

# Hydrogen Sulfide: Issues and Answers Workshop

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# New Mexico Oil Conservation Division Rule 118

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- <http://www.emnrd.state.nm.us/emnrd/ocd/Rules.htm>

# New Mexico Oil Conservation Division Rule 118

- Regulatory Threshold.
  - Determination of Hydrogen Sulfide Concentration.
  - Testing, using a sample from each well, facility or operation
  - Testing a representative sample, or
  - Using process knowledge in lieu of testing.
  - Must be reasonably representative of the hydrogen sulfide concentration

# New Mexico Oil Conservation Division Rule 118

- Regulatory Threshold (cont'd)
  - The tests used to make the determination shall be conducted in accordance with applicable ASTM or GPA standards or by another method approved by the division.

# New Mexico Oil Conservation Division Rule 118

- Regulatory Threshold (cont'd)
  - If the concentration of hydrogen sulfide in a given well, facility or operation is less than 100 ppm, no further actions shall be required

# New Mexico Oil Conservation Division Rule 118

- Regulatory Threshold (cont'd)
  - If the concentration of hydrogen sulfide in a given well, facility or operation is determined to be 100 ppm or greater, then the person, operator or facility must calculate the radius of exposure

# New Mexico Oil Conservation Division Rule 118

- **Radius of Exposure.** The **radius of exposure** is that radius constructed with the point of escape as its starting point and its length calculated using the following Pasquill-Gifford derived equation, or by such other method as may be approved by the division:

# New Mexico Oil Conservation Division Rule 118

- **Escape Rate.** The "escape rate" is the maximum volume (**Q**) that is used to designate the possible rate of escape of a gaseous mixture containing hydrogen sulfide, as set forth herein.

# New Mexico Oil Conservation Division Rule 118

- For existing gas facilities or operations, the **escape rate** shall be calculated using the maximum daily rate of the gaseous mixture produced or handled or the best estimate thereof. For an existing gas well, the **escape rate** shall be calculated using the current daily absolute open flow rate against atmospheric pressure or the best estimate of that rate.

# New Mexico Oil Conservation Division Rule 118

- For new gas operations or facilities, the **escape rate** shall be calculated as the maximum anticipated flow rate through the system. For a new gas well, the **escape rate** shall be calculated using the maximum open-flow rate of offset wells in the pool or reservoir, or the pool or reservoir average of maximum open-flow rates.

# New Mexico Oil Conservation Division Rule 118

- For **existing** oil wells, the **escape rate** shall be calculated by multiplying the producing gas/oil ratio by the maximum daily production rate or the best estimate thereof.
- For **new** oil wells, the **escape rate** shall be calculated by multiplying the producing gas/oil ratio by the maximum daily production rate of offset wells in the pool or reservoir, or the pool or reservoir average of the producing gas/oil ratio multiplied by the maximum daily production rate.

# New Mexico Oil Conservation Division Rule 118

- For facilities or operations not mentioned, the **escape rate** shall be calculated using the actual flow of the gaseous mixture through the system or the best estimate thereof.

# New Mexico Oil Conservation Division Rule 118

- For determining the 100-ppm **radius of exposure**:  $ROE = [(1.589)(H_2S \text{ concentration})(\text{escape rate})]^{(0.6258)}$

$H_2S$  concentration is the decimal equivalent of the mole or volume fraction of hydrogen sulfide in the gaseous mixture,

**escape rate** is expressed in cubic feet per day (corrected for standard conditions of 14.73 psia and 60 degrees F).

# New Mexico Oil Conservation Division Rule 118

- For determining the 500-ppm **radius of exposure**  $ROE = [(0.4546)(H_2S \text{ concentration})(\text{escape rate})]^{(0.6258)}$

$H_2S$  concentration is the decimal equivalent of the mole or volume fraction of hydrogen sulfide in the gaseous mixture

**escape rate** is expressed in cubic feet per day (corrected for standard conditions of 14.73 psia and 60 degrees F).

# New Mexico Oil Conservation Division Rule 118

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

# New Mexico Oil Conservation Division Rule 118

- **Potentially Hazardous Volume** means the volume of hydrogen sulfide gas of such concentration that:
- the 100-ppm radius of exposure includes any public area;
- the 500-ppm radius of exposure includes any public road; or
- the 100-ppm radius of exposure exceeds 3,000 feet.

# New Mexico Oil Conservation Division Rule 118

- Public Area. A "public area" is any building or structure that is not associated with the well, facility or operation for which the radius of exposure is being calculated and that is used as a dwelling, office, place of business, church, school, hospital, or government building, or any portion of a park, city, town, village or designated school bus stop or other similar area where members of the public may reasonably be expected to be present.

# New Mexico Oil Conservation Division Rule 118

- Public Road. A "public road" is any federal, state, municipal or county road or highway.

# New Mexico Oil Conservation Division Rule 118

- If calculation of the radius of exposure reveals that a potentially hazardous volume is present,
  - Determination of the hydrogen sulfide concentration and the calculation of the radius of exposure shall be provided to the division.
    - For facilities existing on the effective date of this section, (1/31/03) the determination, calculation and submission required herein shall be accomplished within 180 days of the effective date of this section;
    - For facilities that commence operations after the effective date of this section, (1/31/03) the determination, calculation and submission required herein shall be accomplished before operations begin.

# New Mexico Oil Conservation Division Rule 118

- Recalculation is required if:
  - The hydrogen sulfide concentration in a well, facility or operation increases to 100 ppm or greater.
  - The actual volume fraction of hydrogen sulfide increases by a factor of twenty-five percent in a well, facility or operation that previously had a hydrogen sulfide concentration of 100 ppm or greater. If calculation or recalculation of the radius of exposure reveals that a potentially hazardous volume is present, the results shall be provided to the division within sixty (60) days.

# New Mexico Oil Conservation Division Rule 118

- Hydrogen Sulfide Contingency Plan.
  - If a well, facility or operation involves a potentially hazardous volume of hydrogen sulfide, a hydrogen sulfide contingency plan that will be used to alert and protect the public must be developed in accordance with the following paragraphs.

# New Mexico Oil Conservation Division Rule 118

- Required Contingency Plan Contents
  - Emergency procedures.
  - Characteristics of hydrogen sulfide and sulfur dioxide
  - Maps and drawings
  - Training and Drills
  - Coordination with State Emergency Plans
  - Activation Levels

# New Mexico Oil Conservation Division Rule 118

- Plan Activation.
  - At a minimum, the plan must be activated whenever a release may create a concentration of hydrogen sulfide of more than 100 ppm in any public area, 500 ppm at any public road or 100 ppm 3,000 feet from the site of release.

# New Mexico Oil Conservation Division Rule 118

- Where Submitted – Appropriate NMOCD District Office
- When Submitted
  - Facilities existing on 1/31/03, by 1/31/04
  - New facilities – before operations commence
  - Within 180 days if conditions around the site change that may create a PHV where one did not exist before (e.g., new road)

# New Mexico Oil Conservation Division Rule 118

- Electronic Submission Required
  - Operator of > 100 wells
  - Crude pump station operator
  - Refinery operator
  - Gas plant operator
- Failure to Submit Plan may result in delay of APD's or other applications

# New Mexico Oil Conservation Division Rule 118

- Review, Amendment is the responsibility of the operator
- Retention and Inspection – plan must be reasonably accessible in the event of a release of H<sub>2</sub>S and available for OCD inspection

# New Mexico Oil Conservation Division Rule 118

- Annual Inventory of Contingency Plans. On an annual basis, each person, operator or facility required to prepare one or more hydrogen sulfide contingency plans pursuant to this section shall file with the appropriate local emergency planning committee and the state emergency response commission an inventory of the wells, facilities and operations for which plans are on file with the division and the name, address and telephone number of a point of contact.

# New Mexico Oil Conservation Division Rule 118

- Plans Required by Other Jurisdictions. A hydrogen sulfide contingency plan required by the Bureau of Land Management or other jurisdiction that meets the requirements of this subsection may be submitted to the division in satisfaction of this subsection.

# New Mexico Oil Conservation Division Rule 118

- Signage, Markers required if facility contains 100 ppm H<sub>2</sub>S or more
- ANSI standard Z535.1-2002 (“Safety Color Code”)

# New Mexico Oil Conservation Division Rule 118

- Drilling, completion, workover and well servicing operations involving a hydrogen sulfide concentration of 100 ppm or greater:
- “Recommended Practice for Oil and Gas Well Servicing and Workover Operations Involving Hydrogen Sulfide,” RP-68 (API)
- “Recommended Practices for Drilling and Well Servicing Operations Involving Wells Containing Hydrogen Sulfide,” RP-49 (API)

# New Mexico Oil Conservation Division Rule 118

- Detection and Monitoring Equipment.  
Drilling, completion, workover and well servicing operations involving a hydrogen sulfide concentration of 100 ppm or greater shall include hydrogen sulfide detection and monitoring equipment

# New Mexico Oil Conservation Division Rule 118

- Drilling and completion sites:
  - Accurate and precise hydrogen sulfide detection and monitoring system that will automatically activate visible and audible alarms when the ambient air concentration of H<sub>2</sub>S reaches a predetermined value not to exceed 20 ppm.
  - A sensing point located at the shale shaker, rig floor and bell nipple for a drilling site and the cellar, rig floor and circulating tanks or shale shaker for a completion site.

# New Mexico Oil Conservation Division Rule 118

- Workover and well servicing operations
  - One operational sensing point located as close to the well bore as practical. Additional sensing points may be necessary for large or long-term operations.

# New Mexico Oil Conservation Division Rule 118

- Hydrogen sulfide detection and monitoring equipment must be provided and must be made operational during drilling when drilling is within 500 feet of a zone anticipated to contain hydrogen sulfide and continuously thereafter through all subsequent drilling.

# New Mexico Oil Conservation Division Rule 118

- Wind Indicators.
  - Drilling, completion, workover and well servicing operations involving a hydrogen sulfide concentration of 100 ppm or greater shall include wind indicators.
  - At least two devices to indicate wind direction shall be installed at separate elevations and visible from all principal working areas at all times. When a sustained concentration of hydrogen sulfide is detected in excess of 20 ppm at any detection point, red flags shall be displayed.

# New Mexico Oil Conservation Division Rule 118

- Flare System.
  - For drilling and completion operations in an area where it is reasonably expected that a potentially hazardous volume of hydrogen sulfide will be encountered, the person, operator or facility shall install a flare system to safely gather and burn hydrogen-sulfide-bearing gas.

# New Mexico Oil Conservation Division Rule 118

- Well Control Equipment.
  - When the 100 ppm radius of exposure includes a public area, the following well control equipment shall be required:
    - Drilling. A remote-controlled well control system shall be installed and operational at all times beginning when drilling is within 500 feet of the formation believed to contain hydrogen sulfide and continuously thereafter during drilling.

# New Mexico Oil Conservation Division Rule 118

- Well Control Equipment.
  - When the 100 ppm radius of exposure includes a public area, the following well control equipment shall be required:
    - Completion, Workover and Well Servicing. A remote controlled pressure and hydrogen sulfide-rated well control system that meets or exceeds API specifications or other specifications approved by the division shall be installed and shall be operational at all times during completion, workover and servicing of a well.

# New Mexico Oil Conservation Division Rule 118

- Mud Program. All drilling, completion, workover and well servicing operations involving a hydrogen sulfide concentration of 100 ppm or greater shall use a hydrogen sulfide mud program capable of handling hydrogen sulfide conditions and well control, including de-gassing.

# New Mexico Oil Conservation Division Rule 118

- Well Testing. Except with prior approval of the division, drill-stem testing of a zone that contains hydrogen sulfide in a concentration of 100 ppm or greater shall be conducted only during daylight hours and formation fluids shall not be permitted to flow to the surface.

# New Mexico Oil Conservation Division Rule 118

- H<sub>2</sub>S at Crude Oil Pump Stations, Producing Wells, Tank Batteries and Associated Production Facilities, Pipelines, Refineries, Gas Plants and Compressor Stations.
  - API Standard RP-55
  - Security Requirements
  - Wind Direction Indicators
  - Control Equipment
    - automatic shut-down devices
    - secondary means of immediate well control

# New Mexico Oil Conservation Division Rule 118

- Tanks or vessels. Each stair or ladder leading to the top of any tank or vessel containing 300 ppm or more of hydrogen sulfide in the gaseous mixture shall be chained or marked to restrict entry.

# New Mexico Oil Conservation Division Rule 118

- Personnel responsible for implementing the contingency plan must be trained
- Equipment that might be exposed to H<sub>2</sub>S must be chosen with that in mind
  - See NACE Standard MR0175

# New Mexico Oil Conservation Division Rule 118

- Exemptions. Any person, operator or facility may petition the director or the director's designee for an exemption to any requirement of this section.