

**SUBCHAPTER J: STANDARDS FOR CLASS I SALT DOME CAVERN
DISPOSAL WELLS
§§131.161 - 131.171
Effective August 16, 2012**

§331.161. Applicability.

The sections of this subchapter apply to all Class I salt cavern disposal wells and their associated salt caverns located in the salt stocks of salt domes, and not to such facilities in horizontally bedded or non-domal salt.

Adopted July 25, 2012

Effective August 16, 2012

§331.162. Performance Standard.

The operator and permittee shall assure for construction, operation, maintenance, monitoring, closure, and post-closure of a Class I salt cavern disposal well and associated cavern, the continuous attainment of a performance standard of no escape of waste from the salt cavern injection zone. The provisions of this chapter, as well as any permit or order issued by the commission, shall be construed as minimum operating requirements. To qualify for a permit or to otherwise operate a Class I salt cavern disposal well and associated cavern, permit applicants and facility operators must demonstrate that this performance standard will be satisfied even if it is necessary to go beyond the minimum operating requirements described in this chapter.

Adopted July 25, 2012

Effective August 16, 2012

§331.163. Well Construction Standards.

(a) Plans and specifications. Except as specifically required in the terms of the disposal well permit, drilling and completion of the well shall be done in accordance with all permit application plans and specifications. Any proposed changes to the plans and specifications must be approved in writing by the executive director that said changes provide protection standards equivalent to or greater than the original design criteria.

(b) Casing and cementing.

(1) All Class I salt cavern disposal wells shall be cased and all casings which extend to the surface shall be cemented to the surface to prevent the movement of fluids and waste into or between underground sources of drinking water (USDWs) or freshwater aquifers, and to prevent potential leaks of fluids and waste from the well. Cementing shall be by the pump and plug or other method approved by the commission,

and cement circulated shall be of a volume equivalent to at least 120% of the calculated volume needed to fill the annular space between the hole and casing and between casing strings to the surface of the ground. Circulation of cement may be accomplished by staging. The executive director may approve an alternative method of cementing in cases where the cement cannot be recirculated to the surface, provided the owner or operator can demonstrate by using logs that the cement is continuous or does not allow any fluid and waste movement behind the well casings. Casing and cement used in the construction of each newly drilled well shall be designed for the life expectancy of the well, including the post-closure care period.

(A) Surface casing shall be set to a minimum subsurface depth, as determined by the executive director, which extends into a confining bed below the lowest formation containing a USDW or freshwater aquifer.

(B) At least one string of intermediate casing, using a sufficient number of centralizers, shall extend at least 100 feet into the salt stock.

(C) At least one long string casing, using a sufficient number of centralizers, shall extend into the salt stock, to the following depths, whichever is greater:

(i) 500 feet into the salt stock; or

(ii) 500 feet below any rock type of recognizable thickness as determined by logging, which is different from salt, and that is hydraulically connected to formations outside the salt stock. For the purposes of this rule, all rock types of recognizable thickness on logs which are different from salt shall be assumed to be in hydraulic connection unless demonstrated otherwise.

(2) In determining and specifying casing and cementing requirements, the following factors shall be considered:

(A) depth of lowermost USDW or freshwater aquifer;

(B) depth to the injection zone;

(C) injection pressure, external pressure, internal pressure, and axial loading;

(D) hole size;

(E) size and grade of all casing strings (wall thickness, diameter, nominal weight, length, joint specification, and construction material);

(F) the maximum burst and collapse pressures, and tensile stresses which may be experienced at any point along the length of the casings at any time during the construction, operation, and closure of the well;

(G) corrosive effects of injected materials, formation fluids, and temperatures;

(H) lithology of injection and confining zones;

(I) types and grades of cement;

(J) quantity and chemical composition of the injected fluid; and

(K) cement and cement additives which must, at a minimum, be of sufficient quality and quantity to maintain integrity over the design life of the well.

(c) Injection tubings. Except for circulation of drilling fluids during well construction, all injection activities for salt cavern construction and waste disposal in a salt cavern shall be performed using two concentric and removable injection tubings suspended from the wellhead.

(1) All injection activities during cavern construction shall be performed with the annulus between the tubing and long string casing filled with a noncorrosive fluid sufficient to protect the bond between salt, cement, and the long string casing seat.

(2) All injection of waste into a salt cavern shall be performed through the inner tubing with a packer to seal the annulus between the tubing and long string casing near the bottom of the long string casing.

(d) Well annulus system factors for consideration. All elements of the design of the well's tubing-long string casing annulus system, including the outer tubing and packer, shall be approved by permit or by the executive director's approval that any proposed modifications to the plans and specifications in the permit application will provide protection equivalent to or greater than the original plans and specifications. In determining and specifying requirements for a tubing and packer system, the following factors shall be considered:

(1) depth of setting;

(2) characteristics of injection fluid and waste;

(3) injection pressure;

- (4) annular pressure;
- (5) rate, temperature, and volume of injected fluid;
- (6) size of casing; and
- (7) tensile, burst, and collapse strengths of the tubing.

(e) Logs and tests.

(1) Geophysical logging. Appropriate logs and other tests shall be conducted during the drilling and construction phases of the well including drilling into the salt. All logs and tests shall be interpreted by the service company which processed the logs or conducted the test; or by other qualified persons. A minimum of the following logs and tests shall be conducted:

(A) deviation checks on all holes, conducted at sufficiently frequent intervals to assure that avenues for fluid migration in the form of diverging holes are not created during drilling;

(B) a spontaneous potential and resistivity log for all formations overlying the caprock;

(C) from the ground surface or from the base of conductor casing to the total investigated depth including all core hole or pilot hole:

- (i) natural gamma ray log;
- (ii) compensated density and neutron porosity logs;
- (iii) acoustic or sonic log;
- (iv) inclination (directional) survey; and
- (v) caliper log (open hole);

(D) from the ground surface or from the base of conductor casing to the lowermost casing seat:

- (i) cement bond with variable density log;
- (ii) temperature log (cased hole); and

(iii) casing inspection log;

(E) fracture detector log from the base of the surface casing to the total investigated depth including all core hole or pilot hole; and

(F) a vertical seismic profile.

(2) Pressure tests.

(A) After installation and cementing of casings, and prior to drilling out the cemented casing shoe, surface casing shall be pressure tested at mill test pressure or 80% of the calculated internal pressure at minimum yield strength, and the intermediate and long string casing shall be tested to 1,500 pounds per square inch (psi) for 30 minutes, unless otherwise specified by the executive director.

(B) After drilling out the cemented long string casing shoe, and prior to drilling more than 100 feet of core hole or pilot hole below the long string casing shoe, the bond between the salt, cement, and casing shall be tested at a pressure of 0.8 psi per foot of depth.

(C) The pilot hole and/or core hole shall be tested between the long string casing shoe and the total investigated depth, at a casing seat pressure of 0.8 psi per foot of depth.

(3) Coring.

(A) Full-hole continuous cores shall be taken beginning at the top of the caprock, or if caprock is not encountered, from the top of the salt stock, to a total investigated depth of 1,000 feet below the intended cavern floor. Cores shall be analyzed at sufficient frequency to provide representative data for the caprock, salt cavern confining zone, and the salt cavern injection zone, including permeability, porosity, bulk density, compressive strength (uniaxial), shear strength (triaxial), water content, and compatibility with permitted waste material. The full-hole, continuous cores shall be photographed for permanent records. The photographs of the cores shall be submitted to the commission as a part of the well completion report as required by §331.167(a)(1) of this title (relating to Reporting Requirements). The cores shall be archived at a facility approved by the executive director. The photos and cores will be maintained as public records.

(B) In situ permeability, lithostatic gradients, and fracture pressure gradients shall be determined in the core hole for the salt, within the cavern injection interval.

(C) Prior to commencement of injection for cavern construction, the pilot hole or core hole shall be filled with salt-saturated cement from total investigated depth back to the designed depth of the salt cavern floor.

(4) Well integrity testing. The mechanical integrity of a well must be demonstrated prior to initiation of injection activities. A mechanical integrity test shall consist of:

- (A) a pressure test with liquid or gas;
- (B) a temperature, noise log, or oxygen activation log;
- (C) a casing inspection log, if required by the executive director; and
- (D) any other test required by the executive director.

(f) Compatibility. All well materials must be compatible with formations and fluids with which the materials may be expected to come into contact. A well shall be deemed to have compatibility as long as the materials used in the construction of the well meet or exceed standards developed for such materials by the American Petroleum Institute (API), the American Society for Testing Materials (ASTM), or comparable standards acceptable to the executive director.

(g) Pre-injection units.

(1) The injection pump system shall be designed to assure that the surface injection pressure limitations authorized by the well permit shall not be exceeded.

(2) Instrumentation shall be installed to continuously monitor changes in annulus pressure and annulus fluid volume for the purpose of detecting well malfunctions.

(3) Pre-injection units, while allowing for pressure release, shall be designed to prevent the release of unauthorized cavern contents to the atmosphere.

(4) To protect the ground surface from spills and releases, the wellhead will have secondary containment in the form of a diked, impermeable pad or sump.

(h) Construction supervision. All phases of well construction and all phases of any well workover shall be supervised by a licensed professional engineer or licensed professional geoscientist, as appropriate, with current registration under the Texas Engineering Practice Act or Texas Geoscience Practice Act, who is knowledgeable and

experienced in practical drilling engineering and who is familiar with the special conditions and requirements of injection well construction.

(i) Approval of completion of the well construction stage. Prior to beginning cavern construction, the permittee shall obtain written approval from the executive director which states that the well construction is in compliance with the applicable provisions of the permit. To obtain approval, the permittee shall submit to the executive director within 90 days of completion of well construction, including all logging, coring, and testing of the pilot hole, the following reports and certifications prepared and sealed by a licensed professional engineer or licensed professional geoscientist with current registration under the Texas Engineering Practice Act or Texas Geoscience Practice Act:

(1) final construction, "as-built" plans and specifications, reservoir data, and an evaluation of the considerations set out in §331.45(2) of this title (relating to Executive Director Approval of Construction and Completion);

(2) certification that construction of the well has been completed in accordance with the provisions of the disposal well permit and with the design and construction specifications of the permittee's application; and

(3) certification that actual reservoir data obtained will not result in the need for a change in the operating parameters specified in the permit.

Adopted September 10, 2003

Effective October 2, 2003

§331.164. Cavern Construction Standards.

(a) Plans and specifications. Except as specifically required in the terms of the disposal well permit, construction of the cavern shall be done in accordance with all permit application plans and specifications. Any proposed changes to the plans and specifications must be certified in writing by the executive director that said changes provide protection standards equivalent to or greater than the original design criteria.

(b) Standards for cavern construction by controlled dissolution. The creation of waste storage or disposal caverns within the salt shall be accomplished by the controlled dissolution of the sidewalls of the well bore to a specified maximum diameter, between selected elevations specified in the permit as the top and bottom of the salt cavern injection interval. The top of the cavern shall be at least 100 feet below the base of the long string casing. The enlargement of a portion of the original well bore to serve as the cavern shall be done according to the cavern construction plans which shall be submitted as a part of the permit application. The cavern construction plans shall demonstrate at a minimum, the following:

(1) the minimum distance between the salt cavern injection zone boundaries and the boundaries of the salt stock, as determined by available geologic data, shall not be less than 500 feet;

(2) adjacent caverns shall be separated by a minimum pillar to cavern diameter (P/D) ratio of 2.0 to ensure a sufficient amount of undisturbed salt for cavern safety and stability. Adjacent salt cavern injection zones shall also be separated by a confining thickness of salt;

(3) that cavern dimensions have been designed by a qualified professional engineer and geologist, to ensure the structural integrity of the cavern;

(4) plans for continual monitoring of the volumes of fluids injected and produced during cavern development;

(5) plans for cavern pressure tests, and sonar surveys to determine the cavern dimensions, volume, geometric shape, and characterization of outbursts or other anomalies;

(6) the cavern construction process shall be conducted under the supervision of a qualified professional engineer, with current registration under the Texas Engineering Practices Act, in accordance with accepted practices in the cavern construction industry.

(7) all cavern solutioning brines shall be disposed of in facilities authorized by the commission for such purpose.

(c) Injection tubing. Except for circulation of drilling fluids during well construction, all injection activities for salt cavern construction and waste disposal in a salt cavern shall be performed through removable injection tubings installed inside of the cemented long string casing and extending from the wellhead at ground surface to the salt borehole or salt cavern below the long string casing seat.

(1) All injection activities during cavern construction shall be performed with the annulus between the outer tubing and long string casing filled with a non-corrosive inhibiting fluid sufficient to protect the bond between salt, cement, and the long string casing seat.

(2) All injection of waste into a salt cavern shall be performed through removable injection tubing with a packer to seal the annulus between the tubing and long string casing near the bottom of the long string casing.

(d) Logs and Tests.

(1) The permit applicant shall submit, as part of its construction plan, information identifying the tests which it will use to verify cavern dimensions throughout the cavern construction process. This information shall include at a minimum, the following:

(A) a description of surveys, logs, and tests to be run and analyzed, including any quantitative performance standards appropriate for any such procedure; and

(B) the frequency of such surveys or logs.

(2) Prior to waste filling, the integrity of the cavern shall be tested in accordance with a test method described in the applicant's cavern construction plan, specified by permit or approved by the executive director in accordance with subsection (a) of this section.

(e) Workovers.

(1) The permittee shall notify the executive director before commencing any workover operation or corrective maintenance which involves taking the injection well out of service. The notification shall be in writing and shall include plans for the proposed work. The executive director may grant an exception of the prior written notification when immediate action is required. Approval by the executive director shall be obtained before the permittee may begin any workover operation or corrective maintenance that involves taking the well out of service. Pressure control equipment shall be installed and maintained during workovers which involve the removal of tubing.

(2) Well mechanical integrity shall be demonstrated following any major operations which involve removal of the injection tubing, recompletions, or unseating of the packer. Cavern integrity demonstration may be required by the executive director in instances where the integrity of the casing seat or cavern may be compromised.

(f) Reports and approval.

(1) Initial cavern integrity report. The operator shall submit a report with the results of all tests regarding cavern integrity, within 30 days of completion of the salt cavern construction stage.

(2) Approval of completion of the cavern construction stage. Within 90 days of completion of cavern construction, including configuration of the well for waste disposal, and prior to beginning waste emplacement, the permittee shall obtain written approval from the executive director which states that the cavern construction is in

compliance with the applicable provisions of the permit. To obtain approval, the permittee shall submit to the executive director the following reports and certifications prepared and sealed by a professional engineer with current registration pursuant to the Texas Engineering Practice Act:

(A) final construction, "as-built" plans and specifications, injection and confining zone data, and an evaluation of the considerations under §331.45(2) of this title (relating to Executive Director Approval of Construction and Completion);

(B) certification that the construction of the cavern has been completed in accordance with the provisions of the disposal well permit and with the design and construction specifications of the permittee's application;

(C) certification that actual confining and injection zone data obtained will not result in need for a change in the operating parameters specified in the permit;

(D) certification that the salt cavern injection zone will not be in or above a formation which within 1/4 mile of the salt cavern injection zone contains an underground source of drinking water.

Adopted November 1, 2000

Effective November 23, 2000

§331.165. Waste Disposal Operating Requirements.

(a) General operating requirements.

(1) Injection pressure at the wellhead shall not exceed a maximum, which shall be calculated, so as to assure that the pressure in the cavern during injection does not disrupt the bond between the salt, cement, and the casing seat, initiate new fractures or propagate existing fractures in the cavern or the confining zone, or cause movement of fluid or waste out of the injection zone.

(2) Injection between the outermost casing protecting underground sources of drinking water (USDWs), and fresh or surface water and the wellbore is prohibited.

(3) The annulus between the outer tubing and long string casing shall be filled with an inert gas approved by the commission. The annulus pressure, at all times that the well is in service, shall be at least 100 pounds per square inch greater than the injection tubing pressure, to detect well malfunctions, unless the executive director determines that such a requirement might harm the integrity of the well.

(4) Chemical and physical characteristics of all injected materials and cavern contents, including but not limited to, bulk density and compressive strength of solidified waste, shall protect and be compatible with the injection well, associated facilities, and injection zone, and shall ensure proper operation of the facility to meet the performance standard of §331.162 of this title (relating to Performance Standard). In addition, after cavern construction is certified and a cavern is authorized to receive wastes under §331.164(f) of this title (relating to Cavern Construction Standards), all injected materials and cavern contents shall not cause further dissolution of the cavern walls.

(5) The waste stream shall be stabilized, prior to injection, to minimize the generation of fluids in the cavern.

(6) All injection of waste into a salt cavern shall be performed through the inner of two removable tubings with a packer to seal the annulus between the outer tubing and long string casing, near the bottom of the long string casing.

(7) Unauthorized releases of cavern contents to the atmosphere are prohibited.

(8) The cavern will be operated so as to control the extent of the disturbed zone.

(9) If an automatic alarm or shutdown is triggered, the owner or operator shall immediately investigate and identify as expeditiously as possible the cause of the alarm or shutoff. If, upon such investigation, the well or cavern appears to be lacking integrity, or if monitoring required under §331.166(c) of this title (relating to Monitoring and Testing Requirements) otherwise indicates that the well or cavern lacks integrity, the owner or operator shall:

(A) immediately cease injection of waste unless authorized by the executive director to continue or resume injection;

(B) take all necessary steps to determine the presence or absence of a leak; and

(C) notify the executive director within 24 hours after the alarm or shutdown.

(10) If the loss of integrity is discovered pursuant to paragraph (3) of this subsection or during periodic integrity testing, the owner or operator shall:

(A) immediately cease injection of waste;

(B) take all steps required to determine whether there may have been a release of wastes into any unauthorized zone;

(C) notify the executive director within 24 hours after loss of mechanical integrity is discovered;

(D) notify the executive director when injection can be expected to resume; and

(E) restore and demonstrate well mechanical integrity and/or cavern integrity to the satisfaction of the executive director prior to resuming injection of waste.

(11) Whenever the owner or operator obtains evidence that there may have been a release of injected wastes into an unauthorized zone:

(A) the owner or operator shall immediately cease injection of waste, and:

(i) notify the executive director within 24 hours of obtaining such evidence;

(ii) take all necessary steps to identify and characterize the extent of any release;

(iii) propose a remediation plan for executive director review and approval;

(iv) comply with any remediation plan specified by the executive director;

(v) implement any remediation plan approved by the executive director; and

(vi) where such release is into a USDW or freshwater aquifer currently serving as a water supply, within 24 hours notify the local health department, place a notice in a newspaper of general circulation and notify by mail the adjacent landowners:

(B) the executive director may allow the operator to resume injection prior to completing cleanup action if the owner or operator demonstrates that the injection operation will not endanger USDWs or freshwater aquifers.

(12) Cavern contents shall not interfere with the set-up of any stabilized waste injected after the waste and solidifying agents have been mixed, but is injected while is still pumpable and has not set.

(13) Waste emplacement must be performed in such a manner as to minimize gas or fluid entrapment, so that compaction of wastes does not disrupt the integrity of the cavern.

(14) A salt cavern disposal well shall be operated in a manner which will not generate high temperatures that will result in nonattainment of the performance standard of §331.162 of this title.

(15) All fluids purged from the cavern after emplacement of any waste shall be managed at a waste management facility pursuant to applicable state and federal regulations.

(b) Workovers.

(1) The permittee shall notify the executive director before commencing any workover operation or corrective maintenance which involves taking the injection well out of service. The notification shall be in writing and shall include plans for the proposed work. The executive director may grant an exception of the prior written notification when immediate action is required. Approval by the executive director shall be obtained before the permittee may begin any workover operation or corrective maintenance that involves taking the well out of service. Pressure control equipment shall be installed and maintained during workovers which involve the removal of tubing.

(2) Mechanical integrity of the well shall be demonstrated following any major operations which involve removal of the injection tubing, recompletions, or unseating of the packer.

(c) Temporary cessation of operations.

(1) An owner or operator of a Class I salt cavern disposal well who ceases injection operations temporarily, may keep the well open provided he:

(A) has received written authorization from the executive director;
and

(B) has described actions or procedures, satisfactory to the executive director, that the owner or operator will take to ensure that the well will not endanger USDWs, and fresh or surface water during the period of temporary disuse.

These actions and procedures shall include compliance with the technical requirements applicable to active injection wells, including mechanical integrity, and monitoring, unless waived by the executive director.

(2) The owner or operator of a well that has ceased operations for more than two years shall notify the executive director, in writing, 30 days prior to resuming operation of the well.

Adopted July 25, 2012

Effective August 16, 2012

§331.166. Monitoring and Testing Requirements.

(a) Waste analysis plan. All material injected into or produced from the cavern shall be sampled and analyzed in accordance with the approved written waste analysis plan required by 40 Code of Federal Regulations §146.68(a).

(b) Pressure gauges. Pressure gauges shall be installed and maintained in proper operating conditions at all times on both tubing strings and on the annulus between the outer tubing and long string casing/liner.

(c) Continuous recording devices. Continuous recording devices shall be installed and used, and maintained in proper operating condition at all times to record tubing string pressures, injection flow rates (by volume or mass), injection waste temperatures, injection waste density, volume and composition of displaced fluids and gases, injection volumes, tubing-long string casing annulus pressure, volume of annulus contents, and any other data specified by the permit. The composition of emplaced and displaced gases will be continuously recorded and monitored for change in composition. When a change in composition is detected a sample will be taken to establish the chemical composition of the displaced gases. The instruments shall be housed in weatherproof enclosures. The owner or operator shall also install and use:

(1) automatic alarm and automatic shutoff systems, designed to sound and shut-in the well when pressures and flow rates or other parameters approved by the executive director exceed a range and/or gradient specified in the permit; or

(2) automatic alarms designed to sound when the pressures, flow rates, or other parameters approved by the executive director exceed a rate and/or gradient specified in the permit, in cases where the owner or operator certifies that a trained operator will be on location and able to immediately respond to alarms at all times when the well is operating.

(d) Testing and calibration of monitoring instruments. All gauges, and pressure sensing and recording devices shall be tested and calibrated quarterly.

(e) Well mechanical integrity. The owner or operator shall maintain mechanical integrity of the injection well at all times that the well is in service. Mechanical integrity of the well must be demonstrated:

(1) within 12-month intervals, or within extended intervals not to exceed 15 months upon approval of the executive director, during the operating life of the well;

(2) by a temperature log, noise log, or other approved log required by the executive director at least once every five years to test for fluid movement along the borehole; and

(3) a casing inspection, casing evaluation, or other approved log may be required by the executive director to determine the condition of the casing.

(f) Cavern integrity. The owner or operator must maintain cavern integrity at all times. The integrity of the cavern must be demonstrated within 12-month intervals, or within extended intervals not to exceed 15 months upon approval of the executive director, by:

(1) pressure tests that determine if pressure interference or fluid flow exists between other caverns or formations; and

(2) a sonar test, or other test approved by the executive director, to determine the geometric shape of the unfilled cavern.

(g) Corrosion monitoring.

(1) Corrosion monitoring of well materials shall be conducted quarterly. Test materials shall be the same as those used in the injection tubing, packer, and long string casing, and will be continuously exposed to the waste with the exception of when the well is taken out of service.

(2) Corrosion monitoring may be waived by the executive director if the injection well owner or operator satisfactorily demonstrates, prior to authorization to conduct injection operations, that the waste will not be corrosive to the well materials with which the waste is expected to come into contact throughout the life of the well. The demonstration shall include a description of the methodology used to make that determination.

(h) Ambient monitoring.

(1) The executive director shall require the owner or operator to develop an ambient monitoring program, based on a site-specific assessment of the potential for waste and/or fluid movement from the well or injection zone and subsidence due to groundwater withdrawal or salt movement.

(2) The executive director shall require subsidence and groundwater quality monitoring over the area of review, and any other type of ambient necessary to comply with §331.162 of this title (relating to Performance Standard).

(3) Any monitor wells within the area of review selected for the observation of water quality, subsidence, formation pressure, or any other parameter, shall be monitored at an accuracy, frequency, and density sufficient to protect underground sources of drinking water, and fresh or surface water.

(i) Hydrogeologic compatibility determination. The owner or operator shall submit information demonstrating to the satisfaction of the executive director that the waste stream and its anticipated reaction products will not alter the permeability, thickness, or other relevant characteristics of the salt cavern confining or salt cavern injection zones such that they would no longer meet the requirements specified in §331.121 of this title (relating to Class I Wells).

(j) Other monitoring and testing. Any other monitoring and testing requirements, including determination of composition and volume of leachate, shall be specified as permit conditions.

(k) Notification of scheduled logging and testing. The executive director or his designated representative shall have the opportunity to witness all logging and testing. The owner or operator shall submit a written schedule of such activities to the executive director at least seven days prior to conducting tests.

Adopted November 1, 2000

Effective November 23, 2000

§331.167. Reporting Requirements.

(a) Pre-operation reports.

(1) Well completion report. Within 90 days after the completion of the well, the permittee shall submit a Well Completion Report to the executive director addressing the considerations and standards in §331.45(2) of this title (relating to Executive Director Approval of Construction and Completion) and §331.163 of this title (relating to Well Construction Standards), and including a completed copy of the commission's Well Data Form, and a surveyor's plat showing the exact location and giving the latitude and longitude of the well. The report will also include a certification

that a notation on the deed to the facility property or on some other instrument which is normally examined during title search has been made stating the surveyed location of the well, and the well permit number. The permittee shall integrate the data obtained into adjusted injection zone fluid transport calculations, and updated cross-sections of the injection zone, and shall include these items in the completion report.

(2) Cavern completion report. Within 90 days after the completion of the cavern, the permittee shall submit a Cavern Completion Report to the executive director addressing the considerations and standards in §331.45(2) of this title and §331.164 of this title (relating to Cavern Construction Standards), and including a surveyor's plat showing the exact location and giving the latitude and longitude of the cavern. The report will also include a certification that a notation on the deed to the facility property or on some other instrument which is normally examined during title search has been made stating the surveyed location of the cavern, the well permit number, the depth of the cavern floor and ceiling, the cavern diameter, the dates of operation, and its permitted waste streams. The permittee shall integrate the data obtained into adjusted injection zone waste transport calculations, waste front calculations and updated cross-sections of the injection zone and include these items in the completion report.

(3) Local authorities. The permittee shall provide written notice to the executive director in a manner specified by the executive director that a copy of the permit has been properly filed with the health and pollution control authorities of the county, city, and town where the well is located.

(4) Start-up date and time. The permittee shall notify the executive director in writing of the anticipated well construction and cavern construction start-up dates. Compliance with all pre-operation terms of the permit must occur prior to beginning injection operations. The permittee shall notify the executive director at least 24 hours prior to beginning drilling and cavern construction operations.

(5) Approval of construction and completion. Prior to beginning operations, the permittee shall obtain written approval from the executive director which states that the constructions and completions of the well and cavern are in compliance with the applicable provisions of the salt cavern solid waste disposal well permit. To obtain certification, the permittee shall submit to the executive director the following reports and certifications prepared and sealed by a professional engineer with current registration pursuant to the Texas Engineering Practice Act:

(A) final construction, "as-built" plans and specifications, reservoir data, and an evaluation of the considerations set out in §331.45(2) of this title;

(B) certification that the construction of the well, cavern, and associated facilities has been completed in accordance with the provisions of the

disposal well permit and with the design and construction specifications of the permittee's application;

(C) certification that actual data obtained on the confining and injection zones will not result in a need for a change in the operating parameters specified in the permit.

(b) Operating reports.

(1) Injection operation quarterly report. For noncommercial facilities only, within 20 days after the last day of the months of March, June, September, and December, the permittee shall submit to the executive director a quarterly report of injection operation on forms supplied by the executive director. These forms will comply with the reporting requirements of 40 Code of Federal Regulations §146.69(a). The executive director may require more frequent reporting.

(2) Injection operation monthly report. For commercial facilities only the following shall apply.

(A) The permittee shall submit to the commission within 10 days after the last day of each month a report describing chemical characteristics of new waste streams received for injection. The report shall be on forms provided by or acceptable to the commission.

(B) The permittee shall submit within 30 days after the last day of each month a report to the commission including the following information for wastes received and injected during the month:

(i) names and locations of the companies and plants
generating the wastes;

(ii) chemical and physical characteristics and volume of
waste received from each company including pH;

(iii) names of companies transporting the wastes; and

(iv) a log of injection operations for each injection episode including, but not limited to, time of injection, injection rate, injection pressures, injection fluid volume, injection fluid pH, and injection fluid density.

(C) The permittee shall submit to the commission within 20 days of the last day of each month a report of injection operations on forms provided by the commission. These forms will comply with the reporting requirements of 40 Code of

Federal Regulations §146.69(a). The executive director may require more frequent reporting.

(3) Injection zone annual report. For all facilities, the permittee shall submit annually with the December report of injection operation an updated graphic or other acceptable report and description of the effects of the well and cavern on the area of review, including a report on monitoring required by §331.166(h) of this title (relating to Monitoring and Testing Requirements). To the extent such information is reasonably available the report shall also include:

(A) locations of newly constructed or newly discovered wells within the area of review if such wells were not included in the technical report accompanying the permit application or in later reports;

(B) a tabulation of data as required by §331.121(a)(2)(B) of this title (relating to Class I Wells) for all such wells within 1/2 mile of the injection well and for all other wells within the area of review that penetrate the injection zone or confining zone; and

(C) for noncommercial facilities only, a current injection fluid analysis.

(4) Workover reports. Within 30 days after the completion of the workover, a report shall be filed with the executive director including the reason for well workover and the details of all work performed and interpretations of all logs and data collected.

(5) Well mechanical integrity, cavern integrity, and other reports. The permittee shall submit within 30 days after test completion a report including both data and interpretation on the results of:

(A) periodic tests of well and cavern integrity; and,

(B) any other test of the injection well or cavern if required by the executive director.

(6) Emergency report of leak or other failure. The permittee shall notify the underground injection control (UIC) staff of the Austin office and the local district office of the commission, within 24 hours of any significant change in monitoring parameters or of any other observations which could reasonably be attributed to a leak or other failure of the well equipment or cavern integrity.

§331.168. Additional Requirements and Conditions.

(a) A permit for a Class I salt cavern disposal well shall include expressly or by reference the following conditions.

(1) A sign shall be posted at the well site which shall show the name of the company, company well number, commission permit number, the depth of the cavern floor and ceiling, and the cavern diameter. The sign and identification shall be in the English language, clearly legible, and shall be in numbers and letters at least one inch high.

(2) An all-weather road shall be installed and maintained to allow access to the injection well and related facilities.

(3) The wellhead and associated facilities shall be painted, if appropriate, and maintained in good working order without detectable leaks.

(4) Secondary containment of the wellhead shall consist of a diked, impermeable pad or sump.

(5) The commission may prescribe additional requirements for Class I salt cavern disposal wells in order to protect underground sources of drinking water, and fresh or surface water from pollution.

(6) The obligation to implement the plugging and abandonment plan and the post-closure plan survives the termination of a permit or the cessation of injection activities. The requirement to maintain an approved plan is directly enforceable regardless of whether the requirement is a condition of the permit.

(b) Pressure control equipment including blowout preventers or a wellhead with closeable valves shall be required to be installed and maintained in proper operating condition at all times at the casing head, extending from the time of advancing the surface casing hole after conductor casing is set, to the time of well closure, to safeguard against any pressure imbalance which might cause a backflow, blowout, or fracturing of the salt to occur.

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§331.169. Record-Keeping Requirements.

(a) The permittee shall keep complete and accurate records of, but not limited to:

- (1) All monitoring required by the permit, including:
 - (A) continuous records of surface injection pressures;
 - (B) continuous records of the pressures and volumes of the annulus between the tubing and long string;
 - (C) continuous records of injection and production flow rates;
 - (D) monthly total volume of injected and produced materials;
 - (E) continuous records of cavern gases chemistry and pressures;
 - (F) continuous records of cavern fill volume and chemistry; and
 - (G) continuous records of cavern fluid volume;
- (2) All periodic well tests, including but not limited to:
 - (A) analyses of injected and produced materials;
 - (B) cavern integrity;
 - (C) well mechanical integrity; and
 - (D) casing inspection surveys;
- (3) all shut-in periods and times that emergency measures were used for handling injection fluid or waste;
- (4) any additional information on conditions that might reasonably affect the operation of the injection well.

(b) All records shall be made available promptly on location for review upon request from a representative of the commission.

(c) The permittee shall retain on location, for a period of three years following abandonment, records of all information resulting from any monitoring activities, including the chemical and physical characteristics of injected waste, or other records required by the permit. The executive director may require a permittee to submit copies of the records at any time prior to conclusion of the retention period.

§331.170. Cavern Closure.

(a) The owner or operator of a Class I salt cavern disposal well shall prepare, maintain, and comply with a plan for cavern closure that meets the minimum following requirements, and that is acceptable to the executive director.

(1) The owner or operator shall submit the plan as a part of the permit application and, upon approval, or approval with modifications, by the executive director, such plan shall be a condition of any permit issued.

(2) The owner or operator shall submit all proposed revisions to the plan and obtain any necessary permit amendments, as appropriate, over the life of the well and cavern.

(3) The plan shall include, at a minimum, the following information:

(A) upon cessation of waste disposal, and prior to cavern sealing, the operator shall:

(i) monitor the cavern pressure and cavern fluid volume and fluid chemical composition, to provide information regarding the cavern's natural closure characteristics and any ensuing pressure buildup;

(ii) provide predictions from data gathered in clause (i) of this subparagraph of cavern behavior after sealing is completed;

(iii) demonstrate, to the executive director, utilizing actual pre-closure monitoring data, that the sealing of the cavern will not result in any pressure buildup within the cavern that could adversely affect the integrity of the cavern, well, or seal;

(iv) fill all partially filled caverns with crushed salt or another approved suitable material which is compatible with the waste and the salt stock;

(v) complete any monitoring of the cavern and its contents required by rule or permit;

(vi) use redundant seals or plugs, comprised of different compositions and sealing properties, to provide for immediate as well as long-term salt cavern injection zone containment;

(vii) obtain written authorization from the executive director for cavern sealing;

(B) upon completion of cavern sealing, the owner or operator shall:

(i) monitor the seal for leaks;

(ii) demonstrate to the executive director that the seal is not leaking prior to requesting authorization for closing the wellbore;

(iii) obtain written authorization from the executive director to begin well closure.

(b) The well shall be closed in accordance with §331.46 of this title (relating to Closure Standards).

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§331.171. Post-Closure Care.

(a) The owner or operator of a Class I salt cavern disposal well shall prepare, maintain, and comply with a plan for post-closure care that meets the requirements of subsection (b) of this section, and that is acceptable to the executive director.

(1) The owner or operator shall submit the plan as a part of the permit application and, upon approval by the executive director, such plan shall be a condition of any permit issued.

(2) The owner or operator shall submit any proposed significant revision to the plan and obtain any necessary permit amendment, as appropriate over the life of the well, but no later than the date of the closure report required under §331.46 of this title (relating to Closure Standards).

(3) The plan shall provide financial assurance as required in this chapter. The owner or operator shall demonstrate and maintain financial assurance in the amount of the post closure cost estimate to cover post closure in a manner that meets the requirements of this chapter and Chapter 37, Subchapter Q of this title (relating to Financial Assurance for Underground Injection Control Wells). The amount of the funds available shall be no less than the amount identified in paragraph (4)(F) of this subsection.

(4) The plan shall include the following information:

- (A) the pressure in the injection zone before injection began;
- (B) the anticipated pressure in the injection zone at the time of closure;
- (C) the predicted time based on actual preclosure monitoring data until pressure in the injection interval reaches equilibrium with the surrounding salt stock;
- (D) predicted position of the waste front at closure (cavern sealing and well plugging);
- (E) the status of any corrective action required under §331.44 of this title (relating to Corrective Action Standards);
- (F) the estimated cost of proposed closure and post-closure care to be based on a reasonable worst case scenario.

(5) At the request of the owner or operator, or on his own initiative, the executive director may modify the post-closure plan after submission of the closure report following the procedures in §331.46 of this title.

(b) The owner or operator shall:

- (1) continue and complete any corrective action required under §331.44 of this title;
- (2) continue to conduct any groundwater monitoring and subsidence monitoring required under the permit until pressure in the injection interval reaches equilibrium with the salt stock. The executive director may extend the period of post-closure monitoring if he determines that the well or cavern may endanger an underground source of drinking water or freshwater aquifer;
- (3) submit a survey plat to the local zoning authority designated by the executive director. The plat shall indicate the location of the well relative to permanently surveyed benchmarks, the depth of the cavern ceiling and floor, and the maximum cavern radius. A copy of the plat shall be submitted to the underground injection control staff of the commission;
- (4) provide appropriate notification and information to such state and local authorities as have authority over drilling activities to enable such state and local authorities to impose appropriate conditions on subsequent drilling activities that may penetrate the well's confining or injection zone;

(5) retain for a period of three years following well closure records reflecting the nature, composition, and volume of all injected materials. The executive director shall require the owner or operator to deliver the records to the executive director at the conclusion of the retention period, and all records shall thereafter be retained at a location designated by the executive director for that purpose.

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