

Kansas Administrative Regulations

Kansas Corporation Commission

Article 3.—Production and Conservation of Oil and Gas

82-3-1209. Design and construction of storage well.

(a) Each operator shall drill and complete each storage well, including the conversion of an existing well of any type to a storage well or the conversion of a storage well to any other type of well, according to a drilling and completion plan signed by a licensed professional engineer or licensed professional geologist and approved by the director. The operator shall submit the plan on a form provided by the conservation division at least 90 days before the proposed date of drilling or completion. The operator shall supplement the plan by submitting open hole logs within 30 days after completing the well. The operator submitting a proposed drilling and completion plan shall include the following:

(1) (A) The operator shall submit, within 30 days of completing any well, the following open hole logs, one on a scale of five inches equals 100 feet, and one on a scale of two inches equals 100 feet, from the surface to the deeper of the base of the storage cavern or reservoir or the total depth of the storage well:

- (i) Spectral gamma ray;
- (ii) spontaneous potential;
- (iii) density;
- (iv) photoelectric;
- (v) caliper;

(vi) for cavern storage wells, dipole sonic for evaluating mechanical rock properties, logged at least from the base of the cavern or the total depth of the storage well to 100 feet above the top of the confining layer of the bedded salt formation; and

- (vii) neutron log, with the source registered in Kansas.

(B) The operator may submit an open hole log that is substantially similar to an open hole log specified in paragraph (a)(1)(A) if the operator demonstrates that the substitute

open hole log provides sufficient data for the director to determine whether the well is constructed in a manner that protects public safety, usable water, and soil.

(2) (A) The operator shall submit, within 30 days of completing any well, the following cased hole logs, with one on a scale of five inches equals 100 feet and one on a scale of two inches equals 100 feet:

- (i) Casing collar log and gamma ray;
- (ii) temperature survey showing the natural thermal gradient of the cavern; and
- (iii) cement evaluation log, performed after the neat cement has cured for at least 72 hours.

(B) The operator may submit a cased hole log that is substantially similar to the cased hole logs specified in paragraph (a)(2)(A) if approved by the director.

(3) The operator shall submit a water quality test performed by a certified laboratory demonstrating that there is no usable water in the proposed storage reservoir.

(4) The operator shall provide at least one core for each cavern storage facility, including both the bedded salt formation interval and a portion of the overburden. The applicant shall use core drilling procedures, a coring interval, and a core analysis that are approved by the director. The operator may use an offset storage facility core if the offset storage facility core represents the local geology at the proposed storage facility. The operator shall make the core available for inspection if requested by the director. The operator shall submit a core analysis report to the conservation division within 30 days after the core analysis is completed.

(5) (A) The core analysis shall include petrographic, geochemical, and geomechanical rock properties for the overburden and bedded salt formation at intervals approved by the director. The core analysis and the petrographic, geochemical, and geomechanical rock properties shall include the following:

- (i) Indirect tensile strength tests;
- (ii) triaxial compression tests; and
- (iii) triaxial creep tests defining the time-dependent creep deformation characteristics of the salt.

(B) The core analysis shall include a geomechanical and geochemistry evaluation used to predict reactions between air and shale and reactions between salt and shale,

including any potential contaminant from fuel-fired combustion turbine exhaust at the electrical generating facility.

(C) The overburden pressure for the bedded salt formation shall be considered when determining geomechanical rock properties.

(D) Permeability and porosity shall be determined for any rock formations layered within the salt formation, except shale layers deposited within the salt formation or the upper confining layer of the layered salt formation.

(E) A gamma ray log of the core shall be correlated with the well's cased hole gamma ray and casing collar locator logs.

(6) The operator shall provide documents demonstrating that each storage well will be drilled and completed pursuant to subsections (b) through (u).

(b) Each operator of a storage well shall equip, complete, and operate the storage well to protect public safety, usable water, and soil, and to confine air in the tubing, production casing, and the storage cavern or reservoir.

(c) Each operator shall use only equipment that can withstand exposure to injected and withdrawn air, including surface, intermediate, and production casing, production tubing, packers, and packer elements.

(d) Each operator shall equip each storage well with surface casing.

(1) The surface casing shall be set below all usable water formations in accordance with "table I: minimum surface casing requirements," dated February 2003 and incorporated into commission order in docket number 34,780-C (C-1825), which is hereby adopted by reference.

(2) The surface casing string shall be equipped with centralizers. The number of centralizers shall be determined as follows:

(A) If the surface casing string is less than 250 feet long, the operator shall at a minimum install one centralizer on the collar of the second joint of the surface casing and one centralizer on the collar of the last joint of the surface casing.

(B) If the surface casing string is 250 feet long or more, the operator shall install the two centralizers specified in paragraph (d)(2)(A) and shall ensure that at least one centralizer is installed every four joints of casing throughout the surface casing string.

(3) The annular space between the casing and the formation shall be filled with cement, and the cement shall be circulated to the surface.

(e) Each operator shall ensure that the surface casing, production casing, and tubing strings meet the standards specified in either of the following, which are hereby adopted by reference:

(1) "Bulletin on performance properties of casing, tubing, and drill pipe," API bulletin 5C2, as published by the American petroleum institute in October 1999; or

(2) "specification for casing and tubing (U.S. customary units)," API specification 5CT, sixth edition, as published by the American petroleum institute in October 1998, including the appendices and including the errata published in May 1999, but not including the publications listed in section 2.1.

(f) Each operator shall use a casing guide shoe or equivalent device to guide and protect the surface, intermediate, and production casing.

(g) Each operator shall use surface, intermediate, and production casing and tubing strings that are either new or reconditioned and the equivalent of new and that have been pressure-tested at the greater of the storage well's maximum allowable operating pressure or the storage facility's air compressor train design. If the casing used is new, the pressure test performed at the manufacturing mill or fabrication plant shall fulfill this requirement.

(h) The operator shall use surface, intermediate, and production casing, tubing, and liners that are rated for at least 125 percent of the maximum allowable operating pressure for the storage well or 125 percent of the storage facility's air compressor train design, whichever is greater.

(i) Each operator shall equip all intermediate and production casing with centralizers and scratchers.

(j) Each operator shall ensure that any cavern storage well is constructed as follows:

(1) The production casing shall be set in the upper part of the bedded salt formation. The production casing shall not extend less than 105 feet into the upper part of the bedded salt formation unless otherwise approved by the director if the operator demonstrates that the installation of the production casing will protect public safety, usable water, and soil.

(A) No permeable formation within the bedded salt formation shall be exposed to the cavern.

(B) Each operator shall demonstrate that any shale layer within the bedded salt formation will not lose integrity if exposed to storage operations.

(2) Liners shall extend from the surface to a depth near the bottom of the production casing, allowing room for any workover operation.

(3) Each operator shall obtain the director's approval before performing any remedial casing repair.

(k) Each operator shall ensure that each storage well is cemented as follows:

(1) Production casing set in a cavern storage well and any intermediate casing string shall be cemented with sufficient cement to fill the annular space between the casing and wellbore to the surface, including the innermost casing or liner that extends the entire length of the production casing.

(2) All intermediate or production casing strings set in a reservoir storage well shall be cemented with sufficient cement to fill the annular space either to 500 feet above the top of the storage reservoir or to the surface.

(3) The cement shall be compatible with the rock formation waters and drilling fluids. Salt-saturated cement shall be used in any bedded salt formation.

(4) Liners set in the casing shall have cement circulated from the bottom of the liner to the top of the liner. If the cement does not circulate, the annulus between the liner and casing shall be equipped to allow the annulus to be monitored and tested for mechanical integrity.

(5) Circulated cement shall have a compressive strength of at least 1,000 pounds per square inch.

(6) Each operator shall perform remedial cementing if there is evidence of either of the following:

(A) Communication between the confining zone and other horizons; or

(B) annular voids that could allow fluid contact with the casing or channeling across or above the confining zone.

(l) Each operator shall equip each reservoir storage well as follows:

(1) The well shall have a tubing and packer completion if any intermediate or production casing string does not have cement circulated to the surface or if the cement is not circulated from the bottom to the top of a liner set in the casing.

(2) The packer shall be set at a depth that is opposite a cemented interval of the production casing and no more than 50 feet above the uppermost perforation or open hole for the storage reservoir.

(m) Each operator shall equip the wellhead of any storage well with manual isolation valves and shall equip each port on the wellhead with either a valve or blind flange, which shall be rated at the same pressure as that of the wellhead.

(n) Each operator shall ensure that the wellhead master valve on each storage well is capable of opening fully and sized to the diameter of the casing or tubing string attached to the valve. The operator shall use a wellhead master valve rated at the same pressure as that of the wellhead.

(o) Each operator shall install a leak detector at any storage well located within 330 feet of an inhabited residence, commercial establishment, church, school, park, or public building.

(p) Each operator shall equip each storage well with a corrosion control system.

(q) Each operator of a cavern storage well shall submit to the conservation division all monitoring, testing, and reporting documents, including any correspondence with the Kansas department of health and environment, relating to any solution mining operation.

(r) Each operator shall ensure that a licensed professional engineer or licensed professional geologist supervises the installation of each storage well personally or through an agent.

(s) Each operator shall post at each storage well a sign large enough to be legible under normal daytime conditions at a distance of 50 feet, which shall include the following:

(1) The operator's name and license number;

(2) the storage facility's name and the storage well number;

(3) the location of the storage well by quarter section, section, township, range, and county; and

(4) the operator's emergency contact phone number.

(t) Each operator shall submit to the conservation division all supporting documents, logs, and tests within 30 days of drilling or completing any storage well.

(u) Each operator shall use only a pit that is permitted pursuant to K.A.R. 82-3-600. Each operator shall dispose of any waste or fluid pursuant to K.A.R. 82-3-602, 82-3-603, 82-3-604, 82-3-606, and 82-3-607.

(Authorized by and implementing K.S.A. 2011 Supp. 66-1274; effective Dec. 21, 2012.)

***** Authenticated Kansas Administrative Regulation *****