

1501:9-4-01 Definitions**As used in Ohio Administrative Code 1501:9-4.**

- (A) "Allowable Deviation from Plan" – means the distance in feet that a certified survey may locate from the planned survey station on the wellbore planning report approved by the division.
- (B) "Anti-Collision Report" is a report of all positional data utilized to quantify location and separation, between the reference well, and all offset wells identified pursuant to 1501:9-4-01 (G) (1), to provide a means for evaluating minimum allowable separation distances. Positional data includes:
- (1) reference and offset well survey station measurements in feet from surface through total measured depth;
 - (2) the validated instrument performance model;
 - (3) the standard deviation or sigma value;
 - (4) center-to-center distance in feet between the reference well and each offset well at the survey stations identified in 1501:9-4 (B)(1);
 - (5) ellipse separation distance in feet between the reference well and each offset well at the survey stations identified in 1501:9-4 (B)(1); and
 - (6) the separation factor between the reference well and each offset well at the survey stations identified in 1501:9-4 (B)(1).
- (C) "Anti-Collision Criteria" means the threshold values, including allowable deviation from plan, minimum allowable separation distance, and separation factor, that trigger an engineering review and/or the cessation of drilling to mitigate the risk of collision.
- (D) "Blind drilling" means the positional certainty of a reference well during drilling cannot be determined because a certified survey cannot be obtained at one or more survey stations. "Blind drilling" does not include the area located between the drill bit and survey sensors in the reference well wellbore.
- (E) "Well Completion Report " means a report that includes all of the information required under 1509.10 of the Revised Code and the following information:
- (1) The name of the cementing contractor;
 - (2) Information concerning the cement used that includes all of the following:
 - (a) Type;

- (b) Additives by per cent of unit volume;
 - (c) Volume of cement in sacks;
 - (d) Cement yield per sack;
 - (e) Average slurry density in pounds per gallon;
 - (f) Slurry volume in barrels; and
 - (g) Displacement volume in barrels.
- (3) The date cementing commenced, and the date cementing was completed for each string of casing or liner;
- (4) Whether cement slurry or other fluids circulated to surface;
- (5) The calculated and estimated volume in barrels and weight of cement slurry or other fluids circulated to surface;
- (6) The source, temperature, and pH of the mix water;
- (7) The volumes and types of fluids circulated prior to cementing;
- (8) A description of any breaks in circulation that may have occurred, including volume of fluid lost;
- (9) The materials and methods used to establish and maintain static conditions;
- (10) The diameter of the hole in inches;
- (11) Casing information that includes all of the following:
- (a) Grade;
 - (b) Weight;
 - (c) Casing and collar outer diameter in inches;
 - (d) Casing length in feet; and
 - (e) Burst pressure rating
- (12) The depth in feet of float equipment, basket or other casing hardware ;
- (13) The number, type, depth and spacing of each centralizer placed on a string of casing in the vertical or directional segment of a wellbore;
- (14) The number, type, and spacing of centralizers placed in the horizontal segment of a wellbore;

- (15) The pumping rates in barrels per minute, displacement pressure in pounds per square inch, and final circulating pressure in pounds per square inch prior to landing the plug;
- (16) The time the plug landed or when displacement was completed if no plug was used;
 - (a) If any problems occurred with the seating of the plug, placing the wiper plug at the calculated depth, or displacing the cement if no plug was used, a description of how the problems were addressed.
- (17) Casing test pressure in pounds per square inch and final test pressure in pounds per square inch; and
- (18) Calculated measurement in feet of the top of cement for each casing string and the method of determination for intermediate and production casing cement jobs.
- (19) If stimulated;
 - (a) Method of stimulation;
 - (b) Type and volume of stimulation fluid;
 - (c) Type and quantity of proppant;
 - (d) Stimulation pressures in pounds per square inch that include all of the following:
 - (i) Average treating Pressure;
 - (ii) Instantaneous Shut-in Pressure; and
 - (iii) Shut-in pressure after five minutes
 - (e) Date(s) of Stimulation.
- (20) Schematic for the casing and well head showing the pressure rating of each component used during production operations.

(F) "Certified Survey" means a survey station that has passed all quality assurance requirements established by the wellbore survey contractor to validate accuracy.

(G) "Collision Avoidance Management Plan" means a plan that documents the management and well positioning principles that a person follows to avoid well collisions during the drilling of a reference well that includes all of the following:

- (1) An area of review conducted around the entire measured depth of the reference well, at a radius length of 1000 feet to identify any existing or proposed wellbores that may pose a collision risk during drilling;
- (2) A detailed drawing that includes a map containing all of the following:
 - (a) The surface layout of the unit boundaries for the reference well;

(b) The surface and subsurface locations of the reference well and offset well paths to the extent known from available records. In addition, each well path is to be identified by name, number, and API number as applicable; and

(c) A legend with a symbol key, north arrow, date, author, scale bar, scale in feet, and version number.

(3) A description of the equipment, methods, and procedures to be used during drilling;

(4) A statement saying the person requires that measurement while drilling equipment and related software has been validated and will be maintained in accordance with manufacturer's specifications and calibrations;

(5) A statement attesting that as-drilled surveys, if available, were utilized for each offset well identified in paragraph (1) of this definition;

(6) A disclosure of the method used to calculate separation factor in the anti-collision report;

(7) A disclosure of the owner's anti-collision criteria and the management processes employed when threshold values associated with the anti-collision criteria are met, including personnel to be notified;

(8) A description of the actions to be taken if a survey station cannot be certified;

(9) A description of the actions to be taken if blind drilling occurs as a result of survey equipment failure to determine wellbore position; and

(10) A description of the actions to be taken if a collision should occur or a survey projection indicates an imminent risk of collision.

(H) "Ellipse separation" means the minimum distance in feet based on positional uncertainty between two adjacent wells.

(I) "Minimum Allowable Separation Distance" means the closest acceptable distance between a reference well and an offset well.

(J) "Offset well" means an existing well or planned well to the extent known from available records, that is to be evaluated for risk of collision with a reference well because it is within the area-of-review of a reference well.

(K) "Positional uncertainty" means an estimate of the accuracy associated with a point on a reference well wellbore path that is determined from a planned survey or an actual survey.

(L) "Potential flow zone " means a rock formation that has any of the following:

(1) Hydrocarbons or other fluids flow when wellbore pressure is less than pore pressure and isolation is necessary to prevent over-pressurization of any annular space;

(2) Has or had a well permitted under Chapter 1501:9-3 of the Administrative Code, Chapter

1501:9-5 of the Administrative Code, or Chapter 1501:9-7 of the Administrative Code to utilize the formation based on a review of wells within two miles;

- (3) Contains any hydrogen sulfide; or
 - (4) Contains a flow of brine.
- (M) "Reference well" means a well being planned to be drilled or a well being drilled that is subject to paragraph (B) of rule 1509:9-4-04.
- (N) "Separation factor" means a ratio of a well separation distance divided by the combined positional uncertainty of a reference well and an offset well.
- (O) "Sigma" means a standard deviation.
- (P) "Survey Station" means a point in the wellbore at which a directional measurement is collected.
- (Q) "Unconfined aquifer" means an aquifer where the water table is at atmospheric pressure.
- (R) "Wellbore planning report" means a report that includes all of the following:
- (1) The name and API number of the reference well, if applicable;
 - (2) The design version or plan version that includes the date it was prepared;
 - (3) A north reference;
 - (4) The method used to calculate the proposed survey stations;
 - (5) A description of the mapping or datum system used to prepare the report;
 - (6) The magnetic survey data reference that includes the sample date;
 - (7) The wellbore plan section data that includes measured depth in feet, vertical depth in feet, +N/-S, +E/-W; and
 - (8) The survey stations measurements from surface through total measured depth in feet reported at intervals of no greater than 100-foot survey intervals.
- (S) "Well Plan" means the series of survey stations that are combined to orient a well.
- (T) "Zone of production" means a geologic zone that has or had production of oil and gas based on a review of wells within one mile.

1501:9-4-02 Spacing of oil and gas wells.**(A) General spacing rules:**

- (1) The division of oil and gas resources management shall not issue a permit for the drilling of a new well, the reopening of an existing well, or the deepening or plugging back of an existing well to a different pool for the production of oil and gas unless the proposed well location and spacing conform to the requirements of this rule.
- (2) This rule shall not apply to any wells drilled in areas under special order from the chief for pool spacing pursuant to 1509.25 of the Revised Code. The chief shall grant an exception to the requirements of any special order from the chief for pool spacing pursuant to 1509.25 of the Revised Code, if the chief determines that an applicant demonstrates that such exception will protect correlative rights and/or promote conservation by permitting oil and/or gas to be produced which could not otherwise be produced. The chief shall grant or deny the application for an exception by order.
- (3) Upon receipt of an application by the division, the chief shall determine if the proposed depth is reasonable to penetrate the objective geological formation or geological zone. If the chief determines that the proposed depth is insufficient to penetrate the proposed geological formation or zone and that, because of the insufficient proposed depth, the spacing and acreage requirements under paragraph (C) of this rule are not fulfilled, the permit shall be denied. No well shall be drilled deeper than the proposed total depth without prior permission from the chief.
- (4) A permit shall not be issued unless the drilling unit or subject tract for the proposed well satisfies the acreage requirements for the anticipated deepest depth at which oil and gas will be produced. If oil or gas is produced at a lesser depth than the geological formation or zone for which the permit was issued, the acreage requirements may be changed to conform with paragraph (C) of this rule by submitting an application to the chief for a revision.

(B) Scope:

Paragraph (C) of this rule applies to the drilling of a new well, the reopening of an existing well, and the deepening or plugging back of an existing well regardless of its depth or the producing geological formation or zone except in areas under temporary minimum well spacing orders of the chief pursuant to paragraph (D) of this rule or for wells subject to exceptions granted by the chief pursuant to paragraph (E) of this rule. All drilling units shall be compact and composed of contiguous land.

(C) Location of wells:

- (1) No permit shall be issued to drill, deepen, reopen, or plug back a well for the production of oil and gas from a pool from zero to one thousand feet in depth unless the proposed well is located:
 - (a) Upon a subject tract or drilling unit containing not less than one acre;
 - (b) Not less than two hundred feet from any well drilling to, producing from, or capable of

- producing from the same pool; and
- (c) Not less than one hundred feet from any boundary of the subject tract or drilling unit.
- (2) No permit shall be issued to drill, deepen, reopen, or plug back a well for the production of oil or gas from a pool greater than one thousand feet in depth to two thousand feet in depth unless the proposed well is located:
- (a) Upon a subject tract or drilling unit containing not less than five acres;
 - (b) Not less than four hundred sixty feet from any well drilling to, producing from, or capable of producing from the same pool; and
 - (c) Not less than two hundred thirty feet from any boundary of the subject tract or drilling unit.
- (3) No permit shall be issued to drill, deepen, reopen, or plug back a well for the production of oil or gas from a pool greater than two thousand feet in depth to four thousand feet unless the proposed well is located:
- (a) Upon a subject tract or drilling unit containing not less than ten acres;
 - (b) Not less than six hundred feet from any well drilling to, producing from, or capable of producing from the same pool; and
 - (c) Not less than three hundred feet from any boundary of the subject tract or drilling unit.
- (4) Except as otherwise provided in paragraph (C)(6) of this rule, no permit shall be issued to drill, deepen, reopen, or plug back a well for the production of the oil or gas from a pool greater than four thousand feet in depth unless the proposed well is located:
- (a) Upon a subject tract or drilling unit containing not less than twenty acres;
 - (b) Not less than one thousand feet from any well drilling to, producing from, or capable of producing from the same pool; and
 - (c) Not less than five hundred feet from any boundary of the subject tract or drilling unit.
- (5) The minimum distance to any boundary of the drilling unit or subject tract for a well drilled in which the well bore reaches a horizontal or near horizontal position to any formation shall be determined from the take points along the wellbore.
- (6)
- (a) No permit shall be issued to drill, deepen, reopen or plug back a horizontal well for the production of oil and gas unless all of the following apply:
 - (i) Except as otherwise provided in paragraph (C)(6)(a)(ii) of this rule, the perpendicular distance from a take point is not less than four hundred feet from any drilling unit or subject tract boundary.

- (ii) The first and last take points are not less than one hundred fifty feet from the drilling unit or subject tract boundary that is approximately perpendicular to the well bore.
- (b) There is no minimum distance required between horizontal wells within the subject tract. However, if adverse communication between one or more horizontal wells occurs in a subject tract, the chief by an order, may require an alternative treatment plan or minimum distances between an existing horizontal well in that subject tract and a new horizontal well in that subject tract or between all new horizontal wells in that subject tract. If the owner of a horizontal well determines that adverse communication has occurred, the owner shall notify the division.
- (7) The distance from any take point of an as-drilled horizontal well may deviate up to ten per cent of the distances specified in paragraph (C)(6)(a) of this rule to the nearest drilling unit or subject tract boundary.
- (8) Wells drilled, deepened, reopened, or plugged back for purposes other than the production of oil and gas will be considered as special situations, and each will be evaluated in accordance with the issues of conservation of natural resources and of safety. Decisions as to spacing of such wells will be determined after evaluation of the special circumstances.
- (D) Temporary minimum well spacing in the vicinity of discovery wells:
 - (1) For the purpose of orderly development of a pool until such time as final spacing is determined, the chief on the chief's own motion or upon consideration of an application by an owner in an affected area, and with approval of the technical advisory council, may order temporary well spacing for wells to be drilled, deepened, reopened or plugged back to a particular pool or field in an area in the vicinity of a discovery well. Such order shall contain the following:
 - (a) A description of the area covered by the order;
 - (b) An identification of the pool, field or geologic formations covered by the order;
 - (c) The minimum distance wells may be drilled from the tract or drilling unit boundaries;
 - (d) The minimum distance between wells;
 - (e) The minimum acreage for tracts or drilling units; and
 - (f) The order may contain other requirements deemed necessary by the chief to accomplish the purpose of paragraph (D) of this rule.
 - (2) An order of the chief for temporary minimum well spacing in the vicinity of a discovery well shall be effective on the date the order is made and shall continue in effect until it is either rescinded or amended by the chief or until such time as an order for special drilling unit requirements is made by the chief after hearing pursuant to 1509.25 of the Revised Code.
 - (3) No well shall be drilled, deepened, reopened, or plugged back to or below the particular pool or field located in the area covered by an order of the chief under paragraph (D) of this rule unless the requirements of such order are satisfied. Permits issued prior to the effective date

of such order for wells to be located in the area and to or below the pool covered by such order that do not comply with the requirements of the order and where actual drilling operations have not commenced, shall be revoked.

(E) Offset wells - spacing exception:

- (1) The chief shall grant an exception to the requirements of paragraph (C) of this rule to an applicant who demonstrates that the well proposed for production of oil or gas will be an offset to a well drilled or commenced before the effective date of paragraph (C) of this rule, and which is producing or may be capable of producing on an adjacent tract, and that is so located on said adjacent tract as not to comply with any one or more of the requirements of paragraph (C) of this rule.
- (2) The chief shall grant an exception to the requirements of paragraph (C) of this rule if the chief determines that the applicant demonstrates that such an exception will protect correlative rights and/or promote conservation by permitting oil and gas to be produced which could not otherwise be produced. The chief shall grant or deny the application for an exception by order.
- (3) A well proposed to be drilled pursuant to such exceptions shall, nevertheless, be subject to the requirements of 1501:9-4 of the Administrative Code.

(F) Revision of drilling units or subject tracts: Except as provided otherwise in Chapter 1509 of the Revised Code, the requirements of paragraph (C) of this rule, as applicable, apply to the revision of a drilling unit or subject tract.

1501:9-4-03 Permitting.

- (A) In addition to the requirements established under 1509.06 of the Revised Code and 1501:9-1-02 of the Administrative Code, an application for a permit under 1509.06 of the Revised Code shall include all of the following:
- (1) An affidavit that the applicant is the owner and has the legal right to drill the entire length of the wellbore;
 - (2) A digital map prepared by an Ohio registered surveyor in a format approved by the chief showing all of the following:
 - (a) The boundaries of the subject tract or drilling unit upon which the well is to be drilled, property lines of all tracts in the drilling unit identifying the name of each surface owner and each mineral owner, and the acreage of each tract within the subject tract or drilling unit;
 - (b) The surface location and target location, if drilled directionally or horizontally, of the proposed well on the subject tract or the drilling unit established by a field survey showing the distances in feet from the proposed well site to the boundary lines of the subject tract or the drilling unit and to the nearest permanent geographic subdivision boundaries. The proposed well location shall be designated in accordance with 157.11 of the Revised Code. Coordinates shall be established by GPS and be accurate to within ten feet of the location;
 - (c) The location, five-digit permit number, well symbol, total depth, and deepest formation of each well within the subject tract or drilling unit, and the distances in feet between each drilling or producing well within the subject tract or drilling unit and the proposed well;
 - (d) The location of all buildings, public roads, streets, highways, railroads, streams, rivers, watercourses, water wells, ponds, lakes, or other bodies of water within two hundred feet of the surface location of the proposed well and the distance in feet of each from the proposed well;
 - (e) A statement certifying the information required in paragraph (A)(2) of this rule;
 - (f) The applicant's name, well name and well number, county, civil township, permanent geographic subdivisions (section, lot and/or tract) and surface elevation for the well location, USGS quadrangle name, map scale, north arrow, date the map was prepared, and the name, and registration number of the surveyor preparing the map; and
 - (g) If the proposed well is to be located in an urbanized area:
 - i. The map shall include the name of the urbanized area in addition to the original civil township name;
 - ii. A color map based on aerial photography, at a scale of one inch to two hundred feet showing the location or proposed location of the access road, tank battery, flowline, separator, gathering line, a five hundred foot radius around the surface location of the proposed well location; and

- iii. The names of all property owners within five hundred feet of the surface location.
- (3) A casing plan and cementing plan showing how the applicant proposes to construct the well that is consistent with the best available geologic information in the vicinity of the proposed wellbore and with the requirements of 1501:9-4-05 of the Administrative Code, including at least the following:
- (a) The name and anticipated depth of all hydrocarbon-bearing zones to be tested, stimulated by hydraulic fracturing, or produced;
 - (b) The estimated total depth for the proposed well and in addition the estimated true vertical depth and estimated first take point if the proposed well is non-vertical;
 - (c) The anticipated diameter and depth of each wellbore segment;
 - (d) The proposed casing type, outside diameter, and proposed setting depth for each casing string; and
 - (e) Proposed cement volumes in barrels for each casing string; and
 - (f) Proposed top of cement for each casing string.
- (4) A collision avoidance management plan, wellbore planning report, and an anti-collision report;
- (D) Unless authorized in 1501:9-2 of the Administrative Code or specified in writing by the chief, no well site construction shall commence in an urbanized area until a permit required by 1509.06 of the Revised Code is issued, is received by the applicant, and is posted on-site in a conspicuous and readily accessible place.
- (E) A permit issued pursuant to these rules and regulations is not transferable.
- (F) Well deviation. Except for wells permitted to be drilled directionally and horizontally, the well shall be vertical or near vertical. The division may require a borehole deviation survey to verify the location of the bottom of the well.
- (G) For all wells drilled horizontally and directionally, a post-drilling map and a borehole deviation survey must be submitted to the division within sixty calendar days after the well reaches total depth.
- (H) For a horizontal well located or proposed to be located within three miles of a known earthquake epicenter or within three miles of a known or inferred fault, the chief may require as a permit condition, the submittal and acceptance of a plan to monitor seismic activity during hydraulic fracturing operations.
- (I) Revising location. An owner may revise the surface location of a proposed well. The surface location of a proposed well may be changed only if the owner submits an application, a non-refundable two hundred fifty-dollar fee, and a revised map complying with this rule and sections

1509.06 and 1509.09 of the Revised Code.

- (J) Corrections. Any information on a nonexpired permit, except the type of well, the location of the well, orientation of the well, or proposed formation, may be corrected after the issuance of the permit without issuing a new permit. The chief may correct the information upon request of the person.
- (K) Reissue. Except for a permit to plug, a person may only file an application for a reissuance of a permit with the applicable fee as required in section 1509.06 (G) of the Revised Code if a permit has expired. The type of well, the proposed location, proposed orientation, proposed formation, or person may not be changed on a reissued permit.

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1501:9-4-04 Anti-Collision.

(A) Plans and document requirements. On and after the effective date of this rule and in addition to the requirements established by section 1509.06 of the Revised Code and 1501:9-4 of the Administrative Code, no person shall spud, drill, deepen, or reopen a well that is subject to paragraph (B) of this rule without first having received written approval from the chief of a collision avoidance management plan, wellbore planning report, and an anti-collision report. A collision avoidance management plan, a wellbore planning report, and an anti-collision report are to be in a format approved by the chief and submitted electronically.

(1) The chief may request additional information be included in a submitted collision avoidance management plan, a wellbore planning report, or an anti-collision report if the chief determines such information is necessary to protect public health, safety, and/or the environment.

(2) The chief will review each submitted plan and report and either accept or reject the plan based on compliance with the requirements of this rule. The person must follow the procedures outlined in the approved collision avoidance management plan.

(3) API RP 78, SPE 187073 and SPE 184730 as defined in 1501:9-12 of the Administrative Code will govern how a collision avoidance is drafted

(B) Applicability. This rule applies to:

(1) A well that will be drilled using directional drilling equipment or techniques to intentionally deviate the well from vertical;

(2) A well that requires a surface location spacing waiver as specified in section 1509.021 of the Revised Code;

(3) A well that will be drilled within 1,000 feet of any point along any non-vertical wellbore; and

(4) If during the permit application review process, the division determines a collision avoidance management plan is necessary to protect public health and safety, to protect the environment, or for the conservation of natural resources.

(C) Drilling Requirements.

(1) When drilling a well in accordance with this rule a person or person's representative must directly notify the division if any of the following occur:

(a) Deviation from the approved well path report that requires drilling to stop based on the accepted anti-collision criteria;

(b) A segment of the wellbore is abandoned and sidetracked; or

(c) A well to well collision has occurred.

(2) If any of the conditions in paragraph (C) (1) occur, the person must submit a modification in accordance with paragraph (D) of this rule.

(D) Plan Modifications. A holder of a permit issued under 1509.06 of the Revised Code or its authorized representative must submit any modifications to an approved collision avoidance management plan, or as necessitated by paragraph (C) of this rule a wellbore planning report and anti-collision report to the division in writing. All modifications must comply with the requirements of this rule. The division will review and accept or reject modifications in writing or return within forty-eight hours of receipt.

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1501:9-4-05 Well Construction.

- (A) A person shall construct a well permitted under Chapter 1509 of the Revised Code in a manner that is approved by the chief as specified by these rules, the terms and conditions of the permit, plans submitted and approved in the permit, and the standards established in 1509.17 of the Revised Code. The casing and cementing plans in the permit are understood by the division to be estimates based upon the best available geologic information prior to drilling. The division will evaluate the as-built well for compliance with this rule. Where this rule does not detail specific methods to meet these standards, the person shall use sound design and industry practices that achieve the standards established in 1509.17 of the Revised Code and the rules.
- (B) The chief may establish alternative well construction standards by permit condition that are well-specific, field-specific, or play-specific to ensure protection of public health or safety or the environment.
- (C) Drilling fluids.
- (1) All intervals drilled prior to and through the USDW protective depth as established by permit shall be drilled using any of the following: air, freshwater, or a freshwater-based drilling fluid. Only additives suitable for drilling through potable water supplies may be used while drilling these intervals.
 - (2) Based on regional knowledge of groundwater resources, well control, or safety factors, the chief may require by permit condition the use of a freshwater-based drilling fluid and specify its characteristics while the person is drilling any interval prior to and through the USDW protective depth.
 - (3) Below cemented surface casing, other drilling fluids may be utilized consistent with sound design and industry practice.
- (D) Casing standards.
- (1) Below the conductor casing or drive pipe, all casing installed in a well shall be steel alloy casing that has been manufactured and tested with standards established by the API in "5 CT Specification for Casing and Tubing", ASTM in "A500/A500M Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes", or a standard as approved in writing by the chief and have a minimum internal yield pressure rating designed to withstand at least 1.2 times the maximum pressure to which the casing may be subjected during production operations.
 - (a) The minimum internal yield pressure rating shall be based upon engineering calculations listed in API "TR 5C-3 Technical Report on Equations and Calculations for Casing, Tubing and Line Pipe used as Casing and Tubing, and Performance Properties Tables for Casing and Tubing", or an equivalent standard as approved in writing by the chief.
 - (b) Where subsurface reservoir pressure is unknown and cannot be reasonably anticipated, the person shall assume a pressure gradient of 0.7 pounds per square inch per foot of true vertical depth in a fully evacuated hole under shut-in conditions.

- (c) All hydrostatic pressure tests shall be conducted pursuant to API "5 CT Specification for Casing and Tubing" or another method approved in writing by the chief.
- (2) (a) All used casing that will be permanently set in a well shall be hydrostatically pressure tested with an applied pressure at least 1.2 times the maximum internal pressure to which the casing may be subjected, based upon known or anticipated subsurface pressure, or pressure that may be applied during production operations, whichever is greater, and assuming no external pressure. The casing shall be marked to verify the test status. In addition, the inspector will reject casing that is excessively pitted, patched, bent, corroded, crimped, or if threads are severely worn or damaged. The owner shall provide a copy of the test results to the inspector before the casing is installed in the well. The person shall not install used casing without an inspector's approval.
- (b) All hydrostatic pressure tests shall be conducted pursuant to API "5 CT Specification for Casing and Tubing" or another method approved in writing by the chief.
- (3) In order to verify casing integrity, the person shall pressure test each cemented casing string greater than two hundred feet long in accordance with the test method of either paragraph (D)(3)(a) or (D)(3)(b) of this rule.
- (a) Immediately upon landing the plug, the person shall increase displacement pressure by at least five hundred pounds per square inch and hold pressure for five minutes. If pressure declines by ten per cent or more, casing integrity and cement placement shall be further evaluated, and corrective action taken to verify casing integrity and cement placement. The person shall submit to the division written documentation of the proposed corrective actions. If the float apparatus does not hold, the person shall pump the volume that flowed back and shut the well in until the cement has reached a compressive strength of at least five hundred pounds per square inch.
- (b) Prior to drilling below a casing shoe or prior to completion, the person shall test any cemented casing strings, at a minimum pump pressure in pounds per square inch calculated by multiplying the length of the casing string by 0.2, but not less than three hundred pounds per square inch.
- (i) If, at the end of thirty minutes of such testing, the pressure shows a drop of ten per cent or more, the person shall notify the inspector and not resume further operations until the condition is corrected. A pressure test demonstrating a pressure drop of less than ten per cent after thirty minutes is evidence that the condition has been corrected. The person shall submit to the division written documentation of the corrective actions on a form prescribed by the chief.
- (ii) Casing integrity may be verified in conjunction with blowout preventer testing without a test plug using either the test pressure described in paragraph (D)(3)(b) of this rule or the pressure required to test the blowout preventer, whichever is lower.
- (E) Casing shoe tests. The chief may require the person to conduct a casing shoe test after drilling below the surface casing seat or the intermediate casing seat if the pressure gradient of the

permitted hydrocarbon reservoir exceeds 0.5 pounds per square inch per foot or in areas where fracture gradients are unknown.

(F) Surface fluids infiltration. Before drilling commences, the person shall crown the surface location around the wellbore to divert surface fluids away from the wellbore.

(G) Drilling fluid containment. All cellars, flow ditches, or pits must be fluid tight by the use of a liner, cement, or other impervious materials.

(H) Mouse and rat holes. If a mouse and/or rat hole is used, it shall be constructed of liquid-tight steel pipe with a welded basal plate with a thickness of not less than 0.5 inches, a steel bull plug, or a cement plug with a thickness of not less than five feet. The annulus shall be sealed with a bentonite slurry, approved clay, or cement in a manner that effectively prevents fluids from entering the annular space.

(1) A mouse or rat hole shall be plugged with cement or other approved plugging material from the bottom of the hole to a minimum of thirty inches below surface of the grade.

(2) A mouse or rat hole employed during drilling of a dry or lost hole shall be plugged immediately after plugging the wellbore.

(3) A mouse or rat hole employed during the drilling of a well for the purpose of production, extraction, or injection of fluids shall be covered when not in use and shall be plugged within seven calendar days after removal of drilling equipment from the well site for a horizontal well and immediately after the production casing has been cemented in the wellbore for any other well.

(I) Wellbore diameters.

(1) Casing with collars.

(a) The diameter of each section of the wellbore in which casing with collars will be set and cemented shall be at least one inch greater than the outside diameter of the casing collar to be installed, unless approved in the permit.

(b) If cable-tool drilling is used to drill the wellbore, the diameter may be less than one inch as approved in the permit.

(2) Casing without collars.

(a) The diameter of each section of the wellbore in which casing will be set and cemented shall be at least two inches greater than the outside diameter of casing to be installed, unless approved in the permit.

(b) If cable-tool drilling is used to drill the wellbore, the diameter may be less than two inches as approved in the permit.

(J) Wellbore conditioning.

- (1) Prior to installing and cementing casing, the wellbore shall be conditioned to kill gas flow and fluid flow and the person shall circulate fluids until fluid returns are effectively clear of cuttings. The wellbore shall be conditioned to foster adequate cement placement and to promote a high-quality bond between cement and the wellbore by displacing drilling fluid with spacers and cement blends of sequentially greater density.
- (2) If oil-based drilling mud is used, the wellbore shall be conditioned with a mud flush and the spacer volume designed for a minimum of ten minutes contact time prior to cementing production casing in the horizontal segment of a wellbore.
- (3) Where cement is required, if underground mine voids, solution voids, or other geologic features render circulation infeasible, the person shall install a cement basket or other approved device as close as possible above the top of the void or the geologic feature.

(K) Cementing standards.

- (1) All cement placed into the wellbore shall be cement that is manufactured to meet the standards of API "10 A Specification for Cements and Materials for Well Cementing" or ASTM "C150/C150M Standard Specification for Portland Cement" or is otherwise approved by the chief in writing. All cement shall be designed to have a seventy-two-hour compressive strength of at least one thousand two hundred pounds per square inch.
- (2) All cemented casing shall remain static with no movement of casing above or below surface until all cement has reached a compressive strength of at least five hundred pounds per square inch. Surface activity may be initiated on casing that is suspended on a hanger before compressive strength of at least five hundred pounds per square inch is reached.
- (3) Cement slurry shall be pumped at the optimum density for each blend. The density of the cement slurry shall be designed to have an optimum density and range based on the wellbore conditions and have an average free fluid loss of no more than three milliliters per two hundred fifty milliliters of cement tested in accordance with API "RP 10 B-2 Recommended Practice for Testing Well Cements." The density of the cement slurry shall be designed to address wellbore, reservoir and flow zone conditions. Slurry shall be pumped at optimum density as specified in standard industry engineering handbooks that list physical properties of cementing materials. For cement blends that are not listed in standard industry engineering handbooks, the density of the slurry shall be based upon a laboratory free fluid separation test demonstrating an average free fluid loss of no more than three milliliters per two hundred fifty milliliters of cement tested in accordance with API "RP 10 B-2 Recommended Practice for Testing Well Cements."
- (4) The person shall ensure that the cement mix water quality and chemistry is compatible for the cement slurry design.
- (5) The person or the person's designee shall be on site to ensure that cement slurry design and placement parameters are followed. A cement slurry shall be mixed and pumped at a rate that ensures the optimum slurry density range is consistent according to the free fluid

separation test described in paragraph (K)(3) of this rule.

- (6) The chief may require, by permit condition, a specific cement mixture to be used in any well or any area if evidence of local conditions dictate specific cement slurry characteristics or performance.
- (7) When the person is drilling in a township where hydrogen sulfide gas is present in specific intervals, the chief will require as a permit condition that the person use cement that meets industry standards to prevent deterioration caused by hydrogen sulfide.
- (8) The person shall design and place cement in a manner that inhibits channeling of the cement in the annular space outside of the casing being cemented.
- (9) If circulation cannot be established or maintained, the person shall notify the inspector and shall conduct testing that is approved in writing by the inspector to evaluate cement placement.
- (10) If wellbore conditions indicate cement placement or quality may be inadequate to meet the standards established in this rule, the person shall not resume activity until a corrective action that achieves compliance with the standards has been approved by the chief in writing. The corrective action may occur at a later time with prior written approval from the chief.
- (11) Compressive strength test requirements.
 - (a) Cement mixtures for which published performance data are not available shall be tested by the person and approved by the chief in writing prior to usage. Tests shall be made on representative samples of the basic mixture of cement and additives used, using a representative mix water sample or potable tap water for preparing the slurry. The tests shall be conducted using the equipment and procedures established in API "RP 10 B-2 Recommended Practice for Testing Well Cements." Test data showing competency of a proposed cement mixture to meet the above requirements shall be furnished to the inspector prior to the cementing operation.

To determine that the minimum compressive strength has been obtained, the person shall use the typical performance data for the particular cement mixture used in the well at the following temperatures and at atmospheric pressure:

- (i) For conductor casing, mine string, and surface casing cement, the test temperature shall be sixty degrees Fahrenheit;
 - (ii) For intermediate casing and production casing cement, the test temperature shall be within ten degrees Fahrenheit of the bottom hole static temperature of the cemented interval.
- (L) Cement verification. For any casing string, where cement is not circulated to surface or fluid circulation is not maintained during placement, the division may require additional tests or corrective actions before authorizing operations to continue. During cementing operations, the

person shall provide samples of the pre-mixed cement, mixed cement slurry, and/or mix water upon request of the chief.

(M) Centralization.

- (1) Each casing string shall be centralized in the wellbore to provide sufficient casing standoff and foster effective placement of cement to isolate critical zones including aquifers, flow zones, voids, lost circulation zones, and hydrocarbon production zones.
- (2) All bowspring centralizers shall meet the standards of API "10 D, Specification for Bow-Spring Casing Centralizers."
- (3) All rigid centralizers shall meet the standards of API "10 TR 4 Considerations Regarding Selection of Centralizers for Primary Cementing Operations."

(N) No cementing operation may proceed without the person or the person's designee on site.

(O) Casing strings

(1) Drive pipe.

(a) Drive pipe need not be cemented if there is no annular space and may be driven through unconsolidated materials in order to:

- (i) Stabilize the wellbore; and
- (ii) Isolate shallow aquifers.

(2) Conductor casing.

(a) Conductor casing shall be set and cemented to surface for any of the following circumstances to:

- (i) Isolate with casing set at least thirty feet below any unconfined aquifers that are within the five-year time of travel as delineated and endorsed under the source water assessment and protection program;
 - (ii) Isolate with casing set at least thirty feet below any unconfined aquifers that provide groundwater for one or more private water wells or springs within a 500-foot radius of the well;
 - (iii) Isolate groundwater before penetrating the workings of an active underground mine; and
 - (iv) Provide a base for equipment to divert shallow natural gas flow.
- (b) The division may require conductor casing in order to stabilize unconsolidated sediments or materials.
- (c) Conductor casing shall be cemented to surface if there is an annular space.

- (d) If circulated cement drops or cement fails to circulate to surface, cement shall be placed from the surface to fill any void by a method approved in writing by the inspector.
- (e) Concentric drilling and drive pipe may not be used for purposes of paragraph (O) (2) (a) of this rule.

(3) Mine string.

- (a) Casing through an active underground mining operation.
 - (i) If a well is drilled within the permitted limits of an active underground mining operation that, based on best available information, may penetrate the excavation of a mine, a person shall construct the well in a manner that protects personnel working in the mine, and, if possible, shall locate the well so as to penetrate a pillar, a barrier, or the unmined perimeter of the seam.
 - (ii) If groundwater has been encountered within the permitted limits of an active underground mining operation and the well may penetrate the excavation of a mine, a person shall set a string of casing approximately fifteen feet above the roof of the mine or in the deepest competent bedrock and cement to surface prior to penetrating the excavations of the active underground mine. After cementing, a person may continue drilling to a minimum of approximately thirty feet below the floor of the mine and set and cement the mine string in accordance with paragraph (O)(3) (f) of this rule.
 - (iii) If no groundwater is encountered within the permitted limits of an active underground mining operation and the well may penetrate the excavation of a mine, the person shall continue drilling to a minimum of approximately thirty feet below the floor of the mine and set and cement the mine string in accordance with paragraph (O)(3) (f) of this rule.
 - (iv) If the well is located within the permitted area of an active underground mine and will not penetrate the excavations of the mine, a person shall drill to a minimum of approximately thirty feet below the base of the coal or mineral being mined and set a string of casing that is cemented to surface.
- (b) Casing through an abandoned underground mine void or a mine that is not an active underground mine. After drilling through the excavations of an underground mine void or rubble zone, a person shall set the mine string in accordance with paragraph (O)(3) (f) of this rule.
- (c) A mine string shall not serve as the surface casing or primary casing to protect the USDW unless otherwise approved in the permit.
- (d) Multiple mines encountered at different depths. The person shall design the casing and cementing plans to include the maximum number of casing strings that may be necessary to isolate each mine or mine void prior to setting and cementing casing. In areas where multiple mines are encountered, each mine string shall be set in accordance of section (O)(3) of this rule.

- (e) Each mine string shall be equipped with a guide shoe or other appropriate device to prevent deformation of the bottom of the casing.
- (f) Cementing the mine string. If a mine void or rubble zone is encountered, the person shall equip the mine string with a cement basket or other approved device as close to the top of the void or rubble zone as practical. The devices and installation methods must be approved by the division in writing before installation. Mine strings shall be cemented above and below the mine void or rubble zone in accordance with paragraph (O) of this rule. The interval from the casing seat to the base of the mine void or rubble zone shall be cemented. Cement shall be placed on top of the basket or other approved device in a manner approved in writing by the division.

(4) Surface casing.

- (a) A person shall set and cement surface casing at least fifty feet below the base of the deepest mapped USDW or at least fifty feet into competent bedrock, whichever is deeper, or as otherwise specified by the permit. Surface casing shall be cemented before drilling through hydrocarbon-bearing flow zones or zones that contain concentrations of total dissolved solids exceeding ten thousand milligrams per liter. In addition, in areas where the transition from groundwater with less than ten thousand milligrams per liter of total dissolved solids to groundwater with more than ten thousand milligrams per liter of total dissolved solids is uncertain, the chief may allow groundwater testing to determine the depth to the base of the deepest USDW. For the purposes of this paragraph, hydrocarbon-bearing flow zones include all formations that have historically been, are currently, or may be produced.
- (b) In areas where the USDW cannot be mapped, except as otherwise established in permit conditions, surface casing shall be set and cemented at the depth as follows, whichever is deepest:
 - (i) At least three hundred feet deep; or
 - (ii) At least one hundred feet below the deepest local perennial stream base;
- (c) In areas where USDWs cannot be mapped and where groundwater resources can be developed in valley-fill aquifers, surface casing shall be set and cemented at least one hundred feet below the base of the valley-fill aquifer or deeper if necessary to reach bedrock for any well within one thousand feet of the one hundred-year floodplain.
- (d) Cement shall fill the annular space outside the surface casing from the seat to the ground surface or to the bottom of the cellar.
- (e) If cement is not circulated to the ground surface or the bottom of the cellar, the person shall perform tests for further evaluation. The person shall notify the inspector prior to performing the tests. After the nature of a well construction deficiency is determined, the person shall contact the inspector and obtain written approval for the procedures to be used to perform any required additional cementing operations. Surface casing shall not be perforated for the purpose of remedial cementing unless intermediate casing will

be subsequently set and cemented to surface or is otherwise authorized in writing by the chief.

- (f) If remedial options fail and the chief determines that USDW are not adequately isolated or protected, the chief may issue an order suspending further drilling operations. If the chief determines additional remedial measures will not isolate and protect the USDW, the chief will issue an order requiring the well to be plugged.
- (g) For surface holes drilled through unconsolidated deposits that exceed one hundred feet in thickness, a guide or float shoe shall be run on the surface casing.
- (h) Alternative surface casing requirements. An alternative method of protecting USDW may be approved upon written application to the chief. The person applying shall state the reason for the alternative USDW protection method and outline the alternative method for casing and cementing through the deepest USDW. Alternative methods for setting more than specified amounts of surface casing for well control purposes may be requested on an area-specific basis. Alternative methods for setting less than specified amounts of surface casing shall be authorized on an individual well basis. The chief may accept, modify, or reject in writing the proposed alternative method. The chief will reject the proposed method if the person has not demonstrated that the alternative casing plan will meet the standards of 1509.17 of the Revised Code and this rule. A person shall obtain the chief's written approval of any alternative method before commencing operations.

(5) Intermediate casing.

- (a) Unless otherwise required by this rule or by the permit, intermediate casing may be set at the discretion of the person to isolate potential flow zones, zones of production, lost circulation zones, or other geologic hazards.
- (b) The person shall set and cement intermediate casing in a competent formation in the following situations:
 - (i) If groundwater containing total dissolved solids of less than ten thousand milligrams per liter is encountered below the base of cemented surface casing;
 - (ii) When drilling within the limits of a gas storage field or the gas storage field buffer zone to strata beneath a gas storage reservoir;
 - (iii) When drilling to permitted zones deeper than the Silurian Clinton formation east of the updip pinchout; the intermediate casing shall be set through the Mississippian Berea Sandstone or one thousand feet, whichever is greater, unless otherwise approved in writing by the chief.
 - (iv) For a horizontal well, the intermediate casing shall be set through the Mississippian Berea Sandstone or one thousand feet, whichever is greater, or as otherwise approved in writing by the chief; or
 - (v) In other situations, required by the chief in writing.

- (c) If the wellbore does not penetrate a potential flow zones, cement shall extend from the seat of the intermediate casing to at least five hundred true vertical feet above the casing seat of the intermediate string of casing that is permanently set in the wellbore.
- (d) The cement used to control annular gas migration from potential flow zones or zones of production shall be designed consistent with recommended methods in API "65-2 Isolating Potential Flow Zones during Construction." Annular pressure shall be monitored as required in section 1501:9-2-03 of the Administrative Code prior to drill out to verify isolation of the potential flow zone or zone of production. If the wellbore penetrates one or more potential flow zones:
 - (i) Except as provided in paragraph (O) (5) (d) (iii) of this rule, cement shall be placed at least five hundred feet above the uppermost potential flow zone if the well is a non-horizontal well;
 - (ii) Except as provided in paragraph (O) (5) (d) (iii) of this rule, cement shall be placed at least five hundred feet above the uppermost potential flow zone or at least five hundred feet above the uppermost zone of production, whichever is higher in the wellbore if the well is a horizontal well; or
 - (iii) Under certain conditions the chief may allow an alternative cementing plan.
- (e) If the cement placement indicators, including but not limited to, fluid returns, lift pressure, or annular pressure indicate inadequate isolation of any potential flow zone or zone of production, the person shall directly notify the inspector and complete a cement bond log. However, the division may allow or require other evaluation of the placement of the cement. The person shall develop and submit to the division a written plan to correct an identified well construction deficiency. The division will approve or deny the plan in writing. The person shall not continue drilling until the person implements the approved plan and demonstrates compliance with the standards of this rule.
- (f) Liners may be set and cemented as intermediate casing provided that the cemented liner has a minimum of two hundred feet of cemented lap within the next larger casing and the liner top is pressure tested at least five hundred pounds per square inch higher than the maximum anticipated pressure to be encountered in each interval to be drilled below the liner. The test pressure may not decline by ten per cent or more during the thirty-minute test period. If at the end of a thirty-minute pressure test, the pressure has dropped by ten per cent or more, the person shall not resume operations until the condition is corrected and verified by a thirty-minute pressure test.

(6) Production casing and liners.

- (a) Cementing. The cement slurry shall be designed to control annular gas migration consistent with recommended methods in API "65-2 Isolating Potential Flow Zones during Construction".
 - (i) For a non-horizontal well, the production casing shall be cemented to fill the annular space in whichever of the following points is highest in the wellbore:

- (a) At least five hundred true vertical feet above the seat in an open-hole vertical completion;
 - (b) At least five hundred true vertical feet above the uppermost perforation in a cemented vertical completion; or
 - (c) At least five hundred true vertical feet above a potential flow zone.
 - (ii) For a horizontal well, the production casing shall be cemented to fill the annular space in whichever of the following points is highest in the wellbore:
 - (a) At least two thousand true vertical feet above the last take point of a horizontal well;
 - (b) At least five hundred true vertical feet above a potential flow zone; or
 - (c) At least five hundred true vertical feet above a zone of production.
 - (ii) When cementing the production string of a well that will be stimulated by hydraulic fracturing and the uppermost perforation is less than five hundred feet below the base of the deepest USDW, cement shall be used to fill the annular space outside the casing from the seat to the ground surface or to the bottom of the cellar. If cement is not circulated to the ground surface or the bottom of the cellar, the person shall notify the inspector and perform tests approved in writing by the inspector. After the top of cement outside the casing is determined, the person shall contact the inspector and obtain written acceptance for the procedures to be used to perform any required additional cementing operations. The person shall then log the well from the total depth to surface and provide a report to the chief that demonstrates the adequacy of each confining zone. The chief will determine if or under what conditions hydraulic fracturing may commence and notify the person of the chief's determination in writing.
 - (iii) If the cement placement indicators, including but not limited to, fluid returns, lift pressure, or annular pressure indicate inadequate isolation of any potential flow zone or zone of production, the person shall directly notify the inspector and complete a cement bond log. However, the division may require other evaluation tools. In addition, the person shall develop and submit to the division a written plan to address an identified well construction deficiency. The division will accept or reject the plan in writing. The person shall not continue drilling until the person implements the approved plan and demonstrates compliance with the standards of this rule.
- (b) Liners may be set and cemented as production casing, provided that the cemented liner has a minimum of two hundred true vertical depth feet of cemented overlap within the next larger casing, and the liner top is pressure tested to a level that is at least five hundred pounds per square inch higher than the maximum anticipated pressure to be encountered by the wellbore. The test pressure may not decline by ten per cent or more during the thirty-minute test period. If at the end of a thirty-minute pressure test, the

pressure has dropped by ten per cent or more, the person shall not resume operations until the condition is corrected and verified by a thirty-minute pressure test. Liners may only be set and cemented as production casing in horizontal wells if approved by the chief.

- (c) Packer well construction. Packer or other non-cemented well construction may be used in place of cemented casing. If intermediate casing is run with this type of well construction cementing shall meet the requirements of paragraph (O)(6) of this rule. If intermediate casing is not run, a multi-stage cementing tool shall be run above the top external packer and cemented to fill the annular space outside the casing to the surface or to a point at least five hundred feet above the packer or casing seat. The chief may approve in writing alternative written well construction proposals. Any approved alternative shall meet the well construction standards of 1509.17 of the Revised Code and these rules.

(P) Casing and Wellhead.

A person shall install a casing head and wellhead to maintain surface control of the well. Wellhead equipment, including associated fittings, flanges, and valves, shall conform to API "6A Specification for Wellhead and Christmas Tree Equipment". Each component of the casing head and wellhead shall have a working pressure rating greater than the highest anticipated operating pressure to which the particular component might be exposed during production operations.

(Q) Annular Pressure Monitoring

Gauges shall be installed to monitor annular pressure. Maximum allowable annular pressures will be determined and monitored as outlined in section 1501:9-2-03 of the Administrative Code.

(R) Well construction records.

- (1) Within sixty days after drilling to total depth, the person shall file with the chief a legible copy of a well completion report and furnish complete data documenting the cementing of all casing strings on a form approved by the chief, and signed by a person having personal knowledge of the facts attesting to compliance with the cementing requirements of this rule.
- (2) Within sixty days after drilling to total depth for any directionally drilled well or any well where the wellbore reaches horizontal or near horizontal, the person shall submit an electronic as-drilled survey plat and borehole survey to the division.

1501:9-4-06 Revising existing subject tracts or units

(A) As used in this rule, “idle well” means either of the following:

- (1) A well, including a horizontal well, with no reported production for a period of two consecutive years as indicated by statements of production submitted under section 1509.11 of the Revised Code;
- (2) A well for which the owner of the well has received an authorization to inject brine or other waste substances under division (D) of section 1509.22 of the Revised Code or for which brine or other waste substances have not been injected for two consecutive years.

"Idle well" does not include a well that has been placed in temporary inactive status pursuant to section 1509.062 of the Revised Code or a well for which the chief of the division of oil and gas resources management has approved another activity

(B) Revising existing tract upon which exists a producing or idle well. As specified in R.C. 1509.061, an owner may make a request to revise an existing tract upon which exists a producing or idle well on a form prescribed by the chief accompanied by a non-refundable two-hundred-and-fifty-dollar fee. The form will include:

- (1) Well name and well number;
- (2) API number;
- (3) Owner name;
- (4) County and township;
- (5) Acreage;
- (6) The names and addresses of all persons holding the royalty interest in the tract upon which the well is located;
- (7) A digital map prepared by an Ohio registered surveyor in a format approved by the chief showing the boundaries of the subject tract or drilling unit upon which the well is drilled, property lines of all tracts in the drilling unit identifying the name of each surface owner and each mineral owner, and the acreage of each tract within the subject tract or drilling unit;

(C) A subject tract or drilling unit of a proposed well, previously approved by the division, may be revised by the owner with the filing of a revised map complying with this rule and section 1509.06 of the Revised Code. This does not apply to units pooled by an order issued by the chief pursuant to sections 1509.27 or 1509.28 of the Revised Code.