, fencing, etc. required to deter and protect public.
 - C. MATERIALS & EQUIPMENT PROVISION:
 - (1) This provision applies only to the parts of a system used for the containment of pressure.
 - (2) After 9/1/76, new or modified operations must use material that satisfies the requirements of NACE MR-01-75. Metals specified by this are not susceptible to H₂S stress cracking under specified conditions.
 - (3) Fiberglass & plastics may be used, but metals not covered by MR-0-75 may not be used unless authorized by RRC.
 - (4) Equipment in use prior to 9/1/76 may be used in same area if no history of failure.
 - (5) General observation
 - (A) Higher grades of metals are more susceptible to H₂S stress cracking.
 - (B) Higher temperatures reduce corrosive effect.
 - (C) Higher pressures increase corrosive effect.
 - (D) H₂S Stress cracking normally does not occur at pressures below 65 PSI.
 - (E) Metals with a Rockwell hardness of 22 or less are normally not susceptible to H₂S stress cracking. J-55
 - (F) Drill pipe with a yield strength of 95,000 PSI or less are normally not susceptible to H₂S stress cracking.

- D. For drilling & workover operations and gas plants, the following are required:
 - (1) Minimum of 2 air packs
 - (2) Wind socks
 - (3) Monitor

- 4. If 100 PPM R.O.E. is greater than 50 feet and includes any part of a public area except a public road or if 100 PPM R.O.E. is greater than 3000 feet regardless of public area; or the 500 PPM R.O.E. is greater than 50' and includes any part of public road.
 - A. Signs, Security, Material Provisions
 - B. Safety Controls, Equipment and/or Procedures to prevent a continued, undetected H₂S leak. Flaring of a potentially hazardous volume of H₂S gas is required, unless venting permission is obtained from the Commission and conducted in a manner that will not pose an unreasonable risk of harm to the public.
 - C. Contingency Plan - Conventional and Reactive - An organized plan of action for alerting & protecting the public prior to an intentional release, or following an accidental release of a potentially hazardous volume of H₂S gas.
 - D. For Drilling and Workover operations
 - (1) Protective breathing equipment adequate to allow for well control.
 - (2) Method for igniting gas.
 - (3) H₂S Detection and Alarm Equipment
 - (4) Choke Manifold, Flareline
 - (5) Remote control for BOP & Chokes.
 - (6) DST Permitted only in daylight hours
 - (A) RRC must be notified
 - (B) Test string must be of acceptable material
 - (7) Must be in compliance within 1000 feet of H₂S zone.
 - (8) API RP-49 is referenced as a suggested guideline. Covers mud systems, locations, etc. Beyond the scope of Rule 36 such as:
 - (A) Maintain mud weight.
 - (B) Maintain mud PH at 11 or greater to neutralize and decompose H₂S in mud stream.

- (C) Use of H₂S scavengers in mud system.
- (9) B.O.P. and Well Control System must be tested at or near compliance depth and RRC must be notified.

INJECTION PROVISIONS

1. Injection of fluids containing H₂S shall not be allowed without a public hearing if:
 - A. The 100 PPM R.O.E. is greater than 50 feet and includes a public area.
 - B. The 500 PPM R.O.E. is greater than 50 feet and includes a public road.
 - C. The 100 PPM R.O.E. is 3,000 feet or greater.
 - D. The H₂S content of the gas to be injected has been increased by a processing plant operation.
2. If a public hearing is not required, must still comply with all applicable provisions of Rule 36.

TRAINING PROVISIONS

1. Operator shall train its employees working in H₂S areas.
2. Operator shall require service companies to utilize trained personnel actually working on H₂S system or well and where such work could allow the escape of H₂S gas.
3. TRAIN ALL PERSONNEL IN:
 - A. Hazards and Characteristics of H₂S.
 - B. Safety Precautions
 - C. Equipment - Safety and Support
4. Train on-site supervisory personnel in:
 - A. Effects of H₂S on metals
 - B. Corrective actions and shutdown procedures.
 - C. Well control - If a drilling operation
 - D. Knowledge of contingency plan.

NOTIFICATION

1. Requires immediate notification to RRC of any accidental release of H₂S of sufficient volume to present a hazard and of any H₂S related accident. Twelve hour advance notice of intentional releases, or as soon as possible of unplanned intentional releases, should the contingency plan be activated.
2. Whether resulting from accidental or intentional release, notification shall be followed by a written report within 10 days.

REPORTS REQUIRED

1. File H-9 at least 30 days prior to the commencement of drilling or workover operations.
2. The H-9 certifies that the operation is in compliance or will be in compliance with the provisions of Rule 36.
3. An Amended H-9 is required if there is a change in public exposure caused by public infringement that will result in a change to the compliance provisions under the existing H-9.
4. H-9'S are not transferable.
5. A "Lease Operation H-9" will cover all work on a lease including workovers and the drilling of new wells, unless the 100 PPM R.O.E. of the well is 3,000 FEET or greater.

ANALYSIS

1. Must normally be "4" complementing conditions to cause a tragedy.
 - A. Must be an undetected, continuous release.
 - B. Release must be of sufficient volume and concentration.
 - C. Must be weather conditions that retard dispersion.
 - D. Must be uninformed public in area of exposure.
2. Probability of all these conditions occurring at the same time is remote under the provisions of Rule 36, but it could happen.

DISCUSSION
OF
RULE 36 REQUIREMENTS

TESTING PROCEDURES

Section (c)(1)

What must you do to comply with the testing portion of Rule 36? Points to consider: (1) Where to sample; (2) Acceptable test instruments; (3) How to sample; and (4) Shortcut.

WHERE TO SAMPLE

You, as an operator, need to know the Hydrogen Sulfide concentration and volume at any given point in your system. A typical well has two sample points, the tubing and the casing. **The tubing is the preferred sampling point** if there is free gas available. If there is no free gas, a second choice would be to hook up a portable test unit at the well and sample the gas as it is separated. A third choice would be to test the well as you do for the W-10 or G-10 tests, and sample the gas at the end of the test period.

The casing represents an easy sample point in a well without a packer because there is normally free gas available. However, this may not be a valid concentration for flow-line calculations because the casing can behave similarly to a storage tank and concentrations can vary. The casing can be a good sample point, if little or no gas is produced through the tubing and the casing produces gas continuously.

After each well is tested, the concentration in each flow line can be calculated. Be sure to recalculate at any point where flow lines are joined. The separator or heater treater affords an excellent cross-check on flow-line calculations. Each storage tank should be measured when the tank is at least three-quarters full.

ACCEPTABLE TEST INSTRUMENTS

"Acceptable test instruments" is the second point. All tests should be field tests, as Hydrogen Sulfide will impregnate all known sample containers: Glass, Plastic, Stainless Steel, etc.

Colormetric Tubes are approved for storage tanks only. Use only industry accepted tubes.

The testing instructions vary somewhat for various tubes and are provided with each box of test tubes. However, since these tubes are not to be force-fed, it is a good idea to run the gas supply into an open jar or bottle, and pull the sample from the bottle at atmospheric pressure. The colormetric tubes are not acceptable for radius of exposure calculations.

Section (c)(1)(A) of Statewide Rule 36 references ASTM and GPA publications for approved test instruments. These publications indicate **two approved testing techniques: Cadmium Sulfate Absorption and Tutweiler**. There is also a provision to approve other instruments. However, at this time, no other instruments have been approved by the Commission.

The **Cadmium Sulfate Absorption** technique has the capability to distinguish Hydrogen Sulfide from the other sulfur compounds. The absorption technique is only applicable to six grains or 99 parts per million (PPM), which limits its use to borderline testing.

The **Tutweiler** and **Colormetric Tubes** measure total sulfur.

The Tutweiler is the preferred method with greatest flexibility.

HOW TO SAMPLE

The storage tanks should be sampled while three-fourths or more full with a hand pump and enough gum rubber tubing to sample one foot above the fluid level. Care should be taken to purge the sampling apparatus of all air. The concentration can then be determined with the Tutweiler, Cadmium Sulfate Absorption or Colormetric Tubes.

For all other sampling points, the first step is to locate an access to free gas. A needle valve, or other means of controlling rate and volume, and length of gum rubber tubing should be attached. Again, the sampling system must be purged of all air. Sample while maintaining a constant flow. Determine the concentration with the Tutweiler or Cadmium Sulfate Absorption technique.

A brief comment about safety. If the range of concentrations is unknown or suspected to be high, a closed-breathing system should be used while sampling. At the very least, use the buddy system with life lines.

SHORTCUT

The last topic is the "Shortcut". Assuming that you have a large system with many wells in one area, and you do not wish to test each well, you may spot check to determine the highest concentration in the system and use this highest concentration in all radii of exposure calculations for the entire system. This shortcut is a trade-off with fewer field measurements, but a larger radius of exposure is used for the entire system.

RADIUS OF EXPOSURE

Section (c)(2) of Rule 36 states "For all operations subject to this rule, the radius of exposure shall be determined, except in the cases of storage tanks, by the following Pasquill-Gifford equations, or by other methods that have been approved by the Commission". The radius of exposure, as we are defining it in Statewide Rule 36, is that distance surrounding a possible or potential leak site where the concentration of 100 parts per million or 500 parts per million (depending on which radius is being calculated) will remain at a constant level for a 24-hour period by way of a continuous emission. The radius of exposure shall be determined for all facilities, other than storage tanks, that have a concentration of 100 parts per million or greater.

The methods discussed here that can be used to determine a radius of exposure are the Pasquill-Gifford equation and the Nomograph (For Nomographs, see last two pages of this book). It should be pointed out that currently these are the only approved methods by which the radius of exposure can be determined. The Pasquill-Gifford equation can be found under Section (c)(2)(A) of the rule. The first equation is for 100 parts per million and the second equation is for the 500 parts per million equation, a 400 parts per million concentration can be entered in the equation and an answer will come out. Naturally, it will be meaningless if you do not have 500 parts to begin with. The equation Pasquill originally formulated was in metric terms, so we have converted this from metric terms to oil-field terms. The "Q" in the equation is the escape rate for a system or facility expressed in cubic feet per day. The "Q" for a gas well will either be the well's adjusted open-flow potential, or if you feel this is too high, your estimate of the well's capacity to flow against a zero back-pressure. The Mole Fraction of Hydrogen Sulfide used in the equation, is the cubic feet of Hydrogen Sulfide per 100 standard cubic feet of mixture expressed as a percent. The Hydrogen Sulfide concentration will have to be converted to a Mole Fraction if expressed in parts per million or grains. "X" is the radius of exposure expressed in feet.

As originally formulated, the Pasquill-Gifford equation described the plume in a three-plane coordinate system. The "X" axis is that direction in which the wind would be blowing at a continuous rate. The "Y" and "Z" axis will be vertical and perpendicular. It is assumed that the emission will be constant to the point that some distance downstream of this is a point at which the 100 parts per million concentration will remain constant over a 24-hour period. Regarding the "Y" and "Z" planes, it is assumed that there is a normal Gaussian distribution; that is there is less concentration on the sides, with the highest concentration in the center. In order to simplify this equation, it is assumed that the point of emission will be at or near the ground level. The reason for this is that most of your wells and part of your facilities are rather close to the ground. It also eliminates that very complex exponent of this equation that is used for effective stack height. The Environmental Protection Agency and the Texas Natural Resources Conversation Commission use this equation.

The original equation took into account meteorological parameters. These are classed into categories A, B, C, D, E and F. Class "A" would be your most unstable; that is, higher velocity winds, more radiation, unlevel terrain, etc. Class "F" is the most stable condition. The Railroad Commission has used this Class "F" condition as it will present the most conservative of your parameters. To further simplify the equation, a wind velocity of one mile per hour is assumed since this situation presents the least amount of fresh-air mixing. consequently, this gives the largest radius of exposure.

Thus we have the following assumptions in this equation:

- (1) Maximum escape rate (complete separation or rupture)
- (2) Stability Class "F" meteorological parameters (there is stability throughout the diffusing layers).
- (3) A wind velocity of one mile per hour.
- (4) The point of emission is at or near the ground level.
- (5) A normal Gaussian distribution of both "Y" and "Z" Planes.

- (6) A constant wind direction.
- (7) Relative level terrain (minimum ground mixing).

It should be pointed out that in calculating a radius of exposure, you should take into account the terrain around the point of emission or possible emission. If there is a cliff a short distance from your well, the probability of the Hydrogen Sulfide going up this is quite small. However, if there is a small creek bed or a small valley like we have in East Texas, with pine trees on both sides; the gas will collect under these trees or in this valley and remain longer. The terrain should be considered when calculating a radius of exposure. The equation is not accurate to the degree that if you calculated a radius of exposure of 1,500 feet, gas is not going to get beyond it. there is a possibility it may.

These three methods provide the best estimate for concentration of a gas at a given distance from a point of emission; however, these predictions are not infallible. The field data collected to date, based on a 10-minute sampling time, indicates that for ground level concentrations, you have a safety factor of two to three. Thus, the radius of exposure calculations, as presented in this rule, is based on the worst possible conditions to create the maximum radius of exposure. A radius of exposure can be calculated using the equation as set out in this rule or by using the Nomographs.

The 100 and 500 parts per million Nomographs. To use these Nomographs, enter the left side with your concentration of Hydrogen Sulfide. This must be expressed in either parts per million or percentage. then draw a straight line across the page to the "Q" rate. For a facility or oil lease, use the escape rate; for a gas well, use the flow against a zero back-pressure. The radius of exposure is the point on the center bar crossed by the line. Again, these Nomographs are based on the assumption previously listed.

These methods of determining a radius of exposure provide the following:

- (1) All operators will use a uniform calculation method.
- (2) It will assure that an approved, conservative equation and compatible parameters have been used in determine the radius of exposure.

- (3) This will assist the Railroad Commission personnel when determining the compliance status of a field facility that is being reviewed for certification.
- (4) The radius of exposure, as determined by these methods, is used as the criteria to require certain actions under this rule.

Section (c)(3) of Rule 36 deals with four possible field conditions. Section (c)(3)(A) of the rule indicates that the escape rate is "The maximum daily volume rate of gas containing Hydrogen Sulfide handled by that system element for which the radius of exposure is calculated". This refers to all facilities except the gas well itself. thus, the "Q" rate (the maximum escape rate at the plant or the facility) would be used in calculating the radius of exposure. Section (c)(3)(B) covers the current existing well that is in a recognized field. For the calculation of the radius of exposure, the "Q" rate will either be the open-flow potential, the adjusted open-flow potential or an estimated escape rate. If an estimated rate is used, a justification for the use of a lower "Q" instead of the adjusted open-flow potential should be given. Section (c)(3)(C) is for drilling of new wells in known areas, where there is sufficient data to know both the concentration and the expected volume rates. The rates used will be the adjusted open-flow rates of the offset wells or the field average current adjusted open-flow rate, whichever is larger. Section (c)(3)(D) states that all escape rate calculations will be based on standard conditions of 14.65 psia and 60° Fahrenheit.

Section (c)(4) of this rule covers new wells drilled as wildcats, or wells drilled in an area where there is insufficient data to calculate a radius of exposure, but where a formation containing Hydrogen Sulfide is anticipated. In this situation, a 100 parts per million radius of exposure, equal to 3,000 feet, will be assumed. If a lesser radius can be justified, a written request must be submitted to the Commission asking for an exception.

STOCK TANK PROVISION

Section (c)(5) of Rule 36 deals with storage tanks. Storage tanks which are utilized as a part of a production operation, and which have a Hydrogen Sulfide concentration in excess of 500 parts per million, shall be subject to the rule. This does not include pipeline storage tanks. Section (c)(5)(A) of the rule states that storage tanks do not require a calculation of a radius of exposure. Section (c)(5)(B) requires a warning sign to be posted on or within 50 feet of the facility indicating a potential danger. Section (c)(5)(C) requires fencing as a securing measure when the tank is located within city limits or a township, or where conditions cause the storage tanks to be exposed to the public. It is up to the operator to determine if the tank will be exposed to the general public. Sections (c)(5)(D) and (c)(5)(E) place storage tanks under the Warning and Marker Provision (Section (c)(6)(a)) and the Certificate of Compliance Provision (Section (d)(1)).

Although not stated in the rule, it is required that the storage tank be at least three-quarters full of crude oil when tested for Hydrogen Sulfide concentration, and that the measurement be taken approximately one foot above this surface.

WARNING AND MARKER SECURITY

The signs and fencing requirements of Rule 36 are found under Section (c)(6)(A) and Section (c)(6)(B). For facilities that have a 100 parts per million radius of exposure that is in excess of 50 feet, there must be signs at the facility and on all access roads. The sign must say "**CAUTION**" and "**POISON GAS**", and it must comply with the standards as indicated in the rule. This standard specifies the coloring on the sign to be **black** and **yellow**, and the size of the lettering to be large enough to be readable from a reasonable distance. The unattended facilities must also be fenced and locked if it is within the city limits or within a quarter-mile of a dwelling, place of business, hospital, church, school, government building, school bus stop, public park, city, town, village or similarly populated area.

Specific fencing requirements will be satisfied on a case-by-case basis as determined by the appropriate district office.

During drilling or workover operations, it is recommended that operational flags be displayed at the lease entrance depicting the status of any danger associated with hydrogen sulfide.

MATERIALS AND EQUIPMENT

Materials and Equipment are covered under Section (c)(6)(C) of Rule 36. Due to the complexity of the provision, the purpose of this discussion is not to address the design of specific equipment, but rather to attempt to expand on the intent of the provision.

First of all, this provision is to apply only to those elements of the system that contribute to the contamination or the safety control of the system.

The intent of this section of the rule, and specifically the portion covering drilling and workover operations, is to extend the metal standards only to those elements of the system where gas is intentionally contacted to the metal components of the system. Section (c)(6)(C)(i) states in part that "For new construction or modification of facilities (including materials and equipment to be used in drilling and workover operations) completed or contemplated subsequent to the effective date of this rule, the metal components shall be those metals which have been selected and manufactured so as to be resistant to Hydrogen Sulfide stress cracking under the operating conditions for which their use is intended, provided that they satisfy requirements described in the latest editions of NACE Standard MR-01-75 and API RP-14E, Sections 1.7(C), 2.1(C), 4.7".

As you know, sulfide stress cracking is a result of metals being subjected to high stress levels in a corrosive environment where Hydrogen Sulfide is present. The metal will often fail catastrophically in a brittle manner. This phenomenon is a function of metal chemical composition and hardness, heat treatment and microstructure, as well as factors such as pH, Hydrogen Sulfide concentration, stress and temperature. It is also a function of handling of the material. The Railroad Commission has adopted the above mentioned NACE publication, as it provides sufficient latitude in material selection in order to limit the sulfide stress cracking phenomenon.

Furthermore, this section of the rule states "The handling and installation of materials and equipment used in Hydrogen Sulfide service is to be performed in such a manner so as not to induce

susceptibility to sulfide stress cracking". This means to avoid cold work stresses. For example, a piece of equipment or material that satisfies the accepted standard, can be made susceptible to sulfide stress cracking by several means, such as transport, loading, unloading, hammer marks, stress risers, improper welding procedures, excessive torque while making up pipe (box ends are susceptible to work hardening of mating surfaces) and cold stress by excessive loads, etc.

Other materials which are non-susceptible to sulfide stress cracking, such as fiberglass and plastics, may be used in Hydrogen Sulfide service provided that such materials have been manufactured and inspected in a manner which will satisfy the latest published and applicable industry standard specification or recommended practices.

Section (c)(6)(C)(ii) of the rule states that "Other materials and equipment (including materials and equipment used in drilling and workover operations) which are not included within the provision of Section (c)(6)(C)(i) above, may be used for Hydrogen Sulfide services provided":

- (1) "Such materials and equipment are proved, as the result of advancements in technology or as the result of control and knowledge of operating conditions (such as temperature and moisture content), to be suitable for the use intended, and where such usage is technologically acceptable as good engineering practice."
- (2) "The Commission has approved the use of said materials and equipment for the specific uses after written application."

In essence, this section is a "catch all" provision. However, NACE does not allow the use of susceptible materials in situations by controlling the environment. Nor does this rule allow the use of materials and equipment that are known to be susceptible to stress cracking solely by attempts to control moisture content or temperature.

Section (c)(6)(C)(iii) states that "Existing facilities (including materials in present common usage for drilling and workover operations in Hydrogen Sulfide areas) which are in operation prior to the effective date of this rule, and where there has been no failure of existing requirements of this rule".

This section is the "**grandfather**" clause. In essence, this means that equipment currently in use within the confines of a field can continue to be used in that field, and it also can be interchanged under similar conditions provided no failures have occurred. This section also applies to the use of drill pipe, drill collars, blowout preventers, choke manifolds and fittings; since these materials are being used primarily for the control of the well; and where they are not intentionally used to contain gases of high Hydrogen Sulfide concentrations.

Section (c)(6)(C)(iv) states that "in the event of a failure of any element of an existing system as the result of Hydrogen Sulfide stress cracking, the compliance status of the system shall be determined by the Commission after the operator has submitted to the Commission a detailed written report on the failure". According to this provision, not only the component part, but the entire system shall be examined if it or any part fails to satisfy the requirement described in the current acceptable NACE and API standards.

CONTROL AND SAFETY PROVISION

Section (c)(8), covers the control and safety provision of Rule 36. This provision states "Operators subject to this provision shall install safety devices and maintain them in an operable condition or shall establish safety procedures designed to prevent the undetected, continuing escape of Hydrogen Sulfide".

The rule states that if you have a 100 parts per million radius of exposure in excess of 50 feet, and it penetrates a public area, or if it is equal to or greater than 3,000 feet, you will have automatic devices that will detect a leak or you will have safety procedures in place to adequately detect a leak. In that the rule does not specify the type of equipment or the number required, operators should comply with the intent of the rule to prevent the undetected, continuing escape of Hydrogen Sulfide, whether it be by the use of safety control, monitors, or safety procedures. The Commission must evaluate each system for compliance.

At this time, if you have a question on compliance, it is suggested that the Railroad Commission district office be contacted. Should a satisfactory solution fail to be reached at that level, then it is suggested that an appeal be made to the Austin office, and if necessary, the case may be set for public hearing.

CONTINGENCY PLANS

The requirement for a contingency plan and its contents is covered in Section (c)(9) of Rule 36. The purpose of the plan is to provide an organized plan of action for alerting and protecting the public following an accidental release of a potential hazardous volume of Hydrogen Sulfide. The plan is not a check list of equipment and players but a game plan; a plan of action, a logical step-by-step approach to an emergency. The plan will also help to prevent overreaction and the bringing in of unnecessary people when the operator may have the capability to handle the problem. As defined in Section (c)(7) of the rule, whenever the radius of exposure includes a public area or is equal to or exceeds 3,000 feet, a contingency plan is required.

Some of the things a plan should include are listed below. The list is not in order of importance, and some items may not apply to every plan, but a plan may include the following:

1. Instructions for alerting employees and the public in case of an emergency.
2. Procedure for requesting assistance and follow-up action to remove the public from the area of exposure.
3. A call list of people to notify of an emergency. For example:

INTERNAL LIST

<u>Title</u>	<u>Name</u>	<u>Office Phone</u>	<u>Home Phone</u>
Production Supt.			
Drilling Supt.			
Field Engineer			
Lease Operator			

EXTERNAL LIST

Ambulance	Police or Fire Department
Hospital	Railroad Commission
Doctor	Texas Natural Conservation Commission
Department of Public Safety	Contractors and Service Companies (Include name and type of equipment available)

4. Plat of area showing radius of exposure, location of public areas, location of evacuation routes, location of safety equipment and telephones.
5. List of names and telephone numbers of residents within the area of exposure and the person responsible for any public area.
6. Provision for advance briefing of public within an area of exposure. This briefing should include information on the hazards and characteristic of Hydrogen Sulfide, possible sources, instructions for reporting a leak and the manner in which the public will be notified of an emergency. If several operators have leases with overlapping radii, this briefing should be coordinated so there will not be a lot of duplication and unnecessary contacts.
7. Detailed operating procedures to be followed in an emergency including specific job assignments for personnel.
8. Detailed remedial procedures to be followed in an emergency.
9. Rules for when protective equipment such as clothing, fresh air breathing equipment, gas detectors, etc. is required to be used by personnel.
10. A plan should include conditions of weather, differences in terrain and covering vegetation and seasonal changes that might create an increase in hazardous conditions or an abnormal dispersion pattern.

In the event of a high density of population, or where the population density is unpredictable, a **reaction plan** will be acceptable in lieu of a contingency plan. The main differences between a contingency plan and a reaction plan is that the reaction plan does not require the advance briefing of the public nor the listing of names and phone numbers. This plan must be approved by the Railroad Commission prior to implementation.

Any plan should be kept close to where the action might be and readily available to operating personnel. The plan should be short, simple and as workable as possible, so that the man in the field can

understand it and can quickly find the portion needed in case of an emergency. A working knowledge of the plan by all personnel is desirable. Information on the plan should be included with safety training programs.

Any plan, no matter how well conceived, will need to be updated from time-to-time. Periodic reviews should be made to keep all portions of the plan current, especially the call list.

INJECTION PROVISION

The injection of a fluid containing Hydrogen Sulfide is covered in Section (c)(10) of the rule. As defined in Section (c)(10), injection of Hydrogen Sulfide is not allowed if the 100 ppm radius of exposure exceeds 50 feet and includes any part of a public area; or, if the 100 ppm radius of exposure is 3,000 feet or greater, unless first approved by the Commission after a public hearing. If the injection project falls into one of the above categories, a public hearing must be requested. The radius of exposure is calculated on the concentration of Hydrogen Sulfide and volume to be used for injection. The injection well's capability to flow to the atmosphere against zero pressure should be considered in calculating the radius of exposure. This section of the rule applies to existing projects and to gas lift operations. A project using gas which has had the Hydrogen Sulfide content increased by a processing plant will also require a hearing.

Operations subject to this provision are required to notify all offset operators. If the radius of exposure includes a public road, local law enforcement agencies should be notified. Notification to all residents and businesses within the 100 ppm radius of exposure is also required. The published notice as required for SWR 9 or 46 must include notice of H₂S injection and state that a public hearing will be required.

An injection project not covered in the above criteria will not require a public hearing, but it will still be subject to any part of Rule 36 that may be applicable.

SECTION (c)(11)
For
DRILLING, WORKOVER AND GASOLINE PLANTS

Section (c)(11) sets out special provisions for drilling and workover operations, and gasoline plant sites where the 100 ppm radius of exposure is greater than 50 feet. These special provisions are in addition to any proceeding requirements of Rule 36. These special provisions are:

- A. Protective breathing equipment shall be maintained in two or more locations at the site. The two locations should be selected so that at least one unit will be accessible, regardless of the wind direction.
- B. Wind direction indicators shall be installed at strategic locations at or near the site and be readily visible from the site. The number required will depend upon the site. One wind indicator would be sufficient if it is readily visible from any location on a site. Where wind indicators are needed at night, they must be illuminated.
- C. Automatic Hydrogen Sulfide detection and alarm equipment that will warn of the presence of Hydrogen Sulfide gas in concentrations that could be harmful shall be utilized at the site.

Please do not confuse the provisions of this section with the drilling and workover provisions of Section (c)(12). Section (c)(12) deals with the provisions of drilling and workover operations where the 100 ppm radius of exposure includes a public area or is greater than 3,000 feet. The provisions of (c)(12) are in addition and more specific than the provisions of Section (c)(11).

DRILLING PROVISION

The drilling provision of Rule 36 is found in Section (c)(12). This provision is directed toward any drilling and workover operation where the 100 parts per million radius of exposure is greater than 50 feet and includes a public area or is 3,000 feet or greater. A workover in this situation is the removal of the christmas tree or the movement of tubing. Changing out a valve, other than the master valve, is not considered a workover.

Section (c)(12)(A) states, "Protective breathing equipment shall be maintained at the well site". It is suggested that the number and type of protective breathing equipment should be determined by the operator, based on the maximum number of persons constantly at the well site. The acceptable type of breathing equipment is the pressure demand fresh air breathing type. The breathing equipment should be maintained at strategic points throughout the drilling location, and they should be checked daily.

Section (c)(12)(B) states, "The operator shall provide a method of igniting the gas in the event of an uncontrollable emergency". This can be accomplished either by flare guns or other acceptable methods.

Section (c)(12)(C) states, "The operator shall install a choke manifold, mud-gas separator and flare line and provide a suitable method for lighting the flare". The choke manifold does not have to necessarily be Hydrogen Sulfide trimmed, as previously mentioned in the Materials and Equipment Provision. The mud-gas separator should be located between the first and second mud tanks. It should be baffle-type construction (not pressurized). Flare lines from the mud-gas separator should be parallel to and perpendicular to prevailing wind direction, and should be maintained in a manner that should be unrestricted to flow. For igniting flare gas at the burn pit or flare line, either a flare gun or an automatic ignition system (including a source of pilot gas) should be available. Railroad Commission Districts 5 and 6 require flare stacks.

Section (c)(12)(D) states, "secondary remote control of blowout prevention and choke equipment is to be located away from the rig floor at a safe distance from the wellhead". Safe distance, in this instance, is to be left up to the discretion of the operator or contractor.

Section (c)(12)(E) states "drill-stem testing of Hydrogen Sulfide zones is permitted only in daylight hours". The operator will be permitted to conduct a full drill-stem test only if the drill stem meets metallurgical requirements of NACE. If the drill stem is not of acceptable standards, then a work string satisfying the NACE standard must be used. If the work string does not meet the standards, then the drill-stem test will have to be limited to the use of a downhole sampling device.

Sections (c)(12)(F), (G), (H), (I) and (J) appear to be self-explanatory, and will not be discussed.

Please be aware that the requirements of the drilling provisions are in addition to any other requirements of the proceeding sections.

TRAINING REQUIREMENT PROVISION

The training requirement of Rule 36 is covered in **Section (c)(13)**. The intent in this provision is to insure that the personnel are trained to prevent and react to an emergency to the degree that safety will be ensured.

Section (c)(13)(A) states that "Each operator whose operations contain H₂S in excess of 100 parts per million shall train its employees working in the affected area.

Section (c)(13)(B) requires that service company personnel also be trained if the work they are performing at well sites, gasoline plants or pipelines could allow the escape of H₂S gas. This provision, therefore would not apply to personnel delivering equipment, painting tanks, hauling pipe, etc.

Section (c)(13)(C) states "The training of personnel shall include the following elements":

- (i) **Hazards and Characteristics of Hydrogen Sulfide.** - In training personnel, it is suggested that each individual be instructed as to the toxic effects of Hydrogen Sulfide and the physical effects at various levels of Hydrogen Sulfide exposure.
- (ii) **Safety Precautions** - Safety precautions normally vary depending on the nature of the situation. The surrounding working conditions and environment would dictate what specific precaution should be observed. In general, when working in a Hydrogen Sulfide environment, individuals should be aware of the Hydrogen Sulfide concentration present, they should not work alone in contaminated areas (make use of the "buddy system") and they should be observant of the wind direction at all times.
- (iii) **Operation of safety equipment and life-support system.** - All personnel should be able to operate safety and life-support systems, including fresh-air breathing equipment and resuscitation equipment. Routine drills on the use of this equipment should be conducted at frequent intervals.

Section (c)(13)(D) specifies that supervisory personnel shall be additionally trained in the following:

- (i) Effect of Hydrogen Sulfide on metal components in the system.
- (ii) Corrective action and shut-down procedures, and when drilling a well, blowout prevention and well control procedures.
- (iii) Full knowledge of the requirement of the contingency plan, when such plan is required.

For this section, supervisory personnel would be the persons in charge of the operation at a particular time. Such a person must be on site at all times if the operation has a public area in the 100 parts per million radius of exposure or if the radius of exposure is greater than 3,000 feet.

NOTIFICATION REQUIREMENT

This section requires that the appropriate Commission district office be immediately notified of any accidental release of Hydrogen Sulfide gas of sufficient volume to present a hazard, and of any Hydrogen Sulfide related accident, whether the injured party is an employee or a member of the general public. As defined in Definitions of SWR 36 (b)(10)(A)(B)&(C), a potentially hazardous volume of hydrogen sulfide is a volume of hydrogen sulfide gas of such concentration that (1) the 100 ppm radius of exposure is in excess of 50 feet and includes any part of a “public area” except a public road; (2) the 500 ppm radius of exposure is greater than 50 feet and includes any part of a “public road”; (3) the 100 ppm radius of exposure is greater than 3,000 feet. In addition, 12 hours advance notification of an intentional release, or as soon as possible after an unplanned intentional release in an emergency situation, is required should the contingency plan be activated.

These notifications must be followed by a written report to the appropriate district office within 10 days of the incident.

SECTION III

FORM H-9

**RAILROAD COMMISSION OF TEXAS
OIL AND GAS DIVISION
CERTIFICATE OF COMPLIANCE STATEWIDE RULE 36**

FORM H-9
12/12/77

FILE WITH
DISTRICT OFFICE
IN TRIPLICATE

1. Operator			2. Operator Number (See Instruction 13)			3. RRC Dist.									
4. Street or P. O. Box No.			5. City			6. State			7. Zip Code						
8. Name of Lease, Facility or Operation				9. Field or Area Name				10. County							
11. General Operation Type - Circle One:						Other Explanation									
A - Oil Field Production		B - Gas Field Production													
C - Pipeline or Gathering Sys.		D - Gasoline Plant													
E - Drilling or Workover		F - Sweetening Unit													
G - Combination (explain)		H - Other (explain)													
12. RRC ID# of Operation(s) to be Covered by This Certificate		Type ID Code (See Instruction 12)		Indicate if Filing for Storage Facility Only		13. Hydrogen Sulfide Concentration PPM		14. Maximum Escape Volume MCF/Day							
				YES NO		15. 100 PPM Radius of Exposure (ROE) _____ Ft.		16. 500 PPM Radius of Exposure (ROE) _____ Ft.							
						17. Operation is Existing New		18. Modification Resulting in Certificate Change		Yes No					
						<input type="checkbox"/> <input type="checkbox"/>		<input type="checkbox"/> <input type="checkbox"/>		<input type="checkbox"/> <input type="checkbox"/>					
						19. Workover or Drilling Well with 100 PPM ROE Greater than 3000' feet on Rule 36 Certified Well/Lease		Yes No							
						<input type="checkbox"/> <input type="checkbox"/>		<input type="checkbox"/> <input type="checkbox"/>							
						20. Previous Certificate Number if Available (For Amended Certificates)		_____							
						21. The 100 PPM ROE includes any part of a public area except a public road		Yes No							
						<input type="checkbox"/> <input type="checkbox"/>		<input type="checkbox"/> <input type="checkbox"/>							
						22. The 500 PPM ROE includes any part of a public road		Yes No							
						<input type="checkbox"/> <input type="checkbox"/>		<input type="checkbox"/> <input type="checkbox"/>							
						23. Injection of fluid containing Hydrogen Sulfide (See Instruction 14)		Yes No							
						<input type="checkbox"/> <input type="checkbox"/>		<input type="checkbox"/> <input type="checkbox"/>							
						24. Date (or Depth) of Compliance with all applicable provisions of Rule 36		____/____/19____							
						Mo Day Year									
						Depth of Compliance for Drilling Operation		____ Ft. from Surface							
25. Contingency Plan Location of Plan (See Instruction 15)						Has been prepared Yes No									
						<input type="checkbox"/> <input type="checkbox"/>									
26. Location of data used to prepare this certificate (See Instruction 15)															
CERTIFICATE															
I declare under penalties prescribed in Section 91.143, Natural Resources Code, that I am authorized to make this report, that this report was prepared by me or under my supervision, and that I am qualified to make this certification by virtue of my training and experience, and by my analysis of the operation being certified, or by the analysis of qualified person working under my supervision, and that the data and facts stated therein are true, correct, and complete, to the best of my knowledge.															
Representative of Company				Title				Phone No.				Date			

RAILROAD COMMISSION USE ONLY

This operation and the equipment used therein is approved on the basis of the above certification and is subject to further Commission audit for compliance with the required provisions of Statewide Rule 36. This approval may be cancelled if investigation determines that the operation does not comply with the provisions of Statewide Rule 36.

APPROVED BY: _____

DATE: _____

REMARKS:

CERTIFICATION NUMBER: _____

INSTRUCTIONS FOR COMPLETING FORM H-9 STATEWIDE RULE 36 CERTIFICATE OF COMPLIANCE

1. The certificate of compliance shall certify that operator has complied, or will comply, with applicable provisions of this rule.
2. The certificate of compliance shall be filed in triplicate in the Commission District Office where the operation is located.
3. The certificate of compliance shall certify existing operations subject to this rule to be in compliance, will be in compliance as specified in an attached schedule, or for new or modified facilities, will be in compliance upon completion.
4. An amended certificate of compliance shall be required if the modification of an existing operation increases the radius of exposure to include additional public areas. If there is a change in public exposure caused by the public infringement of existing radius of exposure resulting in a change in applicable provisions not described by the existing certificate, then an amended certificate of compliance shall be submitted within 30 days.
5. For new or modified facilities not covered by existing certificate of compliance, or where the modification would require amended certificate, the operator shall file a certificate at least 30 days prior to initiating the operation or construction.
6. In case of extenuating circumstances, an operator may file a certificate of compliance with an attached written explanation for those cases where waiver of 30-day prior filing is requested. In such cases, the approval of the certificate will constitute authority to proceed.
7. The certificate of compliance shall be prepared and executed by a party who, through training and experience, is qualified to make such certification.
8. A certification of compliance may cover a single operation or multiple operations located in an area, a field, or a group of fields within a Commission District. The description of the type of operation is indicated on form must be sufficiently complete to the degree that it is obvious what element of an operation is to be covered by the certificate.
9. Certificates are non-transferable, and a new operator of a system or any acquired element of a system or operations shall be required to certificate that operation. An Amended H-9 shall be required should any change occur that would add or delete a RRC ID or Registration Number covered by a certificate. Any change in operator address or location of contingency plan and/or test data shall require an amended certificate.
10. In completing Form H-9 the items 13, 14, 15, and 16 are based on maximum volume and concentrations within system available for escape. If system to be certified is a vacuum system and no gas could possibly escape, so indicate by filling item 14 with "0-Vacuum".
11. On Form H-9 items 21 and 22 are to be based on the maximum effect of any element within system.
12. Show Railroad Commission ID or Registration Numbers to be certificated: I.D. Numbers should be identified by the type with codes:
 1. Oil Lease Number
 2. Gas Well Number
 3. Pipeline Permit Number
 4. Plant I.D. Number
 5. Drilling Permit Number
 6. API Number
 9. Other (Explain)If necessary attach additional 8 ½ x 11 sheet.
13. Operator Number is a unique number assigned to each company filing a RRC Form P-5. This number is found at the bottom of each page of the operator's copy of the proration schedule.
14. Disposal of produced water with little or no free gas does not require a "yes" entry in item 23.
15. Location of contingency plan and test data should be in the form of a delivery address (not a post office box).
16. If this is an amended filing, indicate reason(s) in "Other Explanation."
17. Forms H-9 filed for drilling or work over must be amended within one year to indicate disposition of well. Include prior Certificate Number, current RRC ID Number, or, if dry hole, date Form W-3 was filed.
18. Drilling Application (W-1) must indicate a Rule 36 covered well in "Remarks" section when a proposed drilling operation is in an area, which requires filing of Form H-9. Please file Form W-1 and H-9 for same well together, if possible.

INSTRUCTIONS FOR COMPLETING FORM H-9

Properly completed, the Form H-9 will:

- Identify the type of operation
- Indicate the level of compliance required
- Certify that the operation will be in compliance with Rule 36.

Items 1 - 10

- Identifies the operator and the operation or facility.

Item 11

- Identifies the type of operation.
- Circle the appropriate letter for the type of operation.
- If G or H is circled, will need to explain under "Other Explanation".

Item 12

- This requires the appropriate Commission's assigned identification number such as drilling permit number, lease number, pipeline number, etc.
- If the H-9 for a drilling operation is filed before a drilling permit number is issued, leave the item blank and the Railroad Commission District Office will fill in the permit number when it is issued.
- The "Type ID Code" column will identify the type of number under the RRC ID# column. The proper code is obtained from the back of the Form H-9. Such as Code (1) for a lease number, Code (2) for a gas ID number, etc.

- Storage Facility
 1. If Item 15 is 50 feet or greater, check "No".
 2. If Item 15 is less than 50 feet and Item 13 is less than 500 ppm, check "No".
 3. If Item 15 is less than 50 feet and Item 13 is 500 ppm or greater, check "Yes".

Item 13

- This is the Hydrogen Sulfide concentration in the gas stream. If the operation is any type other than a drilling operation, the concentration must be measured. If the H-9 is for a drilling operation, the concentration from a nearby producing well can be used, if the formation is the same. If the drilling well is a Wildcat to a known Hydrogen Sulfide zone, leave Item 13 blank and enter 3,000 feet under Item 15. If you use anything less than 3,000 feet under Item 15 on such a Wildcat well, explain why under "Remarks".

Item 14

- This is the maximum volume of gas that could escape from a well or system if it was fully opened to atmospheric pressure.

Item 15

- This is the distance from a leak site that a concentration of 100 ppm (parts per million) of Hydrogen Sulfide in the air could be expected to reach. This distance can be determined from the 100 ppm equation in Rule 36 or from the 100 ppm nomograph, in the back of this manual, by using the concentration reported in Item 13 and the volume reported in Item 14.

Item 16

- This would be the same as Item 15 except it would be the distance for a 500 ppm concentration and you would use the 500 ppm equation or the 500 ppm nomograph to determine the distance or radius.

Item 17

- Needs no explanation

Item 18

- Check "Yes" if this is a previously certified operation that has been modified to such an extent that the level of compliance changes due to a change in the radius of exposure or change of exposure in public areas to such an extent that the level of compliance will change. If "Yes" is checked, you should list the previous certification number under Item 20.

Item 19

- If you have filed a Production H-9 for an oil lease, a drilling H-9 is not required for future wells drilled on the lease unless the well will have a 100 ppm radius of exposure greater than 3,000 feet. If this be the case, the "Yes" block should be checked.

Item 20

- If this is an amendment to a previously certified well, lease, facility, or operation, the previously issued certification number should be given.

Item 21

- Using the 100 ppm radius reported under Item 15, the area around the operational site must be surveyed to see if there is a public area in the radius. If so, "Yes" must be checked. "Yes" checked will require full compliance with Rule 36.

Item 22

- Using the 500 ppm radius reported under Item 16, the area around the operations site must be surveyed to see if there is a public road in the radius. If so, "Yes" must be checked. If "Yes" is checked, full compliance with Rule 36 will be required.

Item 23

- This normally applies to the injection of gas containing Hydrogen Sulfide rather than the injection of produced water since it would be rare for a salt water injection well to have a radius of exposure of 50 feet or greater. If "Yes" is checked and if either Items 21 or 22 are checked "Yes", a public hearing will be required to consider approval of the H-9. Also, if the concentration of the Hydrogen Sulfide in the gas stream has been increased by a processing plant prior to injection, a public hearing will be required regardless of how Items 21 and 22 are checked.

Item 24

- Date or depth of compliance with all applicable provisions of Rule 36. For any operation other than drilling, a date for compliance must be given. This will be the date the operation was or will be in compliance with Rule 36. If the H-9 is for a drilling operation, a depth of compliance must be given. The depth given should be 1,000 feet above the expected H₂S zone. If no depth is given, it will be assumed that the drilling operator will be in compliance with Rule 36 from ground zero.

Item 25

- If Items 21 or 22 are checked "Yes", or if Item 15 is 3,000 feet or greater, a contingency plan is required. Indicate the locations, not P. O. Box, where the contingency plan will be kept. If the plan has already been prepared, check the "Yes" block. If the plan has not yet been prepared, check the "No" block and indicate when the plan is expected to be completed. If a contingency plan is not required, leave Item 25 blank.

Item 26

- Give a location, not a P. O. Box, where the data used to prepare the H-9 is kept.

Certification

- The Form H-9 must be signed by a person knowledgeable of the requirements of Rule 36 and who can certify that the operation is or will be in compliance, or else supervises someone who is knowledgeable in the requirements of Rule 36 and can certify that the operation is or will be in compliance.

POINTS TO REMEMBER

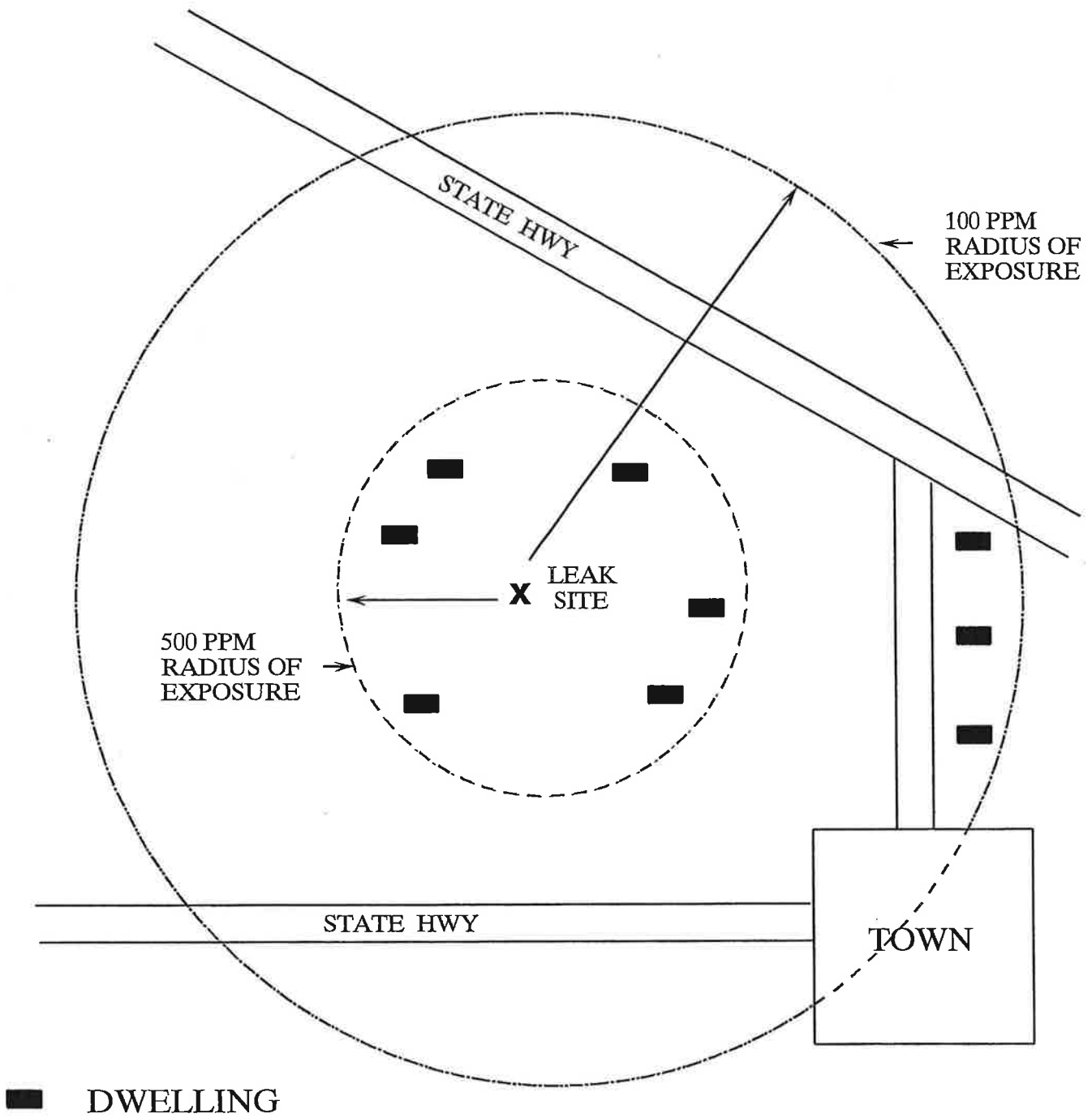
1. For drilling operations, Form H-9 must be filed 30 days prior to the commencement of drilling operations. The Form H-9 does not have to be filed at the same time the Form W-1 drilling application is filed, as long as the H-9 is filed 30 days prior to drilling.
2. A Form H-9 must be filed for a well in a field classified as an H₂S field even if the well contains no H₂S gas. This is necessary in order for the well to be coded exempt in our H₂S system. Otherwise, the well will show up in our system as being in violation of Rule 36.
3. If an H-9 is filed for the drilling of a well and the well is subsequently completed as a producer, an amended H-9 must be filed for production. When filing the production H-9, the H₂S concentration in the gas must be measured, and the volume determined. The H₂S concentration and volume used on the drilling H-9 should not be used on the production H-9 since the values used on the drilling H-9 were only assumed values.
4. A production H-9 will cover all drilling and workover operations on an oil lease provided the 100 ppm radius of exposure for the well is less than 3,000 feet. This means that it is not necessary to file a drilling or workover H-9 if the well is on a lease with certified production H-9 on file unless the 100 ppm radius of exposure for the well will be 3,000 feet or greater.
5. Gas wells are assigned individual RRC Identification Numbers, unlike oil wells where the lease is assigned an RRC Lease Number rather than assigning individual numbers to the oil wells on the lease. Production H-9's for gas wells, therefore, must be filed for each gas well. Several gas wells may be filed on a single H-9, but the I.D. Number of each well must be listed under

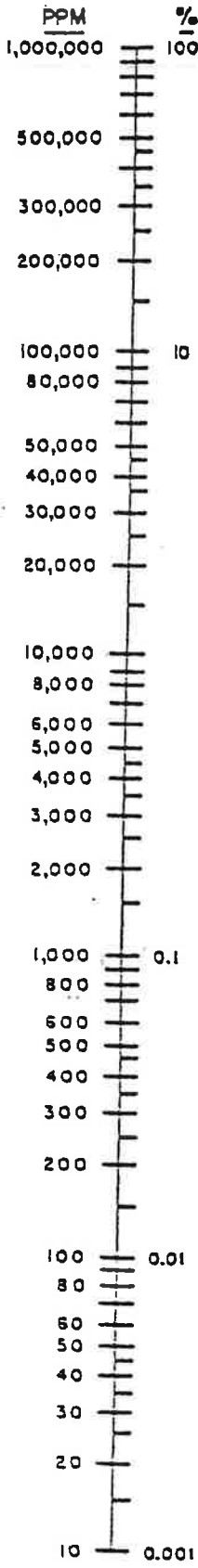
Item 12. In this situation, the values from the well with the largest radius of exposure must be used to complete Items 13, 14, 15 & 16. In some cases, this could cause excessive compliance on some wells listed if they happen to have a smaller radius of exposure.

6. Certified Form H-9's are not transferable. If the operation of an H₂S facility is taken over by a new operator, the new operator must file a new H-9 to show the change of operator. This is necessary to ensure that the new operator is aware of the requirements of Rule 36 and will certify that the operation will be maintained in compliance with Rule 36. Indicate in "Remarks" that the H-9 is being filed to show a change of operator. If the certification number is known, enter this number under Item 20.

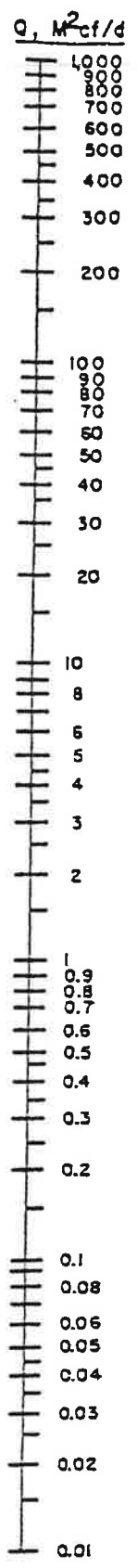
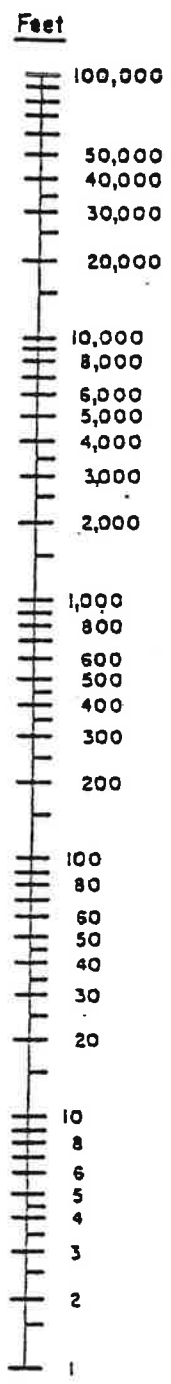
APPENDIX

EXAMPLES OF DISPERSION PROBLEMS





HYDROGEN SULFIDE 100 PPM EXPOSURE RADIUS



At X = 3000 Ft.
 Q = 226,547 PPM

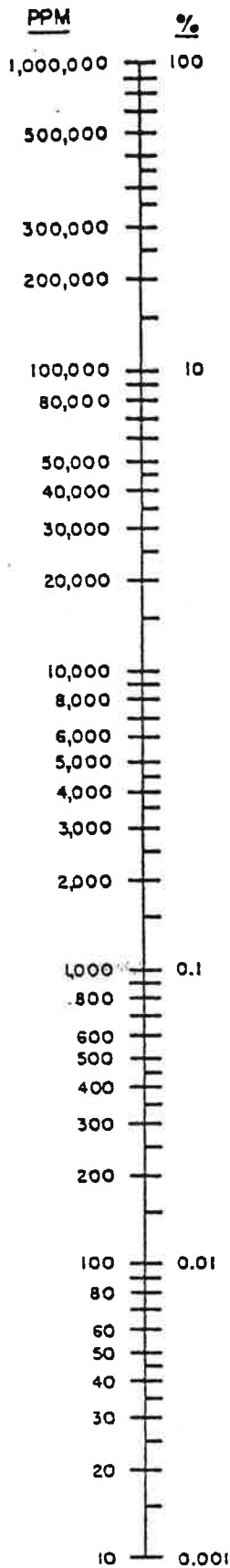
At X = 50 Ft.
 Q = 326.4 PPM

Below 100 PPM
 Rule 36 N.A.

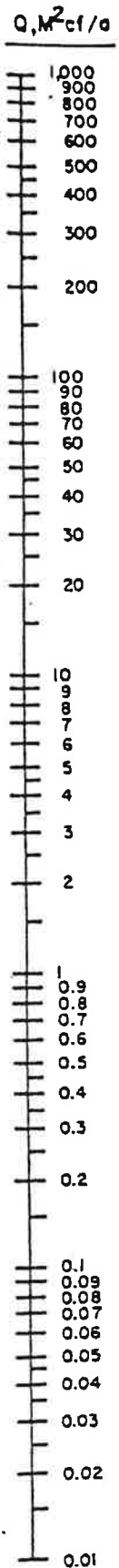
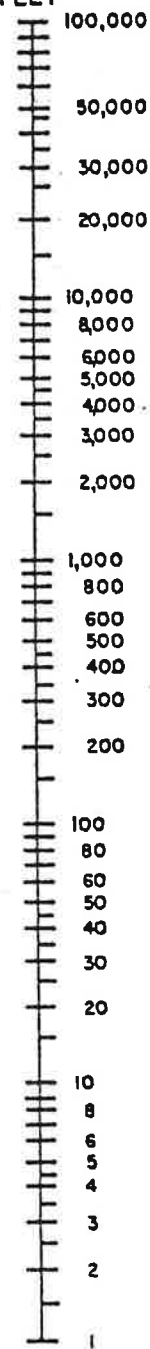
100 PPM Radius of Exposure in Feet = X

$$X = [(1.589)(\text{Mole Fraction})(\text{Escape Rate})]^{0.6258}$$

$$= [(1.589)(\text{PPM})(Q \text{ in } M^2\text{cf/d})]^{0.6258}$$



HYDROGEN SULFIDE
 500 PPM EXPOSURE RADIUS
 FEET



At X = 50 Ft.
 Q = 1140.9
 PPM

500 PPM Radius of Exposure in Feet = X
 $X = [(0.4546)(\text{Mole Fraction})(\text{Escape Rate})]^{0.6258}$

$X = [(0.4546)(\text{PPM} \div 10^6)(Q \times 10^6 \text{ cu. ft.})]^{0.6258}$

Wind velocity = 1 mph; Plume is shape of H₂S dispersion.

Pressure base 14.65 psia, T_b = 60°F

