BUREAU OF LAND MANAGEMENT
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Onshore Oil and Gas Operations; Federal and Indian Oil and Gas Leases; Onshore Oil and Gas Order No. 6, Hydrogen Sulfide Operations

I. Introduction.
- A. Authority.
- B. Purpose.
- C. Scope.

II. Definitions.

III. Requirements.
- A. Application, Approvals, and Reports.
- B. Public Protection.
- C. Drilling/Completion/Workover Requirements.
- D. Production Requirements.

IV. Variances from Requirements.

Attachments.

I. Introduction

A. Authority

This Order is established pursuant to the authority granted to the Secretary of the Interior through various Federal and Indian mineral leasing statutes and the Federal Oil and Gas Royalty Management Act of 1982. This authority has been delegated to the Bureau of Land Management and is implemented by the onshore oil and gas operating regulations contained in 43 CFR part 3160. More specifically, this Order implements and supplements the provisions of § 3162.1 – General Requirements; §3162.5-1(a)(c)(d) – Environmental Obligations; §3162.5-2(a) – Control of Wells; and §3162.5-3 – Safety Precautions.

43 CFR 3164.1 specifically authorizes the Director, Bureau of Land Management, to issue Onshore Oil and Gas Orders, when necessary, to implement or supplement the operating regulations and provides that all such Orders shall be binding on the operator(s) of all Federal and Indian (except Osage Tribe) oil and gas leases which have been, or may hereafter be, issued. The authorized officer has the authority pursuant to 43 CFR 3161.2 to implement the provisions of this Order, require additional information, and approve any plans, applications, or variances required or allowed by the Order.

The authorized officer may, pursuant to 43 CFR 3164.1 and 3164.2, after notice and comment, issue onshore oil and gas orders when necessary to implement and supplement the regulations contained in 43 CFR 3160, and issue notices to lessees and operators (NTL's) when necessary to implement onshore oil and gas orders and the regulations. Pursuant to Section IV of this Order, the authorized officer may approve a variance from the requirements prescribed herein to accommodate special conditions on a State or area wide basis.
[57 FR 2039 and 2136, Jan. 17, 1992]

B. Purpose

The purpose of this Order is to protect public health and safety and those personnel essential to maintaining control of the well. This Order identifies the Bureau of Land Management's uniform national requirements and minimum standards of performance expected from operators when conducting operations involving oil or gas that is known or could reasonably be expected to contain hydrogen sulfide (H_2S) or which results in the emission of sulfur dioxide (SO_2) as a result of flaring H_2S. This Order also identifies the gravity of violations, probable corrective action(s), and normal abatement periods.

C. Scope

This Order is applicable to all onshore Federal and Indian (except Osage Tribe) oil and gas leases when drilling, completing, testing, reworking, producing, injecting, gathering, storing, or treating operations are being conducted in zones which are known or could reasonably be expected to contain H_2S or which, when flared, could produce SO_2, in such concentrations that upon release could constitute a hazard to human life. The requirements and minimum standards of this Order do not apply when operating in zones where H_2S is presently known not to be present or cannot reasonably be expected to be present in concentrations of 100 parts per million (ppm) or more in the gas stream.

The requirements and minimum standards in this Order do not relieve an operator from compliance with any applicable Federal, State, or local requirement(s) regarding H_2S or SO_2 which are more stringent.
[57 FR 2039, Jan. 17, 1992]

II. Definitions

A. "Authorized officer" means any employee of the Bureau of Land Management authorized to perform the duties described in 43 CFR Groups 3000 and 3100 (3000.0-5).

B. *Christmas tree* means an assembly of valves and fittings used to control production and provide access to the producing tubing string. The assembly includes all equipment above the tubinghead top flange.

C. *Dispersion technique* means a mathematical representation of the physical and chemical transportation, dilution, and transformation of H_2S gas emitted into the atmosphere.

D. *Escape rate* means that the maximum volume (Q) used as the escape rate in determining the radius of exposure shall be that specified below, as applicable:

1. For a production facility, the escape rate shall be calculated using the maximum daily rate of gas produced through that facility or the best estimate thereof;
2. For gas wells, the escape rate shall be calculated by using the current daily absolute

open-flow rate against atmospheric pressure;

3. For oil wells, the escape rate shall be calculated by multiplying the producing gas/oil ratio by the maximum daily production rate or best estimate thereof;
4. For a well being drilled in a developed area, the escape rate may be determined by using the offset wells completed in the interval(s) in question.

E. *Essential personnel* means those on-site personnel directly associated with the operation being conducted and necessary to maintain control of the well.

F. *Exploratory well* means any well drilled beyond the known producing limits of a pool.

G. *Gas well* means a well for which the energy equivalent of the gas produced, including the entrained liquid hydrocarbons, exceeds the energy equivalent of the oil produced.

H. *H_2S Drilling Operations Plan* means a written plan which provides for safety of essential personnel and for maintaining control of the well with regard to H_2S and SO_2.

I. *Lessee* means a person or entity holding record title in a lease issued by the United States (3160.0-5).

J. *Major violation* means compliance which causes or threatens immediate. substantial, and adverse impacts on public health and safety, the environment, production accountability, or royalty income (3160.0-5).

K. *Minor violation* means noncompliance which does not rise to the level of a major violation (3160.0-5).

L. *Oil well* means a well for which the energy equivalent of the oil produced exceeds the energy equivalent of the gas produced, including the entrained liquid hydrocarbons.

M. *Operating rights owner* means a person or entity holding operating rights in a lease issued by the United States. A lessee may also be an operating rights owner if the operating rights in a lease or portion thereof have not been severed from record title (3160.0-5).

N. *Operator* means any person or entity including but not limited to the lessee or operating rights owner who has stated in writing to the authorized office, that he/she is responsible under the terms of the lease for the operations conducted on the leased lands or a portion thereof (3160.0-5).

0. *Potentially hazardous volume* means a volume of gas of such H_2S concentration and flow rate that it may result in radius of exposure-calculated ambient concentrations of 100 ppm H_2S at any occupied residence, school, church, park, school bus stop, place of business or other area where the public could reasonably be expected to frequent, or 500 ppm H_2S at any Federal, State, County or municipal road or highway.

P. *Production facilities* means any wellhead, flowline, piping, treating, or separating equipment, water disposal pits, processing plant or combination thereof prior to the approved measurement point for any lease, communitization agreement, or unit participating area.

Q. *Prompt correction* means immediate correction of violations, with operation suspended if required at the discretion of the authorized officer.

R. *Public Protection Plan* means a written plan which provides for the safety of the potentially affected public with regard to H_2S and SO_2.

S. *Radius of exposure* means the calculation resulting from using the following Pasquill-Gifford derived equation, or by such other method(s) as may be approved by the authorized

officer:

1. For determining the 100 ppm radius of exposure where the H_2S concentration in the gas stream is less than 10 percent:

   $X = [1.589)(H_2S \text{ concentration})(Q)]^{(0.6258)}$ or

2. For determining the 500 ppm radius of exposure where the H_2S concentration in the gas stream is less than 10 percent:

   $X = [(0.4546)(H_2S \text{ concentration})(Q)]^{(0.6258)}$

   Where:
   X= radius of exposure in feet:
   H_2S Concentration = decimal equivalent of the mole or volume fractions of H_2S in the gaseous mixture;
   Q= maximum volume of gas determined to be available for escape in cubic feet per day (at standard condition of 14.73 psia and 60°F).

3. For determining the 100 ppm or the 500 ppm radius of exposure in gas streams containing H_2S concentrations of 10 percent or greater, a dispersion technique that takes into account representative wind speed, direction, atmospheric stability, complex terrain, and other dispersion features shall be utilized. Such techniques may include, but shall not be limited to one of a series of computer models outlined in the Environmental Protection Agency's "Guidelines on Air Quality Models(EPA-450/2-78-027R)."

4. Where multiple H_2S sources (i.e., wells, treatment equipment, flowlines, etc.) are present, the operator may elect to utilize a radius of exposure which covers a larger area than would be calculated using radius of exposure formula for each component part of the drilling/completion/workover/ production system.

5. For a well being drilled in an area where insufficient data exits, to calculate a radius of exposure, but where H_2S could reasonably be expected to be present in concentrations in excess of 100 ppm in the gas stream, a 100 ppm radius of exposure equal to 3,000 feet shall be assumed.

T. *Zones known to contain H_2S* means geological formations in a field where prior drilling, logging, coring, testing, or producing operations have confirmed that H_2S-bearing zones will be encountered that contain 100 ppm or more of H_2S in the gas stream.

U. *Zones known not to contain H_2S* means geological formations in field where prior drilling, logging, coring, testing, or producing operations have confirmed the absence of H_2S-bearing zones that contain 100 ppm or more of H_2S in the gas stream.

V. *Zones which can reasonably be expected to contain H_2S* means geological formations in

the area which have not had prior drilling, but prior drilling to the same formations in similar field(s) within the same geologic basin indicates there is a potential for 100 ppm or more of H_2S in the gas stream.

W. *Zones which cannot reasonably be expected to contain H_2S* means geological formations in the area which have not had prior drilling, but prior drilling to the same formations in similar field(s) within the same geologic basin indicates there is not a potential for 100 ppm or more of H_2S in the gas stream.

[57 F 2039 and 2136, Jan. 17, 1992]

III. Requirements

The requirements of this Order are the minimum acceptable standards with regard to H_2S operations. This Order also classifies violations as typically major or minor for purposes of the assessment and penalty provisions of 43 CFR part 3163, specifies the corrective action which will probably be required, and establishes the normal abatement period following detection of a major or minor violation in which the violator may take such corrective action without incurring an assessment. However, the authorized officer may, after consideration of all appropriate factors, require reasonable and necessary standards, corrective actions and abatement periods that may in some cases, vary from those specified in this Order that he/she determines to be necessary to protect public health and safety, the environment, or to maintain control of a well to prevent waste of Federal mineral resources. To the extent such standards, actions or abatement periods differ from those set forth in this Order, they may be subject to review pursuant to 43 CFR 3165.3.

[57 F 2039, Jan. 17, 1992]

A. Applications, Approvals, and Reports

1. Drilling

For proposed drilling operations where formations will be penetrated which have zones known to contain or which could reasonably be expected to contain concentrations of H_2S of 100 ppm or more in the gas stream, the H_2S Drilling Operation Plan and if the applicability criteria in section III.B.1 are met, a Public Protection Plan as outlined in section III.B.2.b, shall be submitted as part of the Application for Permit to Drill (APD) (refer to Oil and Gas Order No. 1). In cases where multiple filings are being made with a single drilling plan, a single H_2S Drilling Operations Plan and, if applicable, a single Public Protection Plan may be submitted for the lease, communitization agreement, unit or field in accordance with Order No. 1. Failure to submit either the H_2S Drilling Operations Plan or the Public Protection Plan when required by this Order shall result in an incomplete APD pursuant to 43 CFR 3162.3-1.

The H_2S Drilling Operations Plan shall fully describe the manner in which the requirements and minimum standards in section III.C, shall be met and implemented. As required by this Order (section III.C.), the following must be submitted in the H_2S Drilling Operations Plan:

a. Statement that all personnel shall receive proper H_2S training in accordance, with section

III.C.3.a.

b. A legible well site diagram of accurate scale (may be included as part of the Well Site Layout as required by Onshore Order NO. 1) showing the following:
   i. Drill rig orientation
   ii. Prevailing wind direction
   iii. Terrain of surrounding area
   iv. Location of all briefing areas (designate primary briefing area)
   v. Location of access road(s) (including secondary egress)
   vi. Location of flare line(s) and pit(s)
   vii. Location of caution and/or danger signs
   viii. Location of wind direction indicators

c. As required by this Order, a complete description of the following H_2S safety equipment/systems:
   i. Well control equipment.
      - Flare line(s) and means of ignition
      - Remote controlled choke
      - Flare gun/flares
      - Mud-gas separator and rotating head (if exploratory well)
   ii. Protective equipment for essential personnel.
      - Location, type, storage and maintenance of all working and escape breathing apparatus
      - Means of communication when using protective breathing apparatus
   iii. H_2S detection and monitoring equipment.
      - H_2S sensors and associated audible/visual alarm(s)
      - Portable H_2S and SO_2 monitor(s)
   iv. Visual warning systems.
      - Wind direction indicators
      - Caution/danger sign(s) and flag(s)
   v. Mud program.
      - Mud system and additives
      - Mud degassing system
   vi. Metallurgy.
      - Metallurgical properties of all tubular goods and well control equipment which could be exposed to H_2S (section III.C.4.c.)
   vii. Means of communication from wellsite.

d. Plans for well testing.
[57 F 2039, Jan. 17, 1992]

2. Production

a. For each existing production facility having an H_2S concentration of 100 ppm or more in

the gas stream, the operator shall calculate and submit the calculations to the authorized officer within 180 days of the effective date of this Order, the 100 and, if applicable, the 500 ppm radii of exposure for all facilities to determine if the applicability criteria section III.B.1. of this order are met. Radii of exposure calculations shall not be required for oil or water flowlines. Further, if any of the applicability criteria (section III.B.1.) are met, the operator shall submit a complete Public Protection Plan which meets the requirements of section III.B.2.b. to the authorized officer within 1 year of the effective date of this Order. For production facilities constructed after the effective date of this Order and meeting the above minimum concentration (100 ppm in gas stream), the operator shall report the radii of exposure calculations, and if the applicability criteria (section III.B.1) are met, submit a complete Public Protection Plan (section III.B.2.b.) to the authorized officer within 60 days after completion of production facilities.

Violation: Minor for failure to submit required information.
Corrective Action: Submit required information (radii of exposure and/or complete Public Protection Plan).
Normal Abatement Period: 20 to 40 days.

b. The operator shall initially test the H_2S concentration of the gas stream for each well or production facility and shall make the results available to the authorized officer, upon request.

Violation: Minor.
Corrective Action: Test gas from well or production facility.
Normal Abatement Period: 20 to 40 days.

c. If operational or production alterations result in a 5% or more increase in the H_2S concentration (i.e., well recompletion, increased GOR's) or the radius of exposure as calculated under sections III.A.2.a., notification of such changes shall be submitted to the authorized officer within 60 days after identification of the change.

Violation: Minor.
Corrective Action: Submit information to authorized officer.
Normal Abatement Period: 20 to 40 days.
[57 F 2039, Jan. 17, 1992]

3. Plans and Reports

a. H_2S Drilling Operations Plan(s) or Public Protection Plan(s) shall be reviewed by the operator on an annual basis and a copy of any necessary revisions shall be submitted to the authorized officer upon request.

Violation: Minor.
Corrective Action: Submit information to authorized officer.
Normal Abatement Period: 20 to 40 days.

b. Any release of a potentially hazardous volume of H_2S shall be reported to the authorized officer as soon as practicable, but no later than 24 hours following identification of the release.

Violation: Minor.

Corrective Action: Report undesirable event to the authorized officer.
Normal Abatement Period: 24 hours.

B. Public Protection

1. Applicability Criteria

For both drilling/completion/ workover and production operations, the H_2S radius of exposure shall be determined on all wells and production facilities subject to this Order. A Public Protection Plan (Section III.B.2) shall be required when any of the following conditions apply:

a. The 100 ppm radius of exposure is greater than 50 feet and includes any occupied residence, school, church, park, school bus stop, place of business, or other areas where the public could reasonably be expected to frequent;
b. The 500 ppm radius of exposure is greater than 50 feet and includes any part of a Federal, State, County, or municipal road or highway owned and principally maintained for public use; or
c. The 100 ppm radius of exposure is equal to or greater than 3,000 feet where facilities or roads are principally maintained for public use. Additional specific requirements for drilling/completion/workover or producing operations are described in sections III.C. and III.D. of this Order, respectively.

[57 F 2039, Jan. 17, 1992]

2. Public Protection Plan

a. Plan Submission/Implementation/Availability —

i. A Public Protection Plan providing details of actions to alert and protect the public in the event of a release of a potentially hazardous volume of H_2S shall be submitted to the authorized officer as required by Section III.A.1. for drilling or by section III.A.2.a. for producing operations when the applicability criteria established in section III.B.1. of this Order are met. One plan may be submitted for each well, lease, communitization agreement, unit, or field, at the operator's discretion. The Public Protection Plan shall be maintained and updated, in accordance with section III.A.3.a.
ii. The Public Protection Plan shall be activated immediately upon detection of release of a potentially hazardous volume of H_2S.

Violation: Major.
Corrective Action: Immediate implementation of the public protection plan.
Normal Abatement Period: Prompt correction required.

iii. A copy of the Public Protection Plan shall be available at the drilling/completion site for such wells and at the facility, field office, or with the pumper, as appropriate, for producing wells, facilities, and during workover operations.

Violation: Minor.

Corrective Action: Make copy of Plan available.
Normal Abatement Period: 24 hours (drilling/completion/workover), 5 to 7 days (production).

b. Plan Content.

i. The details of the Public Protection Plan may vary according to the site specific characteristics (concentration, volume, terrain, etc.) expected to be encountered and the number and proximity of the population potentially at risk. In the areas of high population density or in other special cases, the authorized officer my require more stringent plans to be developed. These may include public education seminars, mass alert systems, and use of sirens, telephone, radio, and television depending on the number of people at risk and their location with respect to the well site.

ii. The Public Protection Plan shall include:

(a) The responsibilities and duties of key personnel, and instructions for alerting the public and requesting assistance;

(b) A list of names and telephone numbers of residents, those responsible for safety of public roadways, and individuals responsible for the safety of occupants of buildings within the 100 ppm radius of exposure (e.g. school principals, building managers, etc.) as defined by the applicability criteria in section III.B.1. The operator shall ensure that those who are at the greatest risk are notified first. The Plan shall define when and how people are to be notified in case an H_2S emergency;

(c) A telephone call list (including telephone numbers) for requesting assistance from law enforcement, fire department, and medical personnel and Federal and State regulatory agencies, as required. Necessary information to be communicated and the emergency responses that may be required shall be listed. This information shall be based on previous contacts with these organizations;

(d) A legible 100 ppm (or 3,000 feet, if conditions unknown) radius plat of all private and public dwellings, schools, roads, recreational areas, and other areas where the public might reasonably be expected to frequent;

(e) Advance briefings, by visit, meeting or letter to the people identified in section III.B.2.b.ii(b), including:
- Hazards of H_2S and SO_2;
- Necessity for an emergency action plan;
- Possible sources of H_2S and $S0_2$;
- Instructions for reporting a leak to the operator;
- The manner in which the public shall be notified of an emergency; and
- Steps to be taken in case of an emergency, including evacuation of any people;

(f) Guidelines for the ignition of the H_2S–bearing gas. The Plan shall designate the title or position of the person(s) who has the authority to ignite the escaping gas and define when, how, and by whom the gas is the be ignited;

(g) Additional measures necessary following the release of H_2S and SO_2 until the release is contained are as follows:

– Monitoring of H_2S and SO_2 levels and wind direction in the affected area;
– Maintenance of site security and access control;
– Other necessary measures as required by the authorized officer; and

(h) For production facilities, a description of the detection system(s) utilized to determine the concentration of H_2S released.

C. Drilling/Completion/Workover Requirements

1. General

a. A copy of the H_2S Drilling Operations Plan shall be available during operations at the well site beginning when the operation is subject to the terms of this Order (i.e., 3 days or 500 feet of known or probable H_2S zone).

Violation: Minor.
Corrective Action: Make copy of Plan available.
Normal Abatement Period: 24 hours.

b. Initial H_2S training shall be completed and all H_2S related safety equipment shall be installed, tested, and operational when drilling reaches a depth of 500 feet above, or 3 days prior to penetrating (whichever comes first) the first zone containing or reasonably expected to contain H_2S. A specific H_2S operations plan for completion and workover operations will not be required for approval. For completion and workover operations, all required equipment and warning systems shall be operational and training completed prior to commencing operations.

Violation: Major.
Corrective Action: Implement H_2S operational requirements, such as completion of training and/or installation, repair, or replacement of equipment, as necessary.
Normal Abatement period: Prompt correction required.

c. If H_2S was not anticipated at the time the APD was approved, but is encountered in excess of 100 ppm in the gas stream, the following measures shall be taken:

i. the operator shall immediately ensure control of the well, suspend drilling ahead operations (unless detrimental to well control), and obtain materials and safety equipment to bring the operations into compliance with of applicable provisions of this Order.

Violation: Major.
Corrective Action: Implement H_2S operational requirements, as applicable.
Normal Abatement Period: Prompt correction required.

ii. The operator shall notify the authorized officer of the event and the mitigating steps that have or are being taken as soon as possible, but no later than the next business day. If said notification is subsequent to actual resumption of drilling operations, the operator shall notify the authorized officer of the date that drilling was resumed no later than the next business day.

Violation: Minor.
Corrective Action: Notify authorized officer.
Normal Abatement Period: 24 hours.

iii. It is the operator's responsibility to ensure that the applicable requirements of this Order have been met prior to the resumption of drilling ahead operations. Drilling ahead operations will not be suspended pending receipt of a written H_2S Drilling Operations Plan(s) and, if necessary, Public Protection Plan(s) provided that complete copies of the applicable Plan(s) are filed with the authorized officer for approval within 5 business days following resumption of drilling ahead operations.

Violation: Minor.
Corrective Action: Submit plans to authorization officer.
Normal Abatement Period: 5 days.
[57 F 2039, Jan. 17, 1992]

2. Locations.

a. Where practical, 2 roads shall be established, 1 at each end of the location, or as dictated by prevailing winds and terrain. If an alternate road is not practical, a clearly marked footpath shall be provided to a safe area. The purpose of such an alternate escape route is only to provide a means of egress to a safe area.

Violation: Minor.
Corrective Action: Designate or establish an alternate escape route.
Normal Abatement Period: 24 hours.

b. The alternate escape route shall be kept passable at all times.

Violation: Minor.
Corrective Action: Make alternate escape route passable.
Normal Abatement Period: 24 hours.

c. For workovers, a secondary means of egress shall be designated.

Violation: Minor.
Corrective Action: Designate secondary means of egress.
Normal Abatement Period: 24 hours.

3. Personnel Protection

a. Training Program. The operator shall ensure that all personnel who will be working at the wellsite will be properly trained in H_2S drilling and contingency procedures in accordance with the general training requirements outlined in the American Petroleum Institute's (API) Recommended Practice (RP) 49 (April 15, 1987 or subsequent editions) for Safe Drilling of Wells Containing Hydrogen Sulfide, Section 2. The operator also shall ensure that the training will be accomplished prior to a well coming under the terms of this Order (i.e., 3 days or 500 feet of known or probable H_2S zone). In addition to the requirements of API RP-49, a minimum of an

initial training session and weekly H_2S and well control drills for all personnel in each working crew shall be conducted. The initial training session for each well shall include a review of the site specific Drilling Operations Plan and, if applicable, the Public Protection Plan.

Violation: Major.
Corrective Action: Train all personnel and conduct drills.
Normal Abatement Period: Prompt correction required.

i. All training sessions and drills shall be recorded on the driller's log or its equivalent.

Violation: Minor.
Corrective Action: Record on driller's log or equivalent.
Normal Abatement Period: 24 hours.

ii. For drilling/completion/workover wells, at least 2 briefing areas shall be designated for assembly of personnel during emergency conditions, located a minimum of 150 feet from the well bore and 1 of the briefing areas shall be upwind of the well at all times. The briefing area located most normally upwind shall be designated as the "Primary Briefing Area."

Violation: Major.
Corrective Action: Designate briefing areas.
Normal Abatement Period: 24 hours.

iii. One person (by job title) shall be designated and identified to all on-site personnel as the person primarily responsible for the overall operation of the on-site safety and training programs.

Violation: Minor.
Corrective Action: Designate safety responsibilities.
Normal Abatement Period: 24 hours.
[57 F 2039, Jan. 17, 1992]

b. Protective Equipment:

i. The operator shall ensure that proper respiratory protection equipment program is implemented, in accordance with the current American National Standards institute (ANSI) Standard Z.88.2-1980 *"Practices for Respiratory Protection."* Proper protective breathing apparatus shall be readily accessible to all essential personnel on a drilling/completion/workover site. Escape and pressure-demand type working equipment shall be provided for essential personnel in the H_2S environment to maintain or regain control of the well. For pressure-demand type working equipment those essential personnel shall be able to obtain a continuous seal to the face with the equipment. The operator shall ensure that service companies have the proper respiratory protection equipment when called to the location. Lightweight, escape-type, self-contained breathing apparatus with a minimum of 5-minute rated supply shall be readily accessible at a location for the derrickman and at any other location(s) where escape from an H_2S contaminated atmosphere would be difficult.

Violation: Major.
Correction Action: Acquire, repair, or replace equipment, as necessary.

Normal Abatement Period: Prompt correction required.

ii. Storage and maintenance of protective breathing apparatus shall be planned to ensure that at least 1 working apparatus per person is readily available for all essential personnel.

Violation: Major.

Corrective Action: Acquire or rearrange equipment, as necessary.

Normal Abatement Period: Prompt correction required.

iii. The following additional safety equipment shall be available for use:

(a) Effective means of communication when using protective breathing apparatus;

(b) Flare gun and flares to ignite the well;

(c) Telephone, radio, mobile phone, or any other device that provides communication from a safe area at the rig location, where practical.

Violation: Major.

Corrective Action: Acquire, repair, or replace equipment.

Normal Abatement Period: 24 hours.

[57 F 2136, Jan. 17, 1992]

c. H_2S Detection and Monitoring Equipment.

i. Each drilling/completion site shall have an H_2S detection and monitoring system that automatically activates visible and audible alarms when the ambient air concentration of H_2S reaches the threshold limits of 10 and 15 ppm in air, respectively. The sensors shall have a rapid response time and be capable of sensing a minimum of 10 ppm of H_2S in ambient air, with at least 3 sensing points located at the shale shaker, rig floor, and bell nipple for a drilling site and the cellar, rig floor, and circulating tanks or shale shaker for a completion site. The detection system shall be installed, calibrated, tested, and maintained in accordance with the manufacturer's recommendations.

Violation: Major.

Corrective Action: Install, repair, calibrate, or replace equipment, as necessary.

Normal Abatement Period: Prompt correction required.

ii. All tests of the H_2S monitoring system shall be recorded on the driller's log or its equivalent.

Violation: Minor.

Corrective Action: Record on driller's log or equivalent.

Normal Abatement Period: 24 hours.

iii. For workover operations, 1 operational sensing point shall be located as close to the wellbore as practical. Additional sensing points may be necessary for large and/or long-term operations.

Violation: Major.

Corrective Action: Install, repair. calibrate, or replace equipment, as necessary.

Normal Abatement Period: Prompt correction required.

[57 F 2039, Jan. 17, 1992]

d. Visible Warning System.

i. Equipment to indicate wind direction at times shall be installed at prominent locations and shall be visible at all times during drilling operations. At least 2 such wind direction indicators (i.e., windsocks, windvanes, pennants with tailstreamers, etc.) shall be located at separate elevations (i.e., near ground level, rig floor, and/or treetop height). At least 1 wind direction indicator shall be clearly visible from all principal working areas at all times so that wind direction can be easily determined. For completion/workover operations, 1 wind direction indicator shall suffice, provided it is visible from all principal working areas on the location. In addition, a wind direction indicator at each of the 2 briefing areas shall be provided if the wind direction indicator(s) previously required in this paragraph are not visible from the briefing areas.

Violation: Minor.
Corrective Action: Install, repair, move, or replace wind direction indicator(s), as necessary.
Normal Abatement Period: 24 hours.

ii. At any time when the terms of this Order are in effect, operational danger or caution sign(s) shall be displayed along all controlled accesses to the site.

Violation: Minor.
Corrective Action: Erect appropriate signs.
Normal Abatement Period: 24 hours.

iii. Each sign shall be painted a high visibility red, black and white, or yellow with black lettering.

Violation: Minor.
Corrective Action: Replace or alter sign, as necessary.
Normal Abatement Period: 5 to 20 days.

iv. The sign(s) shall be legible and large enough to be read by all persons entering the well site and be placed a minimum of 200 feet but no more than 500 feet from the well site and at a location which allows vehicles to turn around at a safe distance prior to reaching the site.

Violation: Major.
Corrective Action: Replace, alter, or move sign, as necessary.
Normal Abatement Period: 24 hours.

v. The sign(s) shall read:

DANGER – POISON GAS – HYDROGEN SULFIDE

and in smaller lettering:

Do Not Approach If Red Flag is Flying or equivalent language if approved by the authorized officer.

Where appropriate, bilingual or multilingual danger sign(s) shall be used.

Violation: Minor.
Corrective Action: Replace or alter sign, as necessary.
Normal Abatement Period: 5 to 20 days.

vi. All sign(s) and, when appropriate, flag(s) shall be visible to all personnel approaching the location under normal lighting and weather conditions.

Violation: Major.
Corrective Action: Erect or move sign(s) and/or flag(s), as necessary.
Normal Abatement Period: 24 hours.

vii. When H_2S is detected in excess of 10 ppm at any detection point, red flag(s) shall be displayed.

Violation: Major.
Corrective Action: Display red flag.
Normal Abatement Period: Prompt correction required.
[57 F 2039, Jan. 17, 1992]

e. *Warning System Response.* When H_2S is detected in excess of 10 ppm at any detection point, all non-essential personnel shall be moved to a safe area and essential personnel (i.e., those necessary to maintain control of the well) shall wear pressure-demand type protective breathing apparatus. Once accomplished, operations may proceed.

Violation: Major.
Corrective Action: Move non-essential personnel to safe area and mask-up essential personnel.
Normal Abatement Period: Prompt correction required.
[57 F 2039, Jan.17, 1992]

4. Operating Procedures and Equipment

a. *General/Operations.* Drilling/completion/workover operations in H_2S areas shall be subject to the following requirements:

i. If zones containing in excess of 100 ppm of H_2S gas are encountered while drilling with air, gas, mist, other nonmud circulating mediums or aerated mud, the well shall be killed with a water- or oil-based mud and mud shall be used thereafter as the circulating medium for continued drilling.

Violation: Major.
Corrective Action: Convert to appropriate fluid medium.
Normal Abatement Period: Prompt correction required.

ii. A flare system shall be designed and installed to safely gather and burn H_2S-bearing gas.

Violation: Major.
Corrective Action: Install flare system.
Normal Abatement Period: Prompt correction required.

iii. Flare lines shall be located as far from the operating site as feasible and in a manner to compensate for wind changes. The flare line(s) mouth(s) shall be located not less than 150 feet from the wellbore unless other-wise approved by the authorized officer. Flare lines shall be straight unless targeted with running tees.

Violation: Minor.
Corrective Action: Adjust flare line(s) as necessary.
Normal Abatement Period: 24 hours.

iv. The flare system shall be equipped with a suitable and safe means of ignition.

Violation: Major.
Corrective Action: Install, repair, or replace equipment, as necessary.
Normal Abatement Period: 24 hours.

v. Where noncombustible gas is to be flared, the system shall be provided supplemental fuel to maintain ignition.

Violation: Major.
Corrective Action: Acquire supplemental fuel.
Normal Abatement Period: 24 hours.

vi. At any wellsite where SO_2, may be released as a result of flaring of H_2S during drilling, completion, or workover operations, the operator shall make SO_2, portable detection equipment available for checking the SO_2 level in the flare impact area.

Violation: Minor.
Corrective Action: Acquire, repair, or replace equipment as necessary.
Normal Abatement Period: 24 hours to 3 days.

vii. If the flare impact area reaches a sustained ambient threshold level of 2 ppm or greater of SO_2 in air and includes any occupied residence, school, church. park, or place of business, or other area where the public could reasonably be expected to frequent, the Public Protection Plan shall be implemented.

Violation: Major.
Corrective Action: Contain SO_2 release and/or implement Public Protection Plan.
Normal Abatement Period: Prompt correction required.

viii. A remote controlled choke shall be installed for all H_2S drilling and, where feasible, for completion operations. A remote controlled valve may be used in lieu of this requirement for completion operations.

Violation: Major.
Corrective Action: Install, repair, or replace equipment, as necessary.
Normal Abatement Period: Prompt correction required.

ix. Mud-gas separators and rotating heads shall be installed and operable for all exploratory wells.

Violation: Major.
Corrective Action: Install, repair, or replace equipment, as necessary.
Normal Abatement Period: Prompt correction required.

[57 F 2039, Jan. 17, 1992]

b. Mud Program.

i. A pH of 10 or above in a fresh water-base mud system shall be maintained to control corrosion, H_2S gas returns to surface, and minimize sulfide stress cracking and embrittlement unless other formation conditions or mud types justify to the authorized officer a lesser pH level is necessary.

Violation: Major.
Corrective Action: Adjust pH.
Normal Abatement Period: Prompt correction required.

ii. Drilling mud containing H_2S gas shall be degassed in accordance with API's RP-49, §5.14, at an optimum location for the rig configuration. These gases shall be piped into the flare system.

Violation: Major.
Corrective Action: Install, repair, or replace equipment. as necessary.
Normal Abatement Period: 24 hours.

iii. Sufficient quantities of mud additives shall be maintained on location to scavenge and/or neutralize H_2S where formation pressures are unknown.

Violation: Major.
Corrective Action: Obtain proper mud additives.
Normal Abatement Period: 24 hours.

[57 F 2039, Jan. 17, 1992]

c. *Metallurgical Equipment.* All equipment that has the potential to be exposed to H_2S shall be suitable for H_2S service. Equipment which shall meet these metallurgical standards include the drill string, casing, wellhead, blowout preventer assembly, casing head and spool, rotating head, kill lines, choke, choke manifold and lines, valves, mud-gas separators, drill-stem test tools, test units, tubing, flanges, and other related equipment.

To minimize stress corrosion cracking and/or H_2S embrittlement, the equipment shall be constructed of material whose metallurgical properties are chosen with consideration for both an H_2S working environment and the anticipated stress. The metallurgical properties of the materials used shall conform to the current National Association of Corrosion Engineers (NACE) Standard MR 0175-90, *Material Requirement, Sulfide Stress Cracking Resistant Metallic Material for Oil Field Equipment.* These metallurgical properties include the grade of steel, the processing method (rolled, normalized, tempered, and/or quenched), and the resulting strength properties. The working environment considerations include the H_2S concentrations the well fluid pH, and the wellbore pressures and temperatures. Elastomers, packing, and similar inner parts exposed to H_2S shall be resistant at the maximum anticipated temperature of exposure. The manufacturer's verification of design for use in an H_2S environment shall be sufficient verification of suitable service in accordance with this Order.

Violation: Major.
Corrective Action: Install, repair, or replace appropriate equipment, as necessary.
Normal Abatement Period: Prompt correction required.

[57 F 2039, Jan. 17, 1992]

d. Well Testing in an H_2S Environment. Testing shall be performed with a minimum

number of personnel in the immediate vicinity which are necessary to safely and adequately operate the test equipment. Except with prior approval by the authorized officer, the drill-stem testing of H_2S zones shall be conducted only during daylight hours and formation fluids shall not be flowed to the surface (closed chamber only).

Violation:	Major
Corrective Action:	Terminate the well test.
Normal Abatement Period:	Prompt correction required.

D. Production Requirements

1. General

a. All existing production facilities which do not currently meet the requirements and minimum standards set forth in this section shall be brought into conformance within 1 year after the effective date of this Order. All existing equipment that is in a safe working condition as of the effective date of this Order is specifically exempt from the metallurgical requirements prescribed in section III D.3.g.

Violation:	Minor.
Corrective Action:	Bring facility into compliance.
Normal Abatement Period:	60 days.

b. Production facilities constructed after the effective date of this Order shall be designed, constructed, and operated to meet the requirements and minimum standards set forth in this section. Any variations from the standards or established time frames shall be approved by the authorized officer in accordance with the provisions of section IV, of this Order. Except for storage tanks, a determination of the radius of exposure for all production facilities shall be made in the manner prescribed in section II.S. of this Order.

Violation:	Minor.
Corrective Action:	Bring facility into compliance.
Normal Abatement Period:	60 days.

c. At any production facility or storage tank(s) where the sustained ambient H_2S concentration is in excess of 10 ppm at 50 feet from the production facility or storage tank(s) as measured at ground level under calm (1 mph) conditions, the operator shall collect or reduce vapors from the system and they shall be sold, beneficially used, reinjected, or flared provided terrain and conditions permit.

Violation:	Major, if the authorized officer determines that a health or safety problem to the public is imminent, otherwise minor.
Corrective Action:	Bring facility into compliance.
Normal Abatement Period:	3 days for major, 30 days for minor.

[57 F 2039, Jan. 17, 1992)

2. Storage Tanks.

Storage tanks containing produced fluids and utilized as part of a production operation and operated at or near atmospheric pressure, where the vapor accumulation has an H_2S concentration in excess of 500 ppm in the tank, shall be subject to the following:

a. No determination of a radius of exposure need be made for storage tanks.

b. All stairs/ladders leading to the top of storage tanks shall be chained and/or marked to restrict entry. For any storage, tank(s) which require fencing (Section III.D.2.f.), a danger sign posted at the gate(s) shall suffice in lieu of this requirement.

Violation: Minor.
Corrective Action: Chain or mark stair(s)/ladder(s) or post sign, as necessary.
Normal Abatement Period: 5 to 20 days.

c. A danger sign shall be posted on or within 50 feet of the storage tank(s) to alert the public of the potential H_2S danger. For any storage tank(s) which require fencing (section III.D.2.f.), a danger sign posted at the locked gate(s) shall suffice in lieu of this requirement.

Violation: Minor.
Corrective Action: Post or move sign(s), as necessary.
Normal Abatement Period: 5 to 20 days.

d. The sign(s) shall be painted in high visibility red. black, and white. The sign(s) shall read:

DANGER – POISON GAS – HYDROGEN SULFIDE

or equivalent language if approved by the authorized officer. Where appropriate, bilingual or multilingual warning signs shall be used.

Violation: Minor.
Corrective Action: Post, move, replace, or alter sign(s). as necessary.
Normal Abatement Period: 20 to 40 days.

e. At least 1 permanent wind direction indicator shall be installed so that wind direction can be easily determined at or approaching the storage tank(s).

Violation: Minor.
Corrective Action: Install, repair, or replace wind direction indicator, as necessary.
Normal Abatement Period: 20 to 40 days.

f. A minimum 5-foot chain-link, strand barbed wire, or comparable type fence and gate(s) that restrict(s) public access shall be required when storage tanks are located within 1/4 mile of or contained inside a city or incorporated limits of a town or within 1/4 mile of an occupied residence, school, church, park, playground, school bus stop, place of business, or where the public could reasonably be expected to frequent.

Violation: Minor.

Corrective Action: Install, repair, or replace fence and/or gate(s), as necessary.
Normal Abatement Period. 20 to 40 days.
[57 F 2136, Jan. 17, 1992]

g. Gate(s), as required by section III.D.2.f. shall be locked when unattended by the operator.

Violation: Minor.
Corrective Action: Lock gate.
Normal Abatement Period: 24 hours.
[57 FR 2136, Jan. 17, 1992]

3. Production Facilities

Production facilities containing 100 ppm or more of H_2S in the gas stream shall be subject to the following:

a. Danger signs as specified in section III.D.2.d. of this Order shall be posted on or within 50 feet of each production facility to alert the public of the potential H_2S danger. In the event the storage tanks and production facilities are located at the same site. 1 such danger sign shall suffice. Further, for any facilities which require fencing (section III.D.2.f.). 1 such danger sign at the gate(s) shall suffice in lieu of this requirement.

Violation: Minor.
Corrective Action: Post, move, or alter sign(s), as necessary.
Normal Abatement Period: 5 to 20 days.

b. Danger signs, as specified in section III.D.2.d. of this Order, shall be required for well flowlines and lease gathering lines that carry H_2S gas. Placement shall be where said lines cross public or lease roads. The signs shall be legible and shall contain sufficient additional information to permit a determination of the owner of the line.

Violation: Minor.
Corrective Action: Post, move, or alter sign(s), as necessary.
Normal Abatement Period: 5 to 20 days.

c. Fencing and gate(s), as specified in section III.D.2.f., shall be required when production facilities are located within 1/4 mile of or contained inside a city or incorporated limits of a town or within 1/4 mile of an occupied residence, school, church, park, playground, school bus stop, place of business, or any other area where the public could reasonably be expected to frequent. Flowlines are exempted from this additional fencing requirement.

Violation: Minor.
Corrective Action: Install, repair, or replace fence, and/or gate(s), as necessary.
Normal Abatement Period: 20 to 40 days.
[57 F 2039, Jan. 17, 1992]

d. Gate(s), as required by section III.D.3.c. shall be locked when unattended by the operator.

Violation: Minor.
Corrective Action: Lock gate.
Normal Abatement Period: 24 hours.

e. Wind direction indicator(s) as specified in section III.D.2.e. of this Order shall be required. In the event the storage tanks and production facilities are located at the same site, 1 such indicator shall suffice. Flowlines are exempt from this requirement.

Violation: Minor.
Corrective Action: Install, repair, or replace wind direction indicator(s), as necessary.
Normal Abatement Period: 20 to 40 days.

f. All wells, unless produced by artificial lift, shall possess a secondary means of immediate well control through the use of appropriate christmas tree and/or downhole completion equipment. Such equipment shall allow downhole accessibility (reentry) under pressure for permanent well control operations. If the applicability criteria stated in Section III.B.1. of this Order are met, a minimum of 2 master valves shall be installed.

Violation: Minor.
Corrective Action: Install, repair, or replace wind direction indicator(s), as necessary.
Normal Abatement Period: 20 to 40 days.

g. All equipment shall be chosen with consideration for both the H_2S working environment and anticipated stresses. NACE Standard MR 0175-90 shall be used for metallic equipment selection and, if applicable, adequate protection by chemical inhibition or other such method that controls or limits the corrosive effects of H_2S shall be used.

Violation: Minor.
Corrective Action: Install, repair, or replace equipment, as necessary.
Normal Abatement Period: 20 to 40 days.
[57 F 2039, Jan. 17, 1992]

h. Where the 100 ppm radius of exposure for H_2S includes any occupied residence, place of business, school, or other inhabited structure or any area where the public may reasonably be expected to frequent, the operator shall install automatic safety valves or shutdowns at the wellhead, or other appropriate shut-in controls for wells equipped with artificial lift.

Violation: Minor.
Corrective Action: Install. repair, or replace equipment as necessary.
Normal Abatement Period: 20 to 40 days.

i. The automatic safety valves or shutdowns, as required by section III.D.3.h. shall be set to activate upon a release of a potentially hazardous volume of H_2S.

Violation: Major.
Corrective Action: Repair, replace or adjust equipment, as necessary.
Normal Abatement Period: Prompt correction required.

j. If the sustained ambient concentration of H_2S or SO_2 from a production facility which is venting or flaring reaches a concentration of H_2S (10 ppm) or SO_2 (2 ppm), respectively, at any of the following locations, the operator shall modify the production facility as approved by the authorized officer. The locations include any occupied residence, school, church, park. playground, school bus stop, place of business, or other areas where the public could reasonably be expected to frequent.

Violation: Major.
Corrective Action: Repair facility to bring into compliance.
Normal Abatement Period: Prompt correction required.

4. Public Protection.

When conditions as defined in section III.B.1. of this Order exist, a Public Protection Plan for producing operations shall be submitted to the authorized officer in accordance with section III.B.2.a. of this Order which includes the provisions of section III.B.2.b.

Violation: Minor.
Corrective Action: Submit Public Protection Plan.
Normal Abatement Period: 20 to 40 days.

IV. Variances from Requirements

An operator may request the authorized officer to approve a variance from any of the requirements prescribed in section III hereof. All such requests shall be submitted in writing to the appropriate authorized officer and provide information as to the circumstances which warrant approval of the variance(s) requested and the proposed alternative methods by which the related requirement(s) of minimum standard(s) are to be satisfied. The authorized officer, after considering all relevant factors, may approve the requested variance(s) if it is determined that the proposed alterative(s) meets or exceeds the objectives of the applicable requirement(s) or minimum standard(s).