

State Comparison of Oil and Gas Programs -- Pits, Tanks, Set-backs, and Pooling 2/7/2019

I. Pits

A. Closure

1) Tennessee

- a. Specifies that all surface pits must be drained and filled when no longer needed for production purposes, and that the site shall be graded and stabilized in order to minimize surface runoff. Additionally, all supplies and equipment must be removed from the site.
- b. **specifies that tanks are preferred method of management of wastes at drilling sites as opposed to pits, restricts the run-on of surface water from entering pits or other waste management facilities, removal of waste fluids from pits following cessation of drilling activities**

2) West Virginia

- a. No pits may be left permanent.
- b. The reclamation period for pits and impoundments permitted with multiple wells shall be calculated from the date the last well was drilled (6 months).

3) Arkansas

- a. Removal of pit fluids, removal of liner, filling with native soils, restoration of original surface contours, and return to grade of the pit.

4) Pennsylvania

- a. Requires that a well site be restored following cessation of drilling operations. This includes restoration of the earthwork or soil disturbed, removal of all drilling supplies and equipment within 9 months after the completion of the drilling well, and compliance with all applicable requirements of the Clean Streams Law. The restoration period is subject to an extension if certain conditions are met.

5) Ohio

- a. Restore the land surface after drilling operations have ceased, including the removal of all equipment, revegetation of the affected area, prevention of sedimentation and erosion, and authorities the chief retains in the closure of a well.

6) New York

- a. Filling of any earthen pits or other excavations following the closure of the well. Reasonable effort to smooth the surface of the site to the original contour must be taken

7) North Carolina

- a. On-site inspection at closure.

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- b. Liquids and solid waste remaining in the pit shall be disposed of in accordance with applicable laws and regulations.
- c. Synthetic liners shall be removed and disposed of in accordance with applicable laws and regulations.
- d. The permittee shall collect a five-point composite sample from the pit sub-base if there are no wet or discolored areas or any other indications of a release of fluids from the pit. The permittee shall collect individual grab samples from any pit base or sidewall slope areas that are wet, discolored or show other evidence of a release along the pit sidewall slopes or base.
- e. The Department may request the permittee to also analyze for chlorides, bromides, and sulfates depending on the drilling, completion, and stimulation fluids used by the permittee
- f. All soil that exceeds limits established in Paragraph (e) of this Rule shall be removed from the pit and disposed of at a permitted municipal solid waste landfill, hazardous waste facility, or soil reclamation facility.
- g. The location where the pit(s) were constructed shall be returned to grade, reclaimed, and seeded in accordance with the approved Reclamation Plan. Pit(s) shall be reclaimed no later than 180 calendar days after the drilling rig is removed from the well site, workover operations are complete, or plugging is complete.

B. Setback

1) Tennessee

- a. Pit or tank, located at a distance of at least 100 feet from any fire hazard or dwellings
- b. The siting of wells, pits, or storage facilities in wetlands or in flood-prone areas (as indicated by the observed high water mark) of a stream is prohibited.

2) West Virginia

- a. <specifics not addressed>

3) Arkansas

- a. <specifics not addressed>

4) Pennsylvania

- a. <specifics not addressed>

5) Ohio

- a. The surface location of a new well or a tank battery may be no closer than 150 feet to an occupied dwelling without the written consent of the owner of the land on which the dwelling is located. This setback

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distance may be reduced to no less than 100 feet upon approval of the Chief.

- b. A staked and chained discharge line must be vented into a pit at least 80 feet from the well.

6) New York

- a. Inspector's discretion

7) North Carolina

- a. (1) occupied dwellings and high occupancy buildings: 650 feet; (2) edge of a public road, highway, utility or railroad track right-of-way, or other right-of-way: 100 feet; (3) a perennial stream, river, watercourse, pond, lake, or other natural and artificial bodies of water, including wetlands and trout stream: 200 feet; (4) intermittent stream: 100 feet; and (5) a public or private water well intended for human consumption or household purpose: 650 feet
- b. The permittee shall ensure a minimum setback of 100 feet from the center each oil or gas wellhead, and the closest edge of a tank, tank battery, or pit to the edge of the mapped 100-year floodplain and floodway
- c. The permittee shall ensure a minimum setback of 1,500 feet downgrade from each oil or gas wellhead, tank, tank battery, pit, or production facility to the edge of any surface water impoundment that serves as a municipal drinking water supply or to the edge of any river having a drainage area greater than 140 square miles and upstream of a municipal drinking water supply point
- d. Variances from setbacks established for high occupancy buildings are prohibited.
- e. The Commission shall not grant a variance for any E & P waste pit setback from an occupied dwelling.

C. Liners

1) Tennessee

- a. Requires all pits to be lined with liners of minimum thickness of 10-mm, specifies minimum requirements for secondary containment of surface tanks, and additional fire prevention requirements.
- b. Specifies additional liner requirements for specific waste stream pits based on the waste stream to be deposited or managed in the pit, including liner thickness, minimum freeboard, and slope setbacks.

2) West Virginia

- a. All pits and impoundments shall have an impermeable synthetic liner to prevent seepage or leakage, except those pits and impoundments deemed to be suitable to prevent seepage or leakage based on soil

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analyses from the operator and standards developed and certified by a registered professional engineer and approved by the Office.

3) Arkansas

a. Reserve Pits

- i) A synthetic liner of at least twenty (20) mils thickness, with a four (4) inch welded seam overlap, completely covering the Reserve Pit bottom and inside walls
- ii) A compacted clay liner may be applied to the bottom and sides of the Reserve Pit to create an impervious/impermeable barrier.
- iii) Other materials or methods used for liner construction must be approved by both the Director of the ADEQ and the Director of the AOGC prior to use.

b. Mud & Circulation Pits (for earthen mud & circulation)

- i) A synthetic liner of at least twenty (20) mils thickness, with a four (4) inch welded seam overlap, completely covering the Reserve Pit bottom and inside walls.
- ii) Bentonite drilling mud from fresh Water-Based Drilling Fluids may be used on the bottom and sides of the earthen Mud or Circulation Pit to create an impervious/impermeable barrier.
- iii) A concrete liner may be applied to the bottom and sides of the earthen Mud or Circulation Pit to create an impervious/impermeable barrier.
- iv) Oil-Based Drilling Fluids shall not be placed in an earthen Mud or Circulation Pit unless the Pit is lined with a synthetic or concrete liner
- v) If Oil-Based Drilling Fluids are to be used, and the location of the Mud or Circulation Pit is within 100 feet of a pond, lake, stream, ERW, ESW or NSW, the Operator is required to use a Closed Loop System.

4) Pennsylvania

- a. Well development impoundments shall be constructed with a synthetic impervious liner.
- b. The physical and chemical characteristics of all liners, coatings or other materials used as part of the secondary containment, that could potentially come into direct contact with regulated substances being stored, must be compatible with the regulated substance and be resistant to physical, chemical and other failure during handling, installation and use.

5) Ohio

- a. <specifics not addressed>

6) New York

- a. Lined with "watertight" material

7) North Carolina

- a. Pits shall have a primary and secondary synthetic liner

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- b. Each synthetic liner shall have a coefficient of permeability no greater than 1×10^{-10} centimeters per second and shall be at least 30 millimeters in thickness for polyvinyl chloride or at least 40 millimeters in thickness for high-density polyethylene
- c. Each synthetic liner shall be designed, constructed and maintained so that the physical and chemical characteristics of the liner are not adversely affected by the E & P waste or by ultraviolet light pursuant to ASTM D5747/D5747M-08 (2013) e1 "Standard Practice for Tests to Evaluate the Chemical Resistance of Geomembranes to Liquids."
- d. The synthetic liner shall be resistant to failures or damage during transportation, handling, installation, and use.
- e. Adjoining sections of synthetic liners shall be sealed together to prevent leakage and tested in accordance with the manufacturer's directions.
- f. The synthetic liner shall be trenched and anchored into the top of the berm
- g. The pit shall be constructed with a leak-detection zone between the upper and lower synthetic liners designed to: (A) reduce the maximum predicted head acting on the lower membrane liner to less than one inch and to detect a leak within 24 hours; (B) function without damaging the liners; and (C) allow permittee to monitor, record, remove, or repair any leakage within the zone
- h. The liner sub-base shall be smooth, uniform, and free from debris, rock, and other materials that may puncture, tear, cut, or otherwise cause the liner to fail. The liner sub-base and subgrade shall be capable of bearing the weight of the material above the liner without causing settling that may affect the integrity of the liner
- i. Monitoring and alarm technology shall be used to continuously verify the integrity of the primary pit liner
- j. The leak detection systems shall be monitored on a monthly basis to determine if the primary liner has failed. The primary liner has failed if the volume of water passing through the primary liner exceeds the action leakage rate, as calculated using accepted procedures, or 1,000 gallons per acre per day, whichever is larger
- k. If a liner becomes torn or otherwise loses integrity, the pit shall be managed to prevent the pit contents from leaking out of the pit, the pit contents shall be removed, and the liner repaired prior to placing the pit back in service.
- l. If the liner drops below the three feet of freeboard, the pit shall be managed to prevent the pit contents from leaking from the pit and the three feet of lined freeboard shall be restored.

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D. Freeboard

- 1) Tennessee
 - a. Mud circulation and reserve pits shall be constructed and operated with a minimum of 2 feet of freeboard, and shall be designed so that only runoff from the immediate work area may enter the pit
- 2) West Virginia
 - a. All pits and impoundments shall have adequate freeboard to prevent overflow, and in no case shall the freeboard be less than approximately two (2) feet.
- 3) Arkansas
 - a. Reserve Pits
 - i) All pits and impoundments shall have adequate freeboard to prevent overflow, and in no case shall the freeboard be less than approximately two (2) feet.
 - b. Mud & Circulation Pits
 - i) Shall be constructed with a minimum of two (2) feet of freeboard, and shall be maintained to handle a storm event up to a 10-year, 24-hour storm event during the operation of the Mud or Circulation Pit.
- 4) Pennsylvania
 - a. If open tanks or open storage structures are used, the tanks and storage structures shall be maintained so that at least 2 feet of freeboard remain at all times unless the tank or storage structure is provided with an overflow system to a standby tank with sufficient volume to contain all excess fluid or regulated substances.
- 5) Ohio
 - a. <specifics not addressed>
- 6) New York
 - a. The requirement to maintain 2 feet of freeboard has been eliminated, meaning an open pit can be filled to the brim.
- 7) North Carolina
 - a. All pits and open tanks shall maintain a minimum of three feet of freeboard at all times and be sized so as to contain the projected volume of E&P waste along with the volume of precipitation that would fall within a 25-year 24-hour storm event
 - b. The permittee shall inspect all pits or open tanks after a rain event of one half inch or more in a 24-hour period to ensure structures have not been impaired and have the required freeboard

E. Pit Design

- 1) Tennessee

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- a. Pits constructed above ground with bermed side walls shall be constructed with a minimum of 2:1 side slopes on both interior and exterior walls. The top of the bermed walls must be a minimum of 2 feet wide

2) West Virginia

- a. >5000 barrels
 - i) A pit or impoundment that is constructed in such a manner that it (a) Rises twenty-five (25) feet or more above the natural bed of a stream or watercourse as measured from the downstream toe of the embankment and does or can impound fifteen (15) acre-feet or more of water; or (b) Rises six (6) feet or more above the natural bed of a stream or watercourse as measured from the downstream toe of the embankment and does or can impound fifty (50) acre-feet or more of water is, by definition, a dam and is thereby subject to the provisions of the West Virginia Dam Control Act

3) Arkansas

- a. Reserve pits
 - i) The top of the bermed pit walls must be a minimum of 2 feet wide

4) Pennsylvania

- a. <specifics not addressed>

5) Ohio

- a. <specifics not addressed>

6) New York

- a. <specifics not addressed>

7) North Carolina

- a. Pits shall be located in cut material to the fullest extent possible. Pits shall be constructed adjacent to the high wall for sloping well sites. If the pit cannot be constructed in cut material, at least 50 percent of the pit shall be constructed below original ground level to prevent failure of the pit dike. Pit dikes constructed of fill material shall be compacted according to soil texture and moisture content pursuant to 15A NCAC 02K .0208, which is incorporated by reference, including subsequent amendments and editions
- b. the pit shall have a perimeter berm that is a minimum of two feet in width along the crest of the berm, to prevent stormwater runoff from entering the pit; the bottom of the pit shall be at least four feet above the seasonal high groundwater table and bedrock

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II. Tanks

A. Flowback/wastewater

1. Tennessee
 - a. <specifics not addressed>
2. West Virginia
 - a. <specifics not addressed>
3. Arkansas
 - a. Mud, Circulation and Reserve Pits shall contain only Drilling Fluids generated during the drilling of the well or wells at the drilling pad where the Pit is constructed, except that transfer of Frac Flow-Back Fluids to another drill pad is permitted in accordance with subparagraph g) 2) above. The transfer of Frac Flow-Back Fluids via tank truck shall be in accordance with General Rule E-3. If the transfer of Frac Flow-Back Fluids is via pipeline, such pipeline shall be constructed and maintained in a leak-free condition and protected from deterioration, punctures and/or any activity which may damage the integrity of the pipeline. If the proposed pipeline will result in a stream crossing, a short term activity authorization shall be received from the ADEQ prior to construction. Any discharge from the pipeline shall be reported immediately to ADEQ
4. Pennsylvania
 - a. If open tanks or open storage structures are used, the tanks and storage structures shall be maintained so that at least 2 feet of freeboard remain at all times unless the tank or storage structure is provided with an overflow system to a standby tank with sufficient volume to contain all excess fluid or regulated substances. If an open standby tank or standby open storage structure is used, it shall be maintained with 2 feet of freeboard.
 - b. Secondary containment is required for all new, refurbished or replaced aboveground primary containment, including their associated manifolds, that contain brine and other fluids produced during operation of the well. If one tank in a series of tanks is added, refurbished or replaced, secondary containment is required for the entire series of tanks. The secondary containment area provided by dikes or other methods of secondary containment open to the atmosphere must have containment capacity sufficient to hold the volume of the largest single aboveground tank, plus an additional 10% of volume for precipitation.
 - c. Tanks that are manifolded together shall be designed in a manner to prevent the uncontrolled discharge of multiple manifolded tanks.

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- d. If an owner or operator uses a tank or tanks with a combined capacity of at least 1,320 gallons to contain oil or condensate produced from a well, the owner or operator shall construct and maintain a dike or other method of secondary containment which satisfies the requirements under 40 CFR Part 112 (relating to oil pollution prevention) around the tank or tanks which will prevent the tank contents from entering waters of the Commonwealth.
 - e. The secondary containment provided by the dikes or other method of secondary containment must have containment capacity sufficient to hold the volume of the largest single tank, plus a reasonable allowance for precipitation based on local weather conditions and facility operation.
5. Ohio
- a. Charcoal filters, vent stacks with low-pressure relief valves, tank hatch lids with seals and lightning arrestors must be in place. If a tank battery with 6 or more tanks (capacity > than 700 barrels) is to be located within 75 feet from property not in drilling unit, the landowner must approve.
6. New York
- a. The owner or operator must state in its plan that it will maximize the reuse and/or recycling of used drilling mud, flowback water and production brine to the maximum extent feasible. Before approving a plan for disposition and/or disposal of such fluids, the department will take into consideration the known geology of the area, the sensitivity of the surrounding environment to such fluids, and the history of any other drilling operations in the area
7. North Carolina
- a. Tank design, installation, and use shall comply with API Specifications 12B "Specification for Bolted Tanks for Storage of Production Liquids," Specification 12D "Specification for Field Welded Tanks for Storage of Production Liquids," Specification 12F "Specification for Shop Welded Tanks for Storage of Production Liquids," or Specification 12P "Specification for Fiberglass Reinforced Plastic Tanks," which are incorporated by reference, including subsequent amendments and editions. These documents, published by API, may be viewed online for no charge at <http://publications.api.org/>.
 - b. The Commission shall not grant a variance for any E & P waste pit setback from an occupied dwelling. An applicant or permittee may request a variance to reduce the setback distances for an oil or gas wellhead, a tank, or tank battery from an intermittent stream, a

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pond, or other natural or artificial water body, which is not a water of the State, wholly contained within the drilling unit. The variance shall include the following conditions: (1) additional measures that eliminate, minimize, or mitigate potential adverse impacts to public health, welfare, and the environment, such as the use of secondary or backup containment measures; (2) the oil or gas wellhead, freshwater storage pit, tank, tank battery, or production facility shall be a minimum of 50 feet from any intermittent stream, pond, or other natural or artificial water body, that is not a water of the State, and that is wholly contained within the drilling unit

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III. Set-back Standards

1. Tennessee
 - a. <specifics not addressed>
2. West Virginia
 - a. <specifics not addressed>
3. Arkansas
 - a. The well setback from drilling unit boundary lines and spacing between wells, for wells drilled in drilling units for unconventional sources of supply within the covered lands are as follows:
 - i) 560' from any drilling unit boundary line
 - ii) Perforated interval of wellbore shall be at least 560' in any direction from any other wellbore perforated interval in the same common source of supply
 - iii) Perforated interval of wellbore shall be at least 448' in any direction (20% variance) from all other wellbore perforated intervals
4. Pennsylvania
 - a. <specifics not addressed>
5. Ohio
 - a. The surface location of a new well may be no closer than 150 feet to any property line not within drilling unit without the landowner's written approval if directional drilling is to be used. This setback distance may be reduced to no less than 100 feet upon approval of the Chief.
6. New York
 - a. Medina gas – 460'
 - b. Onondaga Reef & Oriskany – 660'
 - c. Fault-bounded Trenton & Black River – 1500'
 - d. Shale Gas (vertical well) – 460'
 - e. Shale Gas (Horizontal well) – 330'
7. North Carolina
 - a. Occupied dwellings & high occupancy buildings – 650'
 - b. Edge of a public roadway – 100'
 - c. Perennial stream or watercourse – 200'
 - d. Intermittent stream – 200'
 - e. Public or private water well – 650'
 - f. The permittee shall ensure a minimum setback of 100 feet from the center each oil or gas wellhead, and the closest edge of a tank, tank battery, or pit to the edge of the mapped 100-year floodplain and floodway

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- g. The permittee shall ensure a minimum setback of 1,500 feet downgrade from each oil or gas wellhead, tank, tank battery, pit, or production facility to the edge of any surface water impoundment that serves as a municipal drinking water supply or to the edge of any river having a drainage area greater than 140 square miles and upstream of a municipal drinking water supply point.
- h. –variances–

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IV. Pooling

1. Tennessee
 - a. Requests for permits for a voluntary pooled drilling unit, or for two or more leases or tracts that have been pooled for exploration or development shall be accompanied by a notarized affidavit signed by the operator that has the right to pool these leases to form a drilling unit.
2. West Virginia
 - a. Once a discovery well has established a pool, an application to establish a drilling unit may be filed with the Commission by the operator of such discovery deep well or by the operator of any lands directly and immediately affected by the drilling of such deep well or subsequent deep well in said pool
 - b. When two or more separately owned tracts are embraced within a drilling unit, or when there are separately owned interests in all or a part of a drilling unit, the interested persons may pool their tracts or interests for the development and operation of the drilling unit
 - c. WV Code has conferred upon the Commission, the authority to set spacing and unit sizes for all deep wells with some mandatory guidance: Surface topography and property lines; The plan of deep well spacing then being employed or proposed; The depth at which production from said pool has been found; The nature and character of the producing formation or formations; The maximum area which may be drained efficiently and economically by one deep well; Any other geological or scientific data pertaining to said pool
3. Arkansas
 - a. Where the oil or gas rights within a drilling unit are separately owned and the owners of those rights have not voluntarily agreed to integrate or pool those rights to develop the oil or gas, an owner may petition the Commission for an order integrating those rights
4. Pennsylvania
 - a. The Oil and Gas Act is meant to allow for responsible development of Pennsylvania's oil and gas resources and does not restrict its application to any depth.
 - b. The Coal and Gas Coordination Act requires coordination between gas and coal operators¹⁹⁹ and applies to all gas wells which penetrate a workable coal seam.
5. Ohio
 - a. The rules distinguish between the depth to which the well is drilled and include both linear and density spacing rules

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- b. The rules do not distinguish based upon mineral produced; neither do they differ based upon direction of drilling. In fact, Ohio regulations provide that unless approval is given by the Chief, wells may not “vary unreasonably from the vertical drawn from the center of the hole at the surface.”
 - c. The Chief will review the application, information presented at the hearing and the TAC recommendation and determine whether mandatory pooling is necessary to protect correlative rights and to effectively develop the mineral resources; then, it will enter an order
 - d. As for unit operation of a pool, the Chief, either by his or her own motion or by application of 65 percent of the owners of the land overlying the pool, will hold a hearing to decide if a need exists for the operation of the pool as a unit.
6. New York
- a. New York law contains spacing rules, as well as both voluntary and statutory pooling and unitization provisions
 - b. Any party who applies for an oil or gas drilling permit must control, either by ownership, voluntary agreement, or departmental integration order, not less than 60 percent of the acreage in the proposed spacing unit.
 - c. The Department of Environmental Conservation, the governing body, must issue permits if the proposed spacing unit conforms to spacing rules and if it is approximately uniform in shape compared to other units covering the same reservoir.
 - d. In the absence of voluntary agreements to integrate interests within a drilling unit, the Department may mandate pooling or unitization.