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REC. OF STATE

CERTIFICATE AND ORDER
FOR FILING
PERMANENT
ADMINISTRATIVE RULES WITH THE SECRETARY OF STATE

I HEREBY CERTIFY that the attached copy is a true, full and correct copy of PERMANENT rule(s) adopted on November 19, 1993
(Date)

by the Water Resources Commission
(Department)

to become effective January 1, 1994
(Date)

The within matter having come before the Water Resources Commission
(Department)

after all procedures having been in the required form and conducted in accordance with applicable statutes and rules and being fully advised in the premises:

Notice of Intended Action published in Secretary of State's Bulletin: NO YES Date Published: September 1, 1993

NOW THEREFORE, IT IS HEREBY ORDERED THAT the following action be taken: (List Rule Number(s) or Rule Title(s) on Appropriate Lines Below)

Adopted:
New Total Rules)

Amended:
Existing Rules)

OAR 690-200 through OAR 690-235, "Water Supply Well Construction and Maintenance Rules" and OAR 690-240, "Monitoring Well Construction and Maintenance Rules"

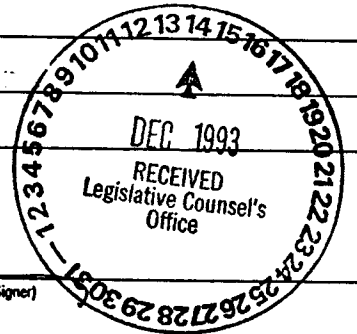
Repealed:
Total Rules Only)

Water Resources Department
Administrative Rules of the (Department)

DATED this 14 day of December, 19 93 (Division)

By: *Mustard D. Bell*
(Authorized Signer)

Title: Director



Statutory Authority: ORS 536.090 and 537.505 through 537.795

Chapter(s) _____ Oregon Laws 19 _____ or

House Bill(s) _____, 19 _____ Legislature; or Senate Bill(s) _____, 19 _____ Legislature

Subject Matter: Water Supply and Monitoring Well Construction Rules. Ground Water Advisory Committee Rules. These rules pertain to proper construction, maintenance and abandonment techniques to be used related to water supply and monitoring wells. Division 235 provides guidance to the Ground Water Advisory Committee.

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DIVISION 230

STANDARDS AND PROCEDURES FOR LOW-TEMPERATURE GEOTHERMAL PRODUCTION AND INJECTION WELLS AND EFFLUENT DISPOSAL SYSTEMS

Policy and Purpose

690-230-005

(1) All low-temperature geothermal fluids are part of the groundwater resources of the State of Oregon and shall be administered by the Water Resources Commission (Commission) under the provisions of ORS 537.010 to 537.796. The Commission recognizes that these fluids are developed primarily because of their thermal characteristics and that special management is necessary. Reservoir assessment of low-temperature geothermal fluids shall be conducted by the Commission in the same manner as groundwater investigations outlined in ORS 537.665 and ORS 537.685.

(2) In areas where substantial thermal alteration exists, the Commission may declare a critical groundwater area, or may otherwise control use of groundwater, or order the discontinued use, repair or permanent abandonment of a well(s) causing substantial thermal alteration, in order to protect the thermal characteristics of the groundwater resource. The Commission may also regulate appropriations to limit thermal interference between wells. Low-temperature geothermal appropriations with a bottom hole temperature less than 60 degrees F shall not be protected from thermal interference caused by groundwater appropriations for other purposes.

(3) The purpose of the following rules is to provide standards and procedures for the development, use and management of low-temperature geothermal fluids, while insuring proper management of all groundwater resources so maximum beneficial use of the resource will be most effectively attained.

(4) These rules supplement OAR 690-200-005 to 690-225-110.

{adopted 12-14-82; amended: 5-19-86; renumbered from 690-65-005 11-1-86; 12-14-90}

Definitions

690-230-020

(1) "Bottom hole temperature" means the maximum temperature measured in the well or borehole. It is normally attained directly adjacent to the producing zone, commonly at or near the bottom of the borehole, and will in all cases be greater than or equal to the temperature of fluid produced from the borehole.

(2) "Low-temperature geothermal effluent" means the outflow, discharge or waste fluid, with its associated dissolved or suspended constituents (being original or introduced), that is produced by a low-temperature geothermal well and its utilization system.

(3) "Low-temperature geothermal fluid" means any groundwater used for its thermal characteristics that is encountered in a well with a bottom hole temperature of less than 250 degrees Fahrenheit (F), or any other fluid that is circulated within a well having a bottom hole temperature of less than 250 degrees F and used for its thermal characteristics.

(4) "Low-temperature geothermal injection well" means any well as defined under ORS 537.515(9) that is constructed or used for returning low-temperature geothermal effluent to a groundwater reservoir.

(5) "Low-temperature geothermal production well" means any well as defined under ORS 537.515(9) with a bottom hole temperature of less than 250 degrees F that is constructed or used for the thermal characteristics of the fluid contained within.

(6) "Nonstandard low-temperature geothermal effluent disposal system" means any low-temperature geothermal effluent disposal system in which one or more of the following conditions are met:

(a) Any portion of the effluent is disposed of in a manner considered non-beneficial by the Director. This includes, but is not limited to, disposal via storm sewer, drainage hole or direct discharge to land surface or a surface water body.

(b) The effluent contains contaminants, other than heat, that have been added to the low-temperature geothermal fluid.

(c) The effluent is injected into a groundwater reservoir that is not considered suitable by the Director. Factors which may render a groundwater reservoir unsuitable include, but are not limited to, chemical or physical incompatibility of the fluids involved or adverse hydraulic characteristics of the receiving reservoir;

(d) There are other existing or potential site specific problems or conditions, that require the nonstandard designation of effluent disposal. Examples include, but are not limited to, instability of near-surface earth materials, undue alteration of thermal characteristics of groundwater, unreasonable head changes or leakage of effluent back to the surface.

(7) "Secondary use" means the consumption of low-temperature geothermal effluent for beneficial use including, but not limited to, domestic, irrigation, stock watering, commercial and industrial uses.

(8) "Standard low-temperature geothermal effluent disposal system" means any low-temperature geothermal effluent disposal system in which one or more of the following

conditions are met:

- (a) No contaminants , other than heat, have been added to the low-temperature geothermal fluid and the effluent is put to a secondary use.
- (b) No contaminants, other than heat, have been added to the low-temperature geothermal fluid and the effluent is returned to the producing groundwater reservoir or other suitable groundwater reservoir as determined by the Director. In addition there are no other existing or potential problems or special conditions, as determined by the Director, that include, but are not limited to, those factors, problems and conditions listed in subsections (6)(c) and
- (d) of this rule.

{adopted 12-14-82; amended: 5-19-86; renumbered from 690-65-010 11-1-86; 6-24-88; 12-14-90}

WELL CONSTRUCTION STANDARDS

Construction of Low-Temperature Geothermal Production and Injection Wells

690-230-030

- (1) Low-temperature geothermal production and injection wells shall be constructed in conformance with applicable rules (OAR 690-200-005 to 690-225-110) with specific additions and modifications as described in OAR 690-230-005 to 690-230-140.
- (2) Low-temperature geothermal production and low-temperature geothermal injection wells shall be constructed in a manner that protects groundwater from contamination, waste and loss of artesian pressure, and substantial thermal alteration.
- (3) If utilization of the well causes heating or cooling of the casing, resulting in thermal expansion or contraction of the casing to the point that adherence to the minimum well construction standards will not prevent or eliminate groundwater contamination, groundwater waste, loss of artesian pressure, or substantial thermal alteration, then the licensed well constructor shall submit a written request to the Director to use alternate construction methods and/or materials to prevent groundwater contamination, groundwater waste, loss of artesian pressure, and substantial thermal alteration. Written approval from the Director must be obtained prior to completion of the well.
- (4) A well constructor or owner of a low-temperature geothermal production or injection well may submit well construction plans to the Department for assistance and review of construction details.

{adopted 12-14-82; amended: renumbered from 690-65-015 11-1-86; 6-24-88; 12-14-90}

Location of Low-Temperature Geothermal Injection Wells Not Exceeding 15,000 Gallons Per Day

690-230-040

- (1) No low-temperature geothermal injection well with an anticipated injection rate of less than 15,000 gallons per day shall be located within 75 feet of any existing low-temperature geothermal production well utilizing the same groundwater reservoir without authorization from the Director unless both the production and injection wells are owned or used by the same person.
- (2) A request to construct a low-temperature geothermal injection well within 75 feet of a low-temperature geothermal production well shall be made in writing to the Director. The request shall list the names and addresses of the property owners, street addresses of the wells, and shall state the reason(s) for locating the injection well closer than 75 feet to the

production well. The Director may approve construction of an injection well closer than 75 feet to a production well only if the Director determines that the hydrologic and thermal conditions described in OAR 690-230-110 (1) justify the closer spacing.

{adopted 12-14-82; amended: renumbered from 690-65-020 11-1-86; 6-24-88; 12-14-90}

Location of Low-Temperature Geothermal Injection Wells Exceeding 15,000 Gallons Per Day

690-230-045 The owner of any low-temperature geothermal injection well having an anticipated injection rate of greater than 15,000 gallons per day is required to have a separation distance between the low-temperature geothermal injection and production wells that is adequate to protect the production wells from substantial thermal interference. The Director shall make a decision on the proposed separation distance based on information supplied by the owner as per OAR 690-230-115.

{adopted 12-14-82}

Description of Proposed Well Use (Start Card)

690-230-050 For any low-temperature geothermal production or injection well, the report required under ORS 537.762 prior to commencing well construction shall identify the intended use of the well, the owner_s name and the owner_s mailing address.

{adopted 12-14-82; amended: renumbered from 690-65-025 11-1-86; 12-14-90}

Identification of Intended Well Use (Well Log)

690-230-060 Any low-temperature geothermal production or injection well shall be clearly identified as such on the water well report filed with the Water Resources Department under ORS 537.765.

{adopted 12-14-82; amended: renumbered from 690-65-025 11-1-86; 6-24-88; 12-14-90}

Well-Head Protection Equipment

690-230-070 Adequate well-head equipment to insure public safety and the protection of the groundwater resource shall be immediately installed on any low-temperature geothermal production well or low-temperature geothermal injection well when the temperature of the fluid being withdrawn from, being pumped from, or flowing from the well bore exceeds 65 degrees C (150 degrees F) A variance from the requirement for well-head protection equipment may be granted if a written request demonstrates that the equipment is not necessary to safely complete the well.

{adopted 12-14-82; amended: renumbered from 690-65-035 11-1-86; 12-14-90}

Disposal of Low-Temperature Geothermal Fluids Produced During Drilling and Testing

690-230-075 Low-temperature geothermal fluids produced during drilling or testing of a low-temperature geothermal production or injection well shall be disposed of in a manner that minimizes hazards. For additional requirements on the disposal of low-temperature geothermal fluids produced during well drilling or testing, contact the Oregon Department of Environmental Quality.

{adopted 12-14-90}

Pump Testing of Low-Temperature Geothermal Injection Wells With an Anticipated Injection Rate of Less Than 15,000 Gallons Per Day

690-230-080

(1) Low-temperature geothermal Injection wells with an anticipated injection rate of less than 15,000 gallons per day shall be pump tested for a period of at least one hour. Test results must be recorded by the well constructor on the water well report. This minimum test shall be conducted as follows:

- (a) Prior to testing, the static water level in the well shall be measured and recorded.
- (b) The water shall be pumped into or from the well at a measured and steady rate. The pumping or withdrawal rate shall approximate the maximum anticipated injection rate.
- (c) For tests that withdraw water from the well, only bailing or pumping the well is acceptable.
- (d) At a minimum, the water level in the well shall be measured and recorded both at the end of pumping and after one hour of recovery.

(2) The Director may require the well owner to provide a more detailed test, separate from the water well report, that could include, but is not limited to, increased frequency of water level measurement, increased test duration and increased monitoring of observation wells. Such modifications will be required when possible impacts resulting from the development include, but are not limited to, thermal or hydrologic interference with existing water rights, water quality degradation or physical or mechanical failure of the well structure.

{adopted 12-14-82; amended: 5-16-86; renumbered from 690-65-040 11-1-86; 6-24-88; 12-14-90}

Pump Testing of Low-Temperature Geothermal Injection Wells With an Anticipated Injection Rate Exceeding 15,000 Gallons Per Day

690-230-085

(1) Low-temperature geothermal injection wells (other than flowing artesian wells) with an anticipated injection rate of greater than 15,000 gallons per day, shall be pump tested for a period of at least four hours. The pump test shall occur after the owner's pump test plan is approved by the Director, and prior to injecting into the well. The results of this test do not need to appear on the water well report. This test shall be in addition to the minimum one-hour test requirement under OAR 690-210-370. Requirements for conducting the minimum four-hour pump test as discussed in this section are as follows:

- (a) Prior to testing, the well shall be idle for a period of at least four hours.
- (b) The static water level in the well shall be measured at least three times, no less than twenty minutes apart, during the hour prior to pumping the well.
- (c) The water shall be pumped into or from the well at a measured and steady rate. The rate shall approximate the maximum anticipated injection rate.
- (d) The pump discharge shall be controlled as much as possible to maintain a constant rate during the test. The discharge rate shall be as close as reasonably possible to the anticipated injection rate during normal use of the well. Discharge rate shall be recorded at the beginning of the test and once every hour thereafter.
- (e) Water levels in the well shall be physically measured by a standard and acceptable method. Visual estimation of water level is not acceptable. Acceptable methods include:
 - (A) An electric water level measuring tape,
 - (B) An air line dedicated to the well,
 - (C) An acoustic sounder,
 - (D) An electronic pressure transducer, or
 - (E) Other water level measuring methods approved in advance by the Director.
- (f) The water level measurements shall occur at least at the minimum frequency outlined below:

Time period

Water level measurement schedule

First 10 minutes
10 to 30 minutes
30 to 100 minutes
100 to 240 minutes

No more than 2 minutes apart
No more than 5 minutes apart
No more than 15 minutes apart
No more than 30 minutes apart

(g) After pumping stops, water level measurements shall be collected for a time equal to that of the pumping period, or until the well reaches 90 percent recovery from the maximum drawdown, whichever occurs first. Recovery water level measurements shall be collected on the same time schedule as described in OAR 690-230-085 (1)(f).

(h) The pump discharge shall be physically measured by a standard and acceptable method. Visual estimation of flow rate is not acceptable. Acceptable methods include:

- (A) A properly installed flow meter, designed for geothermal use, which is functional and calibrated within reasonable limits for the type of meter,
- (B) A properly installed weir or flume,
- (C) A properly installed and calibrated orifice plate and manometer,
- (D) Known volume/time calculations (including calibrated bucket and stopwatch up to 60 gallons per minute),
- (E) Properly installed and used ultrasonic flow measuring devices, or
- (F) Other discharge methods approved in advance by the Director.

(2) The owner may consult with the Department before selecting representative nearby wells for monitoring during the pump test. If monitoring wells are selected in absence of specific instructions from the Department, the measurement of water levels in each well shall adhere to the schedule established in OAR 690-230-085 (1) (f).

(3) The Director may require the owner of the well to have a pump test performed that is more detailed than the test requirements described in OAR 690-230-085(1)-(2). This more detailed test could include, but is not limited to, increased frequency of water level measurements, increased test duration and increased monitoring of observation wells. Such modifications will be required when possible impacts resulting from the proposed injection include, but are not limited to, thermal or hydrologic interference with existing water rights,

water quality degradation or physical or mechanical failure of the well structure.

(4) For flowing artesian wells, pump test specifications shall be prescribed by the Department on a case-by-case basis.

{adopted 12-14-90}

Water Temperature Measurement

690-230-090

(1) The water well report prepared for any low-temperature geothermal well that is tested by pumping water from the well, shall include the temperature of the fluid, as measured at the discharge point at the beginning and end of a timed production test, as well as the maximum fluid temperature attained during the test. Bailing or pumping the well are acceptable methods of withdrawing water from the well during the test. Air testing is not acceptable.

(2) The well report prepared for any low-temperature geothermal well that is tested by pumping water into the well shall include the maximum temperature in the borehole and its corresponding depth.

(3) The well constructor is required to provide the temperature data on the water well report. The Director may use other temperature data in making the final determination of the bottom hole temperature.

{adopted 12-14-82; amended: 5-19-86; renumbered from 690-65-045 11-1-86; 6-24-88; 12-14-90}

Additional Standards for Low-Temperature Geothermal Injection Wells

690-230-100 Procedures required to inject effluent into a low-temperature geothermal injection well shall not cause failure of the well casing and/or seal materials or other components of the well structure, including but not limited to, movement, displacement or fracturing of the overburden.

{adopted 12-14-82; amended: 5-16-86; renumbered from 690-65-050 11-1-86; 12-14-90}

LOW-TEMPERATURE GEOTHERMAL EFFLUENT DISPOSAL

Injection Plan For Wells With an Anticipated Injection Rate Not Exceeding 15,000 Gallons Per Day

690-230-110 No low-temperature geothermal injection well shall be used for injection

without approval of the Director in accordance with OAR 690-210-070. The injection plan for the proposed injection of less than 15,000 gallons per day to a low-temperature geothermal injection well will consist of a water well report from both the injection and production wells. These well reports shall be sent to the Director for review. If the injection well has not yet been constructed, or if a water well report is not available from the injection or production well, acceptable data that shall be submitted as part of the injection plan include, but are not limited to, the following: geological information of the area, depth of the well(s) in question, water well reports from nearby wells, static water level data or water quality data from the well(s) in question. After review of the well reports, or other acceptable data, the Director may require water quality testing, as per OAR 690-230-115 (1)-(2), if the Director deems it necessary. The water quality testing may be required in the situations that include, but are not limited to, injection into a groundwater reservoir that is different from the producing groundwater reservoir, or when the well is of poor construction.

{adopted 12-14-82; amended: renumbered from 690-65-055 11-1-86; 6-24-88; 12-14-90}

Injection Plan For Wells With an Anticipated Injection Rate Exceeding 15,000 Gallons Per Day

690-230-115 No low-temperature geothermal injection well shall be used for injection without approval of the Director in accordance with OAR 690-210-070. The injection plan for the proposed injection of greater than 15,000 gallons per day to a low-temperature geothermal injection well shall include, but is not limited to, the following:

- (1) Details of well construction, including water well reports for the production well and the injection well,
- (2) Description of the number and location of water bearing zones from both production and injection wells,
- (3) Water temperature data from both the production and injection wells, and
- (4) Water level data from both the production and injection wells. If information from the well report is not sufficient to determine the effects of injection, the Director may require additional geologic or hydrologic information, including but not limited to, temperature/depth logs of the wells.
- (5) Water quality information including analysis by a laboratory certified by the Oregon Health Division for drinking water standards for the following parameters: arsenic, boron, calcium, carbonate or bicarbonate, chloride, fluoride, iron, magnesium, manganese, pH, potassium, silica, sodium, specific conductance, sulfate, suspended solids, total dissolved solids, and total coliform bacteria. If the low-temperature geothermal effluent is suspected to be of poor water quality or to be otherwise incompatible with the water in the receiving

zone in the injection well, the Director may require additional specific water quality data. If the information on the well reports for the wells involved is not sufficient to determine the effects of injection, the Director may require additional geologic or hydrologic information, including but not limited to, temperature/ depth logs of the wells. The Director may waive the requirement for specific portions or all of the chemical analyses if the fluid quality is known to be suitable for the intended production and injection.

(6) A map indicating the location and elevation of both the production well and the injection well in accordance with OAR 690-230-045. All maps shall be drawn to a standard, even scale of not less than 4 inches = 1 mile. Small area maps may be more easily and clearly drawn to a larger scale, such as 1 inch = 400 feet. The well owner shall submit injection plans to the Director indicating proposed separation distances between production and injection wells on the parcel of land on which the production well is located, on the parcel of land on which the injection well is located, and on all adjacent parcels of land, as well as land surface elevation at each well head.

(7) Any planned safeguards to prevent substantial thermal or hydrologic interference with existing rights to appropriate groundwater and surface water and alteration of existing or potential drinking water supplies.

{adopted 12-14-82}

WATER RIGHTS PROCEDURE

Processing of Applications

690-230-120 The appropriator shall make application for a water right to appropriate low-temperature geothermal fluid unless an exemption is provided for under ORS 537.545.

{adopted 12-14-82; amended: renumbered from 690-65-060 11-1-86; 12-14-90}

Exemption From Water Right Permit Application/Use of Low-Temperature Geothermal Fluid

690-230-130

(1) Low-temperature geothermal fluid appropriation for single industrial or commercial use including, but not limited to, electrical, agricultural, aquacultural, heating and/or cooling in an amount not exceeding 5,000 gallons per day shall be exempt from application for a water right as provided for under ORS 537.545.

(2) Low-temperature geothermal fluid appropriation for single or group domestic purposes including household heating and/or cooling shall be exempt from being required to apply for a water right as provided for under ORS 537.545 when the combined amount of groundwater

for single or group domestic purposes, including household heating and/or cooling, does not exceed 15,000 gallons per day. Construction must comply with well construction and maintenance rules as per OAR 690-200-230.

(3) The exemptions under subsections (1) and (2) of this section apply to the use of groundwater for any such purpose to the extent that it is beneficial and constitutes a right to appropriate groundwater equal to that established by a groundwater right certificate.

{adopted 12-14-82; amended: renumbered from 690-65-065 11-1-86; 12-14-90}

Water Right Limitation for Nonstandard Effluent Disposal Systems

690-230-140 If the low temperature geothermal effluent is disposed of by way of a nonstandard low-temperature geothermal effluent disposal system, the right to appropriate the low-temperature geothermal fluid shall be inferior to all subsequent rights for beneficial consumptive use and/or to the rights of those appropriators who make use of a standard low-temperature geothermal effluent disposal system. If a nonstandard low-temperature geothermal effluent disposal system is upgraded to a standard low-temperature geothermal effluent disposal system the associated water right retains the priority date established upon initial filing.

{adopted 12-14-82; amended: renumbered from 690-65-070 11-1-86; 12-14-90}