

General Rules and Regulations for Geothermal Energy Production

North Dakota Industrial Commission

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PART I--STATUTE

North Dakota Century Code Chapter 38-19

GEOTHERMAL RESOURCE DEVELOPMENT REGULATION

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38-19-01. Declaration of policy. It is hereby declared to be in the public interest to encourage, and promote the proper use of geothermal resources in a manner which will prevent waste; to authorize and provide for the operation of geothermal resource extraction facilities in such manner as will achieve the optimum utilization of the geothermal resource and protect the correlative rights of all owners; to prevent contamination and pollution of surface and ground water sources; and to avoid creation of secondary hazards of a geologic nature.

Source: S.L. 1981, ch. 377 § 1.

38-19-02. Definitions. As used in this chapter:

1. “Commission” means the industrial commission of North Dakota.
2. “Geothermal energy” means the internal energy of the earth, available to man as heat from rocks or liquids.
3. “Geothermal energy extraction facility” means and includes any drilled, bored, or excavated device or installation to provide for the extraction of geothermal energy.
4. “Geothermal resource” means the recoverable stored heat of the earth.
5. “Producer” means the owner of a geothermal energy extraction facility or facilities, and his agents or employees.
6. “Product” means anything produced, whether usable or unusable, by means of a geothermal energy extraction facility.
7. “Waste” means and includes the locating, spacing, drilling, excavating, or operating of any geothermal energy extraction facility in a manner which causes or tends to cause reduction in the quantity or quality

of geothermal energy ultimately recoverable from a geothermal resource, or which causes or tends to cause unnecessary or excessive use, or degradation, of land surface.

Source: S.L. 1981, ch. 377 § 2.

38-19-03. Jurisdiction of the commission. The commission has jurisdiction and authority and is charged with the responsibility to enforce the provisions of this chapter. This chapter does not apply to any activity regulated under chapters 38-08, 38-12, 38-12.1, 38-14.1, and 61-28. The jurisdiction granted to the commission by this chapter is not exclusive and does not affect the jurisdiction of other governmental entities. The commission acting through the office of the state geologist has the authority:

1. To require:
 - a. Identification of ownership of all facilities, installations, and equipment used in the extraction of geothermal energy.
 - b. The making and filing of all logs and reports on facility location, drilling, boring, excavating, and construction and the filing, free of charge, of samples, core chips, and complete cores, when requested, in the office of the state geologist.
 - c. The drilling, boring, casing, excavating, plugging, and construction of facilities in a manner to prevent contamination and pollution of surface and ground water sources and unnecessary environmental degradation.
 - d. The furnishing of a reasonable bond with good and sufficient surety, conditioned upon the full compliance with this chapter and the rules and orders of the commission relating to the extraction of geothermal energy. The person required to furnish the bond may elect to deposit a collateral bond, self-bond, cash, or any alternative form of security approved by the commission, or combination thereof, by which a permittee assures faithful performance of all requirements of this chapter and the rules and orders of the industrial commission.
 - e. Metering or measuring all products extracted from or by means of a facility regulated by this chapter.
 - f. That every person who operates a geothermal energy extraction facility in this state shall keep and maintain complete and accurate records of the quantities and nature of products extracted from or by means of any facility, and the ultimate disposition of such products, which records must be available to the commission or its agents at all times, and that every such person file with the commission such reports as it may prescribe.
 - g. That upon termination of the operation of any facility or activity regulated by this chapter, the operator of the facility shall restore the surface as nearly as possible to its original condition and productivity.
2. To regulate:

- a. The drilling, boring, excavating, and construction of all geothermal energy extraction facilities.
 - b. Operations to assure the optimum performance of all facilities regulated under this chapter.
3. To limit and prescribe the nature, quantity, and source of geothermal energy to be extracted from any facility regulated by this chapter.
 4. To adopt rules and issue orders to effectuate the purposes of this chapter.

Source: S.L. 1981, ch. 377 § 3.

38-19-04. Permit or report required. It shall be unlawful to commence any operations for the drilling, boring, excavating, or construction of a geothermal energy extraction facility, which is used for other than private residential heating and cooling purposes, without first securing a permit from the state geologist, under such rules as may be adopted by the commission and after paying to the commission a fee for each such facility in an amount to be prescribed by the commission by rule. The fee set must be related to the cost of regulation and inspection under this chapter.

A report is required upon completion of any geothermal energy extraction facility used solely for private residential heating or cooling purposes. The report must be prepared by the geothermal energy extraction facility installer on a form provided by the state geologist and furnished to the state geologist within thirty days after the completion of the facility. The report must contain relevant information the state geologist requires relating to the environmental safety of the facility, including the facility owner and location, a log of formations penetrated, if any, system specifications and design, and fluids used in the facility.

All construction of geothermal energy extraction facilities must comply with rules adopted under this chapter.

Source: S.L. 1981, ch. 377 § 4.

38-19-05. Commission may employ examiners. The commission may use hearing examiners under such rules as the commission may adopt.

Source: S.L. 1981, ch. 377 § 5.

38-19-06. Action to restrain violation or threatened violation. Whenever it appears that any person is violating or threatening to violate any provision of this chapter, or any rule or order of the commission, the commission may bring action against that person, in the district court of the county where the violation occurs or is threatened, to restrain that person from continuing the violation or from carrying out the threat of violation. In any such action, the court has jurisdiction to issue, without the filing of a bond or other undertaking by the commission, such prohibitory and mandatory injunctions as are necessary, including temporary restraining orders, preliminary injunctions, temporary, preliminary, or final orders restraining the person from continuing the violation or from carrying out the threat of violation.

Source: S.L. 1981, ch. 377 § 6.

38-19-07. Penalties.

1. Any person who violates any provision of this chapter, or any rule or order of the commission adopted or issued under this chapter, is subject to a civil penalty of not more than twelve thousand five hundred dollars for each act of violation and for each day the violation continues.
2. It is a class C felony for any person, for the purpose of evading this chapter, or any rule or order of the commission, to make or cause to be made any false entry or statement in a report required by this chapter or by any rule or order adopted or issued or promulgated by the commission, or to make or cause to be made any false entry in any record, account, or memorandum required by this chapter, or by any rule or order of the commission, or to omit, or cause to be omitted, from any such record, account, or memorandum, full, true, and correct entries as required by this chapter or by any rule or order of the entries as required by this chapter or by any rule or order of the commission, or to remove from this state or destroy, mutilate, alter, or falsify any record, account, or memorandum.
3. The civil penalties provided in subsection 1 are recoverable by suit filed by the attorney general in the name and on behalf of the commission, in the district court of the county in which the defendant resides, or in which any defendant resides, if there is more than one defendant, or in the district court of any county in which the violation occurred. The payment of the penalty does not operate to relieve a person on whom the penalty is imposed from liability to any other person for damages arising out of such violation.

Source: S.L. 1981, ch. 377 § 7.

38-19-08. Administrative procedure and judicial review. Any proceedings under this chapter for the adoption or modification of rules or orders, including emergency orders relating to extraction of geothermal energy and determining compliance with rules of the commission, must be conducted in accordance with sections 38-08-11, 38-08-12, 38-08-13, and 38-08-14; and chapter 28-32 governs administrative practice where consistent with the provisions of this chapter and the above-referenced sections.

Source: S.L. 1981, ch. 377 § 8.

38-19-09. Disposition of unusable products. Products for which there is no beneficial use and which the commission determines to be hazardous, must be disposed of in accordance with the provisions of chapter 23-20.2 and other state laws and regulations regarding the management of hazardous waste.

Source: S.L. 1981, ch. 377 § 9.

PART II--REGULATIONS

North Dakota Century Code Chapter 43-02-07

GEOHERMAL ENERGY PRODUCTION

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43-02-07-14	Disposal of Unusable Products
43-02-07-15	Plugging and Abandonment

43-02-07-01. Definitions. The terms used throughout this chapter have the same meaning as in North Dakota Century Code chapter 38-19, except:

1. “Commission” means the industrial commission of this state.
2. “Contaminant” means any physical, chemical, biological, or radiological substance or matter in water.
3. “Deep well” means any well drilled into rocks older than the Greenhorn Formation or which encounters brackish or saline formation waters to develop or produce geothermal energy.
4. “Injection well” means a well into which fluids are being injected.
5. “Person” means and includes any natural person, corporation, association, partnership, receiver, trustee, executor, administrator, guardian, fiduciary, or other representative of any kind and includes any department, agency or instrumentality of the state, or of any governmental subdivision thereof.
6. “Shallow well” means any well drilled into rocks younger than the Belle Fourche Formation and does not encounter saline or brackish formation waters to develop or produce geothermal energy.
7. “Underground source of drinking water” means an aquifer or its portion which supplies drinking water for human consumption or in which the ground water contains fewer than ten thousand milligrams per liter total dissolved solids.

8. “Well” means a bored, drilled or driven shaft, or a dug hole, whose depth is greater than the largest surface dimension.
9. “Closed-loop system” means any geothermal energy extraction facility, vertical, horizontal, or otherwise, in which a fluid is permanently confined within pipe or tubing and does not come in contact with the outside environment.
10. “Open-loop system” means any geothermal energy extraction facility in which water is extracted for heating or cooling purposes and is reinjected into the subsurface or disposed of at the surface.
11. “Substantial modification” means the construction or installation of any addition, or any restoration or renovation, of a geothermal energy extraction facility which increases or decreases its heating or cooling capacity, significantly alters its physical configuration, or impairs or improves its physical integrity. In all cases, the determination of “substantial modification” must be made by the state geologist.

History: Effective March 1, 1984; amended effective October 1, 1990; December 1, 1992.

General Authority: NDCC 38-19-03

Law Implemented: NDCC 38-19-03

43-02-07-02. Scope of chapter. This chapter is of statewide application and has been adopted by the commission to conserve the natural resources of this state, to prevent waste, to protect the correlative rights of all owners, to prevent the contamination of underground sources of drinking water, and to avoid creation of secondary hazards of geologic nature. The commission may grant exceptions to this chapter, after due notice and hearing, when such exceptions will result in the prevention of waste and operation in a manner to protect correlative rights.

History: Effective March 1, 1984.

General Authority: NDCC 38-19-03

Law Implemented: NDCC 38-19-03

43-02-07-03. Powers and duties. The state geologist shall act as a supervisor charged with the duty of enforcing the regulations and orders of the commission applicable to geothermal energy extraction facilities. All applications, correspondence, protests, and other communications shall be addressed to the state geologist as follows:

State Geologist
600 East Boulevard Avenue
Bismarck, ND 58505
(701) 328-8000

History: Effective March 1, 1984; amended effective October 1, 1990.

General Authority: NDCC 38-19-03

Law Implemented: NDCC 38-19-03

43-02-07-04. Authority to cooperate with other agencies. The commission may from time to time enter into arrangements with state and federal agencies, industry, and individuals with respect to special projects, services, and studies relating to geothermal energy.

History: Effective March 1, 1984; amended effective October 1, 1990.

General Authority: NDCC 38-19-03

Law Implemented: NDCC 38-19-03

43-02-07-05. Prohibition of movement of fluids into underground sources of drinking water. No producer may construct, operate, maintain, convert, plug, or abandon any geothermal energy extraction facility in a manner which causes or allows movement of fluid containing any contaminant into underground sources of drinking water or which may adversely affect human health. The applicant for a permit has the burden to prove that the requirements of this section are met.

History: Effective March 1, 1984; amended effective October 1, 1990.

General Authority: NDCC 38-19-03

Law Implemented: NDCC 38-19-03

43-02-07-06. Permit or report required. A permit is required prior to the commencement of operations for the drilling, boring, excavating, construction, or substantial modification of a geothermal energy extraction facility. A permit is not required for private residential heating or cooling purposes, nor for facilities that use a treated municipal water supply as its sole source of water. A permit may be required by the state department of health and consolidated laboratories or the water utility, or both, for facilities hooked into a municipal water supply. The state geologist may grant a permit for up to ten years upon receipt of a permit application on a form provided by the commission, the furnishing of a bond (if required) as provided in section 43-02-07-08, and the payment of a fee of one hundred dollars for each permit. The state geologist may waive the fee requirement if the applicant is an instrumentality of the state. The application for a permit must be accompanied by an accurate plat showing the location of the proposed facility with reference to the nearest lines of a governmental section.

The state geologist may deny an application for permit if the construction of a geothermal energy extraction facility would violate correlative rights or would cause, or tend to cause, waste, damage to the environment, or contaminate underground sources of drinking water. The applicant may appeal the decision of the state geologist to the commission.

A report is required upon completion of any geothermal energy extraction facility used solely for private residential heating or cooling purposes. The report must be prepared by the geothermal energy extraction facility installer on a form provided by the state geologist and furnished to the state geologist within thirty days after the completion of the facility. The report must contain relevant information the state geologist requires relating to the environmental safety of the facility, including the facility owner and location, a log of formations penetrated, if any, system specifications and design, and fluids used in the facility.

All construction of geothermal energy extraction facilities must comply with rules adopted under this chapter.

History: Effective March 1, 1984; amended effective October 1, 1990; December 1, 1992; August 1, 1995.

General Authority: NDCC 38-19-03

Law Implemented: NDCC 38-19-03, 38-19-04

43-02-07-07. Modification or revocation and reissuance of permit - Termination of permit - Transfer or renewal of permit.

1. Modification or revocation and reissuance of permit.
 - a. The commission may modify or revoke and reissue a permit if there are substantial alterations or additions to the permitted facility, or if the standards or regulations on which the permit was based have been changed by promulgation of amended standards or regulations or by judicial decision after the permit was issued.
 - b. When a permit is modified, only the conditions subject to modification are reviewed. If a permit is revoked and reissued, the entire permit is reviewed and subject to revision and the permit is reissued for a new term.
2. Termination of permit.
 - a. The commission may terminate a permit during its term or deny a renewal application for noncompliance by the permittee with any condition of the permit, the rules or regulations, or failure to disclose fully or misrepresent all relevant facts.
 - b. A permit may be terminated if the permitted activity endangers human health or the environment, or causes pollution to underground sources of drinking water.
3. Transfer or renewal of permit.
 - a. A permit may be renewed or transferred to a new owner or operator if the current permittee notifies the commission at least thirty days in advance of the proposed renewal or transfer date and provided the permit does not need to be modified or revoked and reissued.
 - b. A notice of transfer must include a written agreement between the existing and new permittees containing a specific date for transfer of permit responsibility, coverage, and liability between them. The notice must demonstrate that the financial responsibility requirements of section 43-02-07-09 will be met by the new permittee.

History: Effective March 1, 1984; amended effective October 1, 1990.

General Authority: NDCC 38-19-03

Law Implemented: NDCC 38-19-03, 38-19-04

43-02-07-08. Bond. Before any person receives a permit to drill, bore, excavate, or construct a geothermal energy extraction facility, the person shall submit to the commission and obtain its approval of a bond, on a form approved by the commission, conditioned as provided by law. Such a bond is not required for geothermal energy

extraction facilities used solely for private residential heating or cooling purposes. At the discretion of the state geologist, an installation or facility bond may be required for the substantial modification of a geothermal energy extraction facility in existence prior to December 1, 1992. The state geologist has the discretion to waive the requirement for a facility bond if the applicant is an instrumentality of the state. Each such bond must be executed by a responsible surety company authorized to transact business in this state.

The amount and type of the bond is as follows:

1. Shallow-well and horizontal-loop facilities.
 - a. The state geologist has the discretion to require a facility surety bond in the amount of fifteen thousand dollars for any shallow-well or horizontal-loop facility that, for any reason, constitutes a special threat to important ground water resources or the environment, or otherwise poses a significant public health hazard.
 - b. An installation surety bond in the amount of ten thousand dollars is required of installers of all shallow-well and horizontal-loop facilities used for other than private residential heating or cooling purposes. This is a blanket bond and must cover all permits for shallow-well and horizontal-loop facilities issued in one year commencing on the date the first permit covered by the bond is issued. Alternately, at the discretion of the state geologist, an installation surety bond in the amount of one hundred dollars for each well (loop) installed per year may be submitted.
 - c. In lieu of the installation surety bond in subsection b, the state geologist has the discretion to accept a cash bond of two thousand five hundred dollars for the installation of up to twenty loops per year for shallow-well closed-loop facilities.
 - d. The geothermal system installer must comply with North Dakota Century Code chapter 38-19 and all rules and orders of the commission as a condition of the installer's bond. Any violation of either North Dakota Century Code chapter 38-19 or the rules or orders of the commission makes the installer liable under the bond and the bond shall be subject to immediate forfeiture. The installer remains liable under the installation bond until construction of the geothermal energy extraction facility has been completed and the work has been approved by the state geologist. At the discretion of the state geologist, the installer's liability under the bond may be terminated at an earlier date when it can be demonstrated that only minor interior work remains to be completed and when completion of this work is subject to inordinate delays beyond the control of the geothermal system installer.
2. Deep-well facilities. A facility bond is required for all deep-well facilities. The amount of the facility bond must be a five thousand dollar bond for a deep-well facility with one supply well. The bond must increase in five thousand dollar increments for each additional supply well and each injection well.

The owner of a geothermal energy extraction facility shall be responsible for obtaining the facility bond in subdivision a of subsection 1 and subsection 2.

The owner of the geothermal energy extraction facility who is required to obtain a facility surety bond under either subdivision a of subsection 1 or subsection 2 must comply with North Dakota Century Code chapter 38-19 and all rules and orders of the commission as a condition of the owner's bond.

Any violation of either North Dakota Century Code chapter 38-19 or the rules or orders of the commission makes the owner liable under the facility surety bond, and the bond shall be subject to immediate forfeiture. The owner of the geothermal energy extraction facility remains liable under the bond until either of the following occurs: (1) the wells or loop systems have been satisfactorily plugged as provided in this chapter, the sites disturbed by any method of production of geothermal energy have been reclaimed in a manner approved by the state geologist, and all logs, plugging records, and other pertinent data required by statute or rules and orders of the commission are filed and approved; or (2) the liability on the bond has been transferred to another bond and such transfer approved by the commission.

The commission shall advise the surety and the principal when liability on a bond is terminated.

The state geologist is authorized to act for the commission as to all matters within this section.

History: Effective March 1, 1984; amended effective October 1, 1990; December 1, 1992; April 1, 1994; May 1, 1994; August 1, 1995.

General Authority: NDCC 38-19-03

Law Implemented: NDCC 38-19-03

43-02-07-09. Proof of financial responsibility. The permittee shall maintain financial responsibility and resources to close, plug, and abandon the geothermal energy extraction facility according to this chapter. The permittee shall show evidence of financial responsibility to the commission by the submission of surety bond, or other adequate assurance, such as financial statements or other materials acceptable to the commission.

History: Effective March 1, 1984.

General Authority: NDCC 38-19-03

Law Implemented: NDCC 38-19-03

43-02-07-10. Technical requirements. All wells must be made by a certified water or monitoring well contractor. All open-loop geothermal energy extraction facility wells must be in compliance with article 33-18. The location and construction of the borehole of closed-loop geothermal energy extraction facilities must be in compliance with article 33-18.

All geothermal energy extraction facilities, including horizontal-loop facilities, used for other than private residential heating or cooling purposes, must be approved by the state geologist prior to installation.

All heat transfer fluids and additives must be approved for use by the state geologist.

History: Effective March 1, 1984; amended effective December 1, 1992; August 1, 1995.

General Authority: NDCC 38-19-03

Law Implemented: NDCC 38-19-03

43-02-07-11. Completion report and basic data collected. Within thirty days after the completion of any geothermal energy extraction facility, a completion report must be filed with the state geologist, on a form

prescribed by the commission.

The following basic data developed by the producer must be delivered, free of charge, to the state geologist, if requested, within six months of the filing of the completion report:

1. Washed and packaged sample cuts, core chips, or whole cores minus those portions of cores used for necessary testing or analysis in which case the results of testing, the analysis, and the description of missing portions shall be submitted to the state geologist upon request. Sample cuttings must be packaged in standard sample envelopes which in turn must be placed in proper order in a standard sample box and carefully identified as to producer, well location, and depth of sample.
2. Sample logs, radioactivity logs, resistivity logs, or other types of electrical or mechanical logs.
3. Elevation and location information on the data collection points.
4. Other pertinent information as may be requested by the state geologist.

History: Effective March 1, 1984; amended effective October 1, 1990.

General Authority: NDCC 38-19-03

Law Implemented: NDCC 38-19-03

43-02-07-12. Production reports. The producer of each and every open-loop geothermal energy extraction facility used for other than private residential heating and cooling purposes shall on or before the first day of February of each year file with the state geologist a sworn statement showing the quantities, temperatures, and nature of products extracted from or by means of any facility during the month and the ultimate disposition of such products.

History: Effective March 1, 1984; amended effective October 1, 1990; December 1, 1992; August 1, 1995.

General Authority: NDCC 38-19-03

Law Implemented: NDCC 38-19-03

43-02-07-13. Records to be kept. All producers of geothermal energy within this state shall make and keep appropriate books and records for a period not less than ten years, from which they may be able to make and substantiate the reports required by this chapter.

History: Effective March 1, 1984; amended effective October 1, 1990.

General Authority: NDCC 38-19-03

Law Implemented: NDCC 38-19-03

43-02-07-14. Disposal of unusable products. The surface disposal or underground injection of unusable products or waste produced from a geothermal energy extraction facility must satisfy additional state laws and regulations. The state department of health and consolidated laboratories must be notified of the disposal method and may require a permit under North Dakota Century Code chapter 61-28 or North Dakota Administrative Code article 33-25.

History: Effective March 1, 1984.

General Authority: NDCC 38-19-03

Law Implemented: NDCC 38-19-03

43-02-07-15. Plugging and abandonment. Notice of intention to abandon any geothermal energy extraction facility must be filed with the state geologist by the producer prior to the commencement of plugging operations, on a form prescribed by the state geologist. The notice must state the name and location of the well or well field and the name of the producer.

Before any geothermal energy extraction facility is abandoned, it must be plugged in a manner which will confine permanently all subsurface minerals, oil, gas, and water in the separate strata originally containing them. This operation must be accomplished by the use of mud-laden fluid, cement, and plugs, used singly or in combination as may be approved by the state geologist. Casing must be cut off three feet [.91 meters] below the surface of the ground. The top plug in any hole must be set at least three feet [.91 meters] below ground level, and the land surface must be restored as nearly as possible to its original condition.

Shallow closed-loop systems using an approved heat transfer fluid may, upon approval of the state geologist, be abandoned by permanently sealing all of the loop ends and burying all pipes at least three feet [.91 meters] below ground. Closed-loop systems containing anything other than approved heat transfer fluids must be completely purged of heat transfer fluid prior to plugging. This fluid must be disposed of in accordance with the provisions of North Dakota Century Code chapter 61-28 and other state laws and regulations.

History: Effective March 1, 1984; amended effective October 1, 1990; December 1, 1992.

General Authority: NDCC 38-19-03

Law Implemented: NDCC 38-19-03

PART III--APPENDIX

SUMMARY OF FORMS

- FORM 1-ge GEOTHERMAL ENERGY EXTRACTION PERMIT APPLICATION. This form is to be used for all single or multiple, deep or shallow well extraction facilities.
- FORM 2-ge GEOTHERMAL ENERGY EXTRACTION FACILITY BOND. This form is to be used for facility and/or installation bonds required by Rule 43-02-07-08.
- FORM 3-ge GEOTHERMAL ENERGY SUNDRY NOTICES AND REPORTS. This form is to be used for filing notices of intention and reports of activity that may be required by the rules and regulations.
- FORM 4-ge GEOTHERMAL ENERGY REPORT OF PRODUCTION. This form satisfies Rule 43-02-07-12.
- FORM 5-ge GEOTHERMAL ENERGY EXTRACTION COMPLETION REPORT. This form satisfies part of Rule 43-02-07-11.
- FORM 6-ge GEOTHERMAL ENERGY EXTRACTION PLUGGING RECORD. This form satisfies part of Rule 43-02-07-15.

INSTRUCTIONS TO FILL OUT GEOTHERMAL ENERGY EXTRACTION FORMS

FORM 1-ge Geothermal Energy Extraction Permit Application.

The office of the State Geologist will retain two copies of this completed form. In submitting the form for approval prepare a sufficient number of copies to provide the amount your organization requires.

BE SURE THE FORM IS COMPLETE.

The signature of the person preparing the form is required in two places: on the line marked 'BY', and again on the line in the acknowledgment marked 'NAME'.

On the line marked 'NAME OF FACILITY OWNER' should be stated the name of the person or organization owning the facility. Unless otherwise stated this is the name under which the well will be carried in the files of the Industrial Commission. If some other designation is desired by the operator this should be noted under remarks on the line so designated. After the permit has been issued a fee of 25 dollars is required before a change in the well name can be made.

Unless the form is complete it will be returned without approval. **NO OPERATIONS FOR THE DRILLING OF THE WELL SHALL BE COMMENCED UNTIL THE APPROVED APPLICATION IS RECEIVED.**

This form must be accompanied by the \$100 permit fee payable to the Industrial Commission of North Dakota, Geological Survey, and a plat of the location.

FILE 2 COPIES OF THIS APPLICATION WITH THE STATE GEOLOGIST.

FORM 2-ge Geothermal Energy Extraction Bond.

BE SURE THAT THE BOND IS COMPLETE IN ALL RESPECTS.

Before the bond will be terminated the agents of the Industrial Commission will inspect the area of exploration to determine whether the site has been properly reclaimed. Only after the area of exploration has been approved by the inspector, and all records concerning the operation have been filed, will the surety be given permission to terminate its liability.

THIS BOND IS TO BE SUBMITTED TO THE STATE GEOLOGIST.

FORM 3-ge Geothermal Energy Sundry Notices and Reports.

The office of the State Geologist will retain two copies of the approved form. If you desire additional copies for your files be sure to supply sufficient copies of the notice.

Be sure that the form is complete. Unsigned forms will be returned.

In the space headed 'Details of Work' should be included all pertinent information. The proposed work will not be approved if there is any doubt as to the compliance with the applicable rules.

EMERGENCY PROCEDURE: The rules of the Industrial Commission require that this notice be filed and approval given before the proposed operation is started. If a situation exists where this procedure would constitute an undue hardship verbal permission may be obtained to proceed but, in any case, the form must be filed. Such verbal permission to proceed may be obtained from the Office of the State Geologist.

After the proposed operation is completed a report of the results of the operation must be filed where required by the applicable rules.

FILE TWO COPIES OF THIS FORM WITH THE STATE GEOLOGIST.

FORM 4-ge Geothermal Energy Report of Production.

The office of the State Geologist requires two copies of this form.

The information shown on this form must be accurate and complete. If any amounts shown are the result of estimates they should be so indicated. The completed form must be notarized.

FILE TWO COPIES OF THIS FORM WITH THE STATE GEOLOGIST.

FORM 5-ge Geothermal Energy Extraction Completion Report.

Within 30 days after the completion of the well, the operator shall file 2 copies of this form with the State Geologist.

Be sure that the form is complete. For those sections that do not apply, write Not Applicable (N/A).

FORM 6-ge Geothermal Energy Extraction Plugging Record.

Be sure that the form is complete and properly notarized.

Within 30 days after the plugging of any well has been accomplished, the owner or operator thereof shall file 2 copies of this form with the State Geologist, setting forth in detail the method used in plugging the well.

BE SURE ALL FORMS ARE COMPLETE.

BE SURE THAT YOU HAVE READ AND THOROUGHLY UNDERSTAND THE RULES AND REGULATIONS OF THE INDUSTRIAL COMMISSION OF NORTH DAKOTA, GEOLOGICAL SURVEY.

SEND TO:

**North Dakota Geological Survey
State Geologist
600 East Boulevard Avenue
Bismarck, ND 58505-0840**



GEOHERMAL ENERGY EXTRACTION PERMIT APPLICATION
INDUSTRIAL COMMISSION OF NORTH DAKOTA
GEOLOGICAL SURVEY
 SFN 11763 (12/97) (1-ge)

Date _____

SEE INSTRUCTIONS ON BACK OF FORM

Name (Operator) (Driller)			
Address	City	State	Zip Code

DESCRIPTION OF FACILITY

Name of Facility Owner			
Address	City	State	Zip Code

Extraction Well Location			
Sec.	Twp.	Range	County
Distance From Proposed Location to (N) (S) Section Line		Distance From Proposed Location to (E) (W) Section Line	
Feet		Feet	
Date Well Will Be Spudded	Number of Wells	Depth to Which Propose to Drill	Elevation of (ground) (KB) (DF) Above Sea Level
		Feet	Feet

Enclose a topographic map of the site and on this or another map show the planned location of all wells, piping, discharge points, etc.

Deep Well <input type="checkbox"/> No <input type="checkbox"/> Yes	Shallow Well <input type="checkbox"/> No <input type="checkbox"/> Yes	Closed-loop System <input type="checkbox"/> No <input type="checkbox"/> Yes- Describe the Type and Volume of the Solution to be Used Below.
Type of Solution		Volume of Solution
Open-loop System <input type="checkbox"/> No <input type="checkbox"/> Yes- Describe the Method of Injection or Disposal for the Used Groundwater		
Remarks		
Date	By	

STATE OF _____)
)ss
 COUNTY OF _____)

I certify that the statements made in this application are true, and understand (pursuant to Section 12.1-11.02, subsection 2 of the North Dakota Century Code) that it is a Class A misdemeanor to make a false written statement, or to intentionally create a false impression in a written application, in a governmental matter when the author does not believe it to be true.

Executed this _____ day of _____
 Name _____ Title _____

FOR OFFICE USE ONLY

Permit Number:
Approved:
Denied:
Signature (State Geologist):



GEOHERMAL ENERGY EXTRACTION BOND
INDUSTRIAL COMMISSION OF NORTH DAKOTA
GEOLOGICAL SURVEY
 SFN 11764 (11/97)

INSTALLATION BOND

SEE INSTRUCTIONS ON BACK OF FORM

KNOW BY ALL MEN BY THESE PRESENTS, that _____ a
 _____ of _____ in the state of _____ as
 principal and _____ a corporation of _____ a
 corporate surety company authorized to do business in the State of North Dakota, as surety, for and in consideration
 of the granting of a permit to drill pursuant to Chapter 38-19 NDCC and amendments thereto, and the rules and
 regulations adopted by the Industrial Commission of the State of North Dakota, under the authority of the said law,
 are held and firmly bound unto the State of North Dakota in the sum of
 _____ lawful money of the United States, to be paid to the State of North
 Dakota, for which payment, well and truly to be made, we bind ourselves and each of us, and each of our successors
 and assigns, jointly and severally, by these presents.

The condition of the foregoing obligations is such that, whereas the said principal is desirous of drilling wells to
 construct a geothermal energy extraction facility in North Dakota, and has made application for a permit to do so.

The foregoing obligation shall start on the date of issuance by the surety, _____,
 and shall expire when notice of cancellation is received by the State Geologist or after all remaining geothermal energy
 extraction facilities have been approved by the State Geologist, whichever is later. This is a blanket bond and shall
 cover all permits for shallow well and horizontal loop facilities issued during the term of this bond. The installer shall
 remain liable under the installation bond until construction of the geothermal energy extraction facilities has been
 completed and approved by the State Geologist.

NOW THEREFORE, if said principal, in its operations after the execution of permit by the State Geologist of the State
 of North Dakota shall fully comply with said Chapter 38-19 NDCC and amendments thereto, and the Rules and
 Regulations of the Industrial Commission of the State of North Dakota prescribed to govern the development of
 geothermal energy resources on State and Private lands within the State of North Dakota, then and in that event the
 above obligation shall be void, otherwise to remain in full force and effect.

WITNESSES:

COUNTERSIGNED:

STATE OF _____)
)ss
 COUNTY OF _____)

By _____
 ITS _____ PRINCIPAL

By _____
 ITS _____ SURETY

On this _____ day of _____, _____, before me, the undersigned, a Notary Public, within and for the County and State
 aforesaid, personally appeared _____, known to me to be the _____ of the
 _____ and acknowledged to me that he executed the within and foregoing instrument on behalf of said
 corporation.

 Notary Public

County of _____

My Commission expires _____

(Attached acknowledgment of surety)



GEOHERMAL ENERGY SUNDRY NOTICES AND REPORTS
INDUSTRIAL COMMISSION OF NORTH DAKOTA
GEOLOGICAL SURVEY
SFN 11765 (1-92) (3-ge)

SEE INSTRUCTIONS ON BACK OF FORM

Refer to Permit Number

(Indicate nature of notice by proper check mark in space below.)

1. Notice of Intention to Drill or Redrill		6. Report of Redrilling or Repair	
2. Notice of Intention to Change Plans		7. Supplementary History	
3. Notice of Intention to Pull Casing		8.	
4. Notice of Intention to Abandon Well		9.	
5. Report of Casing		10.	

Name of Well			Well Number	Date	
Well Location From (N) (S) Line Feet	Well Location From (E) (W) Line Feet	Section	Township	Range	
County	Elevation of the			is	Feet Above Sea Level
Name of Contractor or Company That Will Do The Work					
Address		City	State	Zip Code	

(DETAILS OF WORK)

(State names of, and expected depth of objective horizons; show sizes, weight, and lengths of proposed casing, indicate mud weights, cementing points, and all other details of work.)

Owner
Address
By
Title

Do not write in this section.

Date Approved
Approved By
Title



GEOHERMAL ENERGY REPORT OF PRODUCTION
INDUSTRIAL COMMISSION OF NORTH DAKOTA
GEOLOGICAL SURVEY
 SFN 11766 (1-92) (4-ge)

SEE INSTRUCTIONS ON BACK OF FORM

Name of Facility		Permit Number
Owner		County
Signature		This Correction Report of Production is for the Month of 20
		Title

WELL NO.	SEC. & 1/4 OF 1/4	TWP.	RGE.	DAYS PRODUCED	VOLUME OF WATER PRODUCED	TEMPERATURE OF PRODUCED WATER	ULTIMATE DISPOSITION OF WATER (DISPOSAL)

This form is required as a regular monthly report, regardless of the status of operations, and must be filed with the State Geologist by the 15th of the succeeding month.

EXECUTED THIS _____ DAY OF _____ 20 ____.

Name of Company or Operator	
Signature	Title

STATE OF _____)
)ss
 COUNTY OF _____)

Before me the undersigned authority, on this day personally appeared _____ known to me to be the person whose name is subscribed to the above instrument, who being by me duly sworn on oath states that he is authorized to make this report and has knowledge of the facts stated herein and that said report is true and correct.

Subscribed and sworn to before me this _____ day of _____ 20 ____.

 Notary Public
 County of _____
 My Commission expires _____



GEOHERMAL ENERGY EXTRACTION COMPLETION REPORT
INDUSTRIAL COMMISSION OF NORTH DAKOTA
GEOLOGICAL SURVEY
 SFN 11767 (12/97) (5-ge)

Permit Number (for commercial installation only)

Installation
 Private Residential
 Commercial/Industrial

Date

SEE INSTRUCTIONS ON BACK OF FORM

Name of Operator			
Address		City	State Zip Code
Location Sec: T: R: County:			
Deep Well System <input type="checkbox"/> Yes <input type="checkbox"/> No	Shallow Well System <input type="checkbox"/> Yes <input type="checkbox"/> No	Closed-loop System <input type="checkbox"/> Yes <input type="checkbox"/> No	Open-loop System <input type="checkbox"/> Yes <input type="checkbox"/> No
Date Project Began	Date Project Completed	Number of Wells Total: Supply: Injection:	
Depth of Wells	Diameter of Wells	Producing Formation	
List of Logs			
Intervals Cored or Sampled			
Disposition of Cores or Samples			
Date of Pressure Test	Results of Pressure Test		
Type of Solution Used	Total Volume of Solution Used	% Heat Transfer Fluid Used	Usage Heating: Cooling: Both:
Rates gpm	Hours per Day	Days per Month	Months of the Year
Total amount of water to be reinjected into the aquifer or disposed of at the surface Gallons per Year			

Attach a scaled drawing of the completed well field indicating depth of wells or loops, distances from permanent bench marks, details of casing, grout and pipe materials, etc. Include a scaled profile of a typical well or loop showing geology, piping, grout, etc.

Name of Company or Operator	
Signature	Title

STATE OF _____)
)ss
 COUNTY OF _____)

I certify that the statements made in this completion report are true and understand (pursuant to Section 12.1-11.02, subsection 2 of the North Dakota Century Code) that it is a Class A misdemeanor to make a false written statement, or to intentionally create a false impression in a written application, in a governmental matter when the author does not believe it to be true.

Executed this _____ day of _____.

Name _____ Title _____



GEOHERMAL ENERGY EXTRACTION PLUGGING RECORD
 INDUSTRIAL COMMISSION OF NORTH DAKOTA
 GEOLOGICAL SURVEY
 SFN 11768 (1-92) (6-ge)

SEE INSTRUCTIONS ON BACK OF FORM

Name of Operator				Permit Number	
Name of Facility				Well Number	
Location (1/4 1/4): Sec: Twp: Rge:					
Elevation				County	
(D.F., G.R., K.B.)					
Name of Person to Mail Correspondence Concerning This Form					
Address			City		State Zip Code
Date Well Was Spudded			Date Well Was Plugged		
Total Depth				Electric or other logs run? <input type="checkbox"/> No <input type="checkbox"/> Yes	
Was this well cored? <input type="checkbox"/> No <input type="checkbox"/> Yes-Give Intervals					
Disposition of Cores					
Was the well filled with mud laden fluid, according to regulations of the State Industrial Commission? <input type="checkbox"/> No <input type="checkbox"/> Yes			How was mud applied?		Were plugs used? <input type="checkbox"/> No <input type="checkbox"/> Yes-Answer Question Below
Show all casing, sizes and lengths of casing, size and kind of plugs used, and depths placed. Also amount of cement used.					

EXECUTED THIS _____ DAY OF _____ 19 ____.

Name of Company or Operator	
Signature	Title

STATE OF _____)
)ss
 COUNTY OF _____)

Before me the undersigned authority, on this day personally appeared _____ known to me to be the person whose name is subscribed to the above instrument, who being by me duly sworn on oath states that he is authorized to make this report and has knowledge of the facts stated herein and that said report is true and correct.

Subscribed and sworn to before me this _____ day of _____ 19 ____.

 Notary Public
 County of _____
 My Commission expires _____

ADDITIONAL RULES AND REGULATIONS:

North Dakota Administrative Code

ARTICLE 33-18

WATER WELL CONTRACTORS

Chapter	
33-18-01	Water Well Construction and Water Well Pump Installation
33-18-02	Ground Water Monitoring Well Construction Requirements

CHAPTER 33-18-01

**WATER WELL CONSTRUCTION AND
WATER WELL PUMP INSTALLATION**

Section	
33-18-01-01	Responsibility
33-18-01-02	Definitions
33-18-01-03	Plans and Specifications
33-18-01-04	Location of Wells
33-18-01-05	Protection of Ground Water Sources
33-18-01-06	General Well Construction Requirements
33-18-01-07	Pump Installation for Water Wells
33-18-01-08	Storage Tanks
33-18-01-09	Materials for Water Distribution
33-18-01-10	Cross-connection Control

33-18-01-01. Responsibility. It is the responsibility of any person, partnership, association, or corporation engaged in the business of construction of water wells or the installation of water well pumps, pitless units, or other appurtenances, or both, to comply within the meaning of this chapter pursuant to North Dakota Century Code chapters 23-01, 43-35, and 61-28.1.

A person, partnership, association, or corporation may not engage in the business of water well construction or the installation of water well pumps, pitless units, or other appurtenances, or both, unless a certified water well contractor or water well pump and pitless unit installer is in charge.

The certified water well contractor or water well pump or water well pump and pitless installer in charge shall provide inspection and supervision of all water well construction activities or installation of water well pumps, pitless units, or other appurtenances, or both.

History: Amended effective January 1, 1984; April 1, 1997.

General Authority: NDCC 43-35-19

Law Implemented: NDCC 43-35-19

33-18-01-02. Definitions. For the purpose of this chapter, the following definitions shall apply:

1. “Abandoned well” means a well whose use has been permanently discontinued.
2. “Annular space” means the opening between a well hole excavation and the well casing or curb, or between a casing pipe and a liner pipe.
3. “Appurtenances” means valves, meters, taps, gauges, or other devices required for adequate control or measurement of the well output.
4. “Aquifer” means a water-bearing formation that transmits water in sufficient quantities to supply a well.
5. “Casing” shall mean the pipe installed in the drill hole to give unobstructed access to the water-bearing formation.
6. “Constructing” a well includes boring, digging, drilling, or excavation in installing casings, well screens, and other appurtenances.
7. “Contamination” means alteration of the physical, chemical, or biological quality of the water so that it is harmful or potentially injurious to the health of the users or for the intended use of the water.
8. “Department” means the North Dakota state department of health.
9. “Disinfection” means the killing of infectious agents outside the body by chemical or physical means.
10. “Drawdown” means the extent of lowering the water surface in a well and of the water table adjacent to the well, resulting from the discharge of water from the well by pumping or natural flow.
11. “Drilling” means making any opening in the earth’s surface by drilling, boring, or otherwise, and includes inserting any object into any part of the earth’s surface for the purpose of obtaining an underground water supply except drainage tiles or similar devices designed primarily to improve land by removing excess water.
12. “Established ground surface” means the permanent elevation of the surface of the ground at the site of the well.
13. “Filter pack” means a clean sand or sand and gravel material of selected grain size and gradation which is installed in the annular space between a well hole excavation and the outside of the well screen for the purpose of preventing formation material from entering the screen.
14. “Ground water source” means all water obtained from dug, drilled, bored, or driven well, infiltration lines, and springs.
15. “Grout” or “grouting material” means any stable impervious bonding material which is capable of providing a watertight seal between the casing and the formation throughout the depth required to protect against objectionable matter and which is reasonably free of shrinkage.

16. “Liner pipe” means a pipe installed inside a completed and cased well for the purpose of sealing off undesirable water or for repairing ruptured or punctured casing or screens.
17. “Pitless adapter” means a commercially manufactured device designed for attachment to a well casing and is so constructed as to prevent the entrance of contaminants into the well or potable water supply, conduct water from the well below the frostline to prevent freezing, and provide full access to the water system components within the well.
18. “Pitless unit” means a factory-assembled device with cap which extends the upper end of a well casing to above grade and is so constructed as to prevent the entrance of contaminants into the well or potable water supply, conduct water from the well below the frostline to prevent freezing, and provide full access to the well and the water system components within the well.
19. “Potable water” means water free from impurities in amounts sufficient to cause disease or harmful physiological effects, with the bacteriological and chemical quality conforming to applicable standards.
20. “Private water supply” means one that is not for public use.
21. “Pressure tank” or “hydropneumatic tank” means a closed water storage container constructed to operate under a designed pressure rating to modulate the water system pressure within a selected range.
22. “Public water supply” means a water supply connected to at least fifteen service connections or regularly serves an average of twenty-five persons daily, sixty days out of the year.
23. “Pumps” and “pumping equipment” means any equipment or materials utilized or intended for use in withdrawing or obtaining ground water for any use, including, without limitation, seals and tanks, together with fittings and controls.
24. “Repair” means any action which results in a breaking or opening of the well seal or replacement of a pump.
25. “Shall” means mandatory compliance with all aspects of the rules and regulations for water well construction and water well pump installation.
26. “Should” means provisions which are not mandatory but which are recommended or desirable procedures or methods. Deviation from the rules and regulations for water well construction and water well pump installation is subject to individual consideration.
27. “Static water level” means the elevation of the surface of the water in a well when no water is being discharged therefrom.
28. “Water well contractor” means any person who is certified to conduct the business of well drilling under the provisions of North Dakota Century Code chapter 43-35.
29. “Water well pump and pitless unit installer” means any person who is certified to conduct the business of installing water well pumps and pitless units under the provisions of North Dakota Century Code chapter 43-35.

30. “Well development” means the general process to achieve sand-free water at the highest possible well capacity.
31. “Well seal” means an approved arrangement or device used to cap a well or to establish and maintain a junction between the casing or curbing of a well and the piping or equipment installed therein, the purpose or function of which is to prevent pollutants from entering the well at the upper terminal.
32. “Well vent” means an outlet at the upper terminal of the well casing to allow equalization of air pressure in the well and escape of toxic or inflammable gases.
33. “Wells” means any artificial opening or artificially altered natural opening however made by which ground water is sought or through which ground water flows under natural pressure or is artificially withdrawn; provided, that this definition does not include a natural spring, stock ponds, or holes drilled for the purpose of exploration for production of oil, gas, gravel, or other minerals.

History: Amended effective September 1, 1986; April 1, 1997.

General Authority: NDCC 43-35-19, 43-35-19.1

Law Implemented: NDCC 43-35-19, 43-35-19.1

33-18-01-03. Plans and specifications. No public water well shall be constructed or modified, or water well pump, pitless unit, or other appurtenances be installed without prior approval of plans and specifications. Plans and specifications shall be submitted to the department for review prior to construction. Note chapter 33-03-08. The plans and specifications shall include:

1. Proposed well location.
2. Location and depths of existing wells, location of septic tanks, absorption fields, sewers, barnyards, feedlots, landfills, and high water marks of lakes or streams with a radius of five hundred feet [152.4 meters].
3. Elevation of highest known flood levels, upper terminal of well casing, floor of structure, and outside grade.
4. A schematic drawing of the well construction showing diameter and depth of drill holes, casing and liner diameters and depths, grouting depths, and other details as necessary to completely describe the proposed well.
5. Certification that the state engineer, North Dakota state water commission, has issued a conditional water permit for the beneficial use of water from the well to be constructed, if such a permit is required pursuant to North Dakota Century Code section 61-04-02. Routine maintenance and repair does not require submission of plans and specifications.

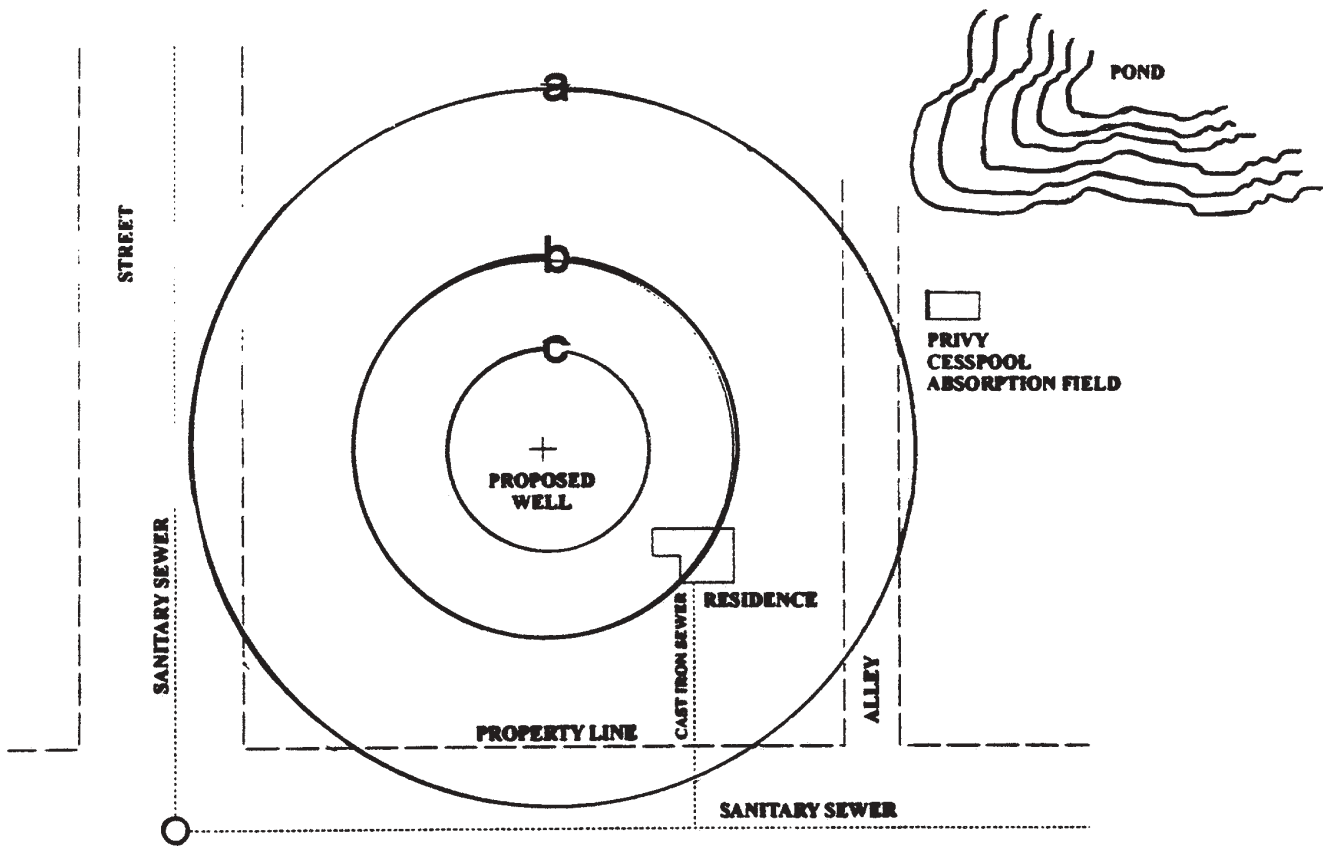
History: Amended effective January 1, 1984.

General Authority: NDCC 43-35-19

Law Implemented: NDCC 43-35-19

33-18-01-04. Location of wells.

1. **Relation to sources of contamination.** Determination of minimum lateral distances of a well from potential sources of contamination, involves evaluation of the character and location of the sources of contamination, types of geologic formations, depth to the aquifer, effect on ground water movement by well pumping, and possibilities of flooding of the site by surface waters. Based on experience, accepted minimum lateral distances for some common sources of pollution with respect to a well have been established. The lack of specific distances for other possible sources of contamination such as refuse disposal sites, excavations, waste treatment facilities, buried oil and gasoline storage tanks, improperly constructed wells and cisterns, etc., does not contaminate underground sources of drinking water. The applicant may appeal the decision of the state geologist to minimize their potential hazards.



The site should be on high ground and be:

- a. At least one hundred feet [39.48 meters] (fifty feet [13.24 meters] for private wells) from privy pits, cesspools, septic tanks, absorption fields, barnyards, feedlots, high water marks of lakes, streams, sloughs, ponds, etc., when well is constructed in unconsolidated soils with filtering properties.
- b. At least thirty feet [9.14 meters] from sewerlines.
- c. At least ten feet [3.05 meters] from basements or pits.
- d. At least twenty feet [6.1 meters] from overhead powerlines and other hazardous devices. Note North Dakota Administrative Code section 24-02-01-03.

Greater distances are always preferable and often necessary, depending upon soil conditions. When wells are constructed in consolidated formations, care must be taken in locating the wells as pollutants have traveled great distances in such formations.

2. Relation to buildings. When a well must be located adjacent to a building, it shall be located so that the centerline of the well extended vertically will clear any projection from the building by not less than two feet [0.609 meter].

Every well shall be reasonably accessible for proper repair, cleaning, testing, inspection, or other attention as may be necessary.

The well casing shall not extend through nor shall the top of the well casing or any other well opening terminate in the basement of any building or in a pit, room, or other space which is below ground surface.

History: Amended effective January 1, 1984.

General Authority: NDCC 43-35-19

Law Implemented: NDCC 43-35-19

33-18-01-05. Protection of ground water sources.

1. **Minimum protective depths of wells.** All wells shall be watertight to exclude contamination. Wells shall be designed to seal off formations that are or may be contaminated or undesirable.

Unless approved otherwise by the department, the annular space between a well hole excavation and the outside of the well casing shall be filled with neat cement grout, high solids bentonite clay grout, bentonite chips, or bentonite tablets at least one and one half inches [3.81 centimeters] in thickness from a depth of not less than thirty feet [9.1 meters] to the ground surface or the upper end of the well casing if a pitless unit or adapter is installed. Wells with a depth of thirty feet [9.1 meters] or less shall be grouted from within two feet [0.609 meter] of the top of the well screen to the ground surface or the upper end of the well casing if a pitless unit or adapter is installed. Greater depths are preferable and may be required for specific installations as determined by review of the plans and specifications.

The annular space of wells constructed in unconsolidated formations without overlying confining beds and static water levels less than thirty feet [9.1 meters] below the ground surface shall be filled with neat cement grout, high-solids bentonite clay grout, bentonite chips, or bentonite tablets at least one and one-half inches [3.81 centimeters] in thickness from the static water level or a depth of not less than ten feet [3.0 meters], whichever is greater, to the ground surface or the upper end of the well casing if a pitless unit or adapter is installed.

Driven well casing may, when conditions warrant, be installed without grouting.

2. **Required protection for various sources.**
 - a. Radial collector wells. The location of all caisson construction joints and porthole assemblies shall be indicated. The caisson wall shall be substantially reinforced. Radial collectors shall be in areas

and at depths approved by the department. Provisions shall be made to assure minimum vertical rise. The top of the caisson shall be covered with a watertight floor. All openings in the floor shall be curbed and protected from entrance of foreign material. Pump discharge piping shall not be placed through caisson walls.

- b. Dug or bored wells. Dug or bored wells greater than two feet [0.609 meter] in diameter shall be developed only where geological conditions preclude the development of a satisfactory drilled well.

Every dug or bored well shall have a continuous watertight casing. The section of casing in the producing zone serving as the well screen, shall readily admit water and be structurally sound to withstand external pressures. The open space between the excavation and the installed casing shall be sealed with neat cement grout, high-solids bentonite clay grout, bentonite chips, or bentonite tablets.

The watertight casing shall extend at least twelve inches [30.48 centimeters] above finished ground surface. A cover slab at least four inches [10.16 centimeters] thick, adequately reinforced and having a diameter sufficient to overlap the lining by two inches [5.08 centimeters] shall be provided. The slab shall be constructed without joints.

The top of the slab shall be sloped to drain to all sides and a watertight joint made where the slab rests on the well casing using cement mortar or a mastic compound.

A manhole, if installed, shall be provided with a curbcast in the slab and extending at least four to six inches [10.16 to 15.24 centimeters] above the slab. The manhole shall have a watertight overlapping cover extending down around the curb by at least two inches [5.08 centimeters].

Adequate sized pipe sleeve or sleeves shall be cast in place in the slab to accommodate the type of pump or pump piping proposed for the well.

- c. Infiltration wells. Infiltration wells may be considered where geological conditions preclude possibility of developing an acceptable drilled well. The area around the well shall be under the control of the water purveyor for a distance acceptable to or required by the department. The flow in the lines shall be by gravity to a collecting well. The water shall be continuously chlorinated to assure bacterial purity.
- d. Flowing wells. The construction of flowing wells shall be in compliance with North Dakota Century Code chapter 61-20.

The construction of flowing wells shall be such that the flow from them can be controlled. Well casing shall be installed, and the annular space grouted with neat cement to form a tight seal. The neat cement grout shall extend upward from within twenty feet [6.1 meters] of the top of the aquifer to the ground surface or the upper end of the well casing if a pitless unit or adapter is installed.

Well casings shall be joined in a watertight manner. Flow control should consist of valved pipe connections, watertight pump connections, or receiving reservoirs set at an elevation corresponding to the artesian head.

- e. Existing wells. The department shall be consulted for requirements concerning the reconstruction of existing wells.

History: Amended effective January 1, 1984; September 1, 1986; April 1, 1997.

General Authority: NDCC 43-35-19, 43-35-19.1

Law Implemented: NDCC 43-35-19, 43-35-19.1

33-18-01-06. General well construction requirements.

1. **Construction water.** Water used in the drilling process shall be obtained from a source which will not result in contamination of the well. Chlorination of the water with an initial dosage of not less than fifty milligrams per liter (one gallon [3.78 liters] of laundry bleach or 0.6 pounds [1.32 kilograms] of calcium hypochlorite per one thousand gallons [3.78 kiloliters] of drilling water) is recommended.

Waters from surface sources must be chlorinated with a minimum dosage of one hundred milligrams per liter (two gallons [7.56 liters] of laundry bleach or 1.2 pounds [2.64 kilograms] of calcium hypochlorite per one thousand gallons [3.78 kiloliters] of drilling water).

2. **Ferrous well casing.**

- a. General. Casing and liner pipe of wrought iron or steel through ten inches [25.4 centimeters] in diameter shall be prime pipe meeting current American Society for Testing and Materials Schedule 40, or equivalent specifications. Larger diameter pipes shall have a minimum wall thickness of three hundred seventy-five thousandths of an inch [0.952 centimeters].

All casing shall have additional thickness and weight if standard thickness is not considered sufficient to assure reasonable life expectancy of the well or be capable of withstanding forces to which they are subjected.

- b. Drive shoe. Pipe that is to be driven shall be equipped with a drive shoe or other device approved by the department.
- c. Joints. Casing and liner pipe joints shall be properly welded or threaded.

3. **Nonferrous well casing.**

- a. General. Pipe other than wrought iron or steel must be adaptable to the stresses to which they will be subjected during and after installation and to the corrosiveness of the water.
- b. Thermoplastic well casing. Thermoplastic well casing shall conform with American Society for Testing and Materials Specification F480-81 or latest revision as follows:
 - (1) Minimum standard dimension ratio shall be twenty-one for casings less than sixteen inches [40.64 centimeters] in diameter. Minimum standard dimension ratio shall be twenty-six for casings sixteen inches [40.64 centimeters] in diameter or larger. Casing with a lower standard dimension ratio (additional thickness) must be used when the minimum standard

dimension ratio is not capable of withstanding the stresses encountered during and after installation.

- (2) Minimum pipe stiffness shall be two hundred twenty-four pounds foot/ (inch - inch) (kiloneutron/ (meter - meter)) when tested according to section 5.4.1 of American Society for Testing and Materials Specification F480.
 - (3) All casing five inches [12.7 centimeters] and larger shall be tested for impact resistance and meet or exceed IC-1 impact classification according to section 6.5 and table 6 of American Society for Testing and Materials Specification F480.
- c. Other materials. Other well casing materials that may be proposed shall carry the seal of the national sanitation foundation and be approved in writing by the department prior to installation.
4. **Packers.** Packers shall be of a material that will not impart taste, odors, toxic substances, or bacterial contamination to the water in the well.
 5. **Screens.** Screens must be constructed of corrosion-resistant material and sufficiently strong to withstand stresses encountered during and after installation. Screen slot openings, screen length, and screen diameter should be sized and designed to provide sufficient open area consistent with strength requirements to transmit sand-free water at a capacity at least equal to one and one-half times the capacity of water anticipated. Screen slot size should be based on sieve analysis of formation samples.

Screens should be installed so that exposure above pumping level will not occur. A screen must be attached or connected to the casing by a threaded, solvent-welded, or welded joint or by threaded fasteners or a nontoxic packer. Solvent-welded joints should not impart taste, odors, toxic substances, or bacterial contamination to the water in the well.
 6. **Filter pack.** Material used as a filter pack shall be sand or sand and gravel that is free of foreign material, properly sized, washed, and then disinfected prior to or during placement. Provisions for prevention of leakage of grout into the filter pack or screen shall be provided.
 7. **Well development.** Every well shall be developed prior to yield and drawdown testing. Well development includes procedures to apply physical energy to the screen and aquifer formation adjacent to the well. After development, the well should produce sand-free water at a capacity at least equal to one and one-half times the capacity of water anticipated.
 8. **Yield and drawdown test.** Every well should be tested for yield and drawdown. The test method to be followed should be clearly outlined in the specifications. The test pump should have a maximum capacity at least equal to one and one-half times the capacity of water anticipated. The test pump should be able to operate continuously until the rate of decline of the pumping water level has stabilized. Test data to be recorded should include:

a. Static water level.

b. Pumping rate.

- c. Drawdown during test.
- d. Recovery water levels.
- e. Depth of pump setting.

Duration of the test shall be determined with due consideration given to pumping of sand, clarity of water pumped, and the obtaining of a representative sample of water for chemical analysis.

- 9. **Chemical conditioning.** When chemical treatment of a public well is proposed, the method of conditioning shall be included in the specifications. The equipment, chemicals, and inhibitors to be used, the method of testing for chemical residuals and the disposal of waste shall be indicated.
- 10. **Grouting requirements.**
 - a. Neat cement grout. The mixture should consist of one sack of cement (ninety-four pounds [42.64 kilograms]) to not more than six gallons [22.71 liters] of clean water. Bentonite additives up to five pounds [2.27 kilograms] per sack of cement to increase fluidity may be used. Pozzuolana additives up to thirty-three pounds [14.97 kilograms] per sack of cement may be used.
 - b. Heat of hydration. Care must be used when grouting thermoplastic well casing with neat cement grout. Heat caused by hydration during curing of the cement may cause weakening of the well casing. High peak temperatures may be minimized by adding sand or bentonite clay to the neat cement grout mixture to increase the curing time. The amount of sand or bentonite clay added to the neat cement grout may not exceed five pounds [2.27 kilograms] per sack of cement.
 - c. High-solids bentonite clay grout. The mixture must consist of not less than three pounds [1.36 kilograms] of bentonite clay per gallon [3.79 liters] of clean water. High-solids bentonite clay grout, bentonite chips, or bentonite tablets must be commercially prepared specifically for the purpose of sealing water wells. The use of bentonite drilling fluids as a grouting material is not permitted.
 - d. Grouting guides. Casing that is to be grouted in the drill hole or annular opening shall be provided with sufficient guides welded to the casing to permit the unobstructed flow and uniform thickness of grout.
 - e. Grout application. Grout material must be positively and accurately placed to fill all voids. All grouting should be performed by adding the mixture, from the bottom of the annular space upward, in one continuous operation, until the annular space is filled. Sufficient annular opening shall be provided to permit a minimum of one and one-half inches [3.81 centimeters] of grout around the casing, including couplings, if used. Bentonite chips or tablets may be added from the top of the annular space to a maximum depth of thirty feet [9.1 meters] provided the grout material is positively and accurately placed to fill all void and hydrated after placement.
- 11. **Plumbness and alignment.** Every well shall be tested for plumbness and alignment upon completion of construction. The casing shall be sufficiently plumb so as not to interfere with the installation and operation of the pump. (See recommended procedures in the appendix to this chapter.)

12. **Well construction data.** The water well contractor shall provide the North Dakota board of water well contractors with an accurate record of well construction data. Drill cuttings should be obtained at five-foot [1.52-meter] intervals, and at all pronounced changes in formation. Well construction data shall include an accurate record of the drill hole diameters and depths, assembled order of size and length of casings and liners, grouting depths, formations penetrated, water levels, location of blast shots, and pumping tests. Well construction report forms are available from the North Dakota board of water well contractors.

13. **Upper terminal of well.** The casing or pitless unit for all ground water sources shall project not less than twelve inches [30.48 centimeters] above the final ground elevation, the well cover slab, or pumphouse floor.

Sites subject to flooding shall have the top of the protective casing, pitless unit, the cover of every dug well, and the floor of the pumphouse at least two feet [0.609 meter] above the highest known flood elevation and be surrounded by earthfill.

14. **Capping.** The well must be protected during construction. A properly fitted cap designed for the type of well casing installed shall be used to protect the well from surface contamination until pumping equipment is installed.

15. **Bacteriological and chemical quality of water.** Every new, modified, or reconditioned ground water source shall be thoroughly cleaned and disinfected after the completion of construction and again after the permanent pump has been installed. The certified water well contractor or pump and pitless unit installer in charge during well construction and pump installation shall advise the well owner that one or more water samples from the source should be submitted to the department or other approved laboratory for bacteriological analysis and that the well should not be placed into service until satisfactory bacteriological results are obtained.

Wells intended for use by a public water system shall be sampled for bacteriological analysis and the following chemicals and not placed into service until the results are deemed by the department to comply with the primary drinking water standards established under the Safe Drinking Water Act: antimony, arsenic, barium, beryllium, cadmium, chromium, copper, cyanide, fluoride, lead, mercury, nickel, combined nitrate/nitrite, selenium, thallium, manganese, and sulfate. When it is established that the ground water is subject to continuous or intermittent contamination, or for public water systems that the ground water is under the direct influence of surface water, provisions for continuous disinfection will be required.

16. **Chemical quality of water.** Every new, modified, or reconditioned ground water source should be examined for its chemical characteristics by tests of a representative sample in a department or other approved laboratory. The samples should be collected and tested as soon as practical.

17. **Water level measurement.** Provisions should be made for periodic measurement of the static and pumping water levels in the completed well. The installation shall be made in such manner as to prevent the entrances of foreign material.

18. **Water supply wells, geothermal ground water and return wells, and special purpose water wells.** All wells designed as water supply wells, geothermal ground water or return wells, or special

purpose water wells shall be constructed in accordance with this chapter. Each well shall be protected at its upper terminal to preclude the entrance of foreign materials.

19. **Abandoned wells.** Any abandoned water wells, including test wells, uncompleted wells, and completed wells shall be sealed by restoring as far as possible the controlling geological conditions which existed before the wells were drilled.

Sealing of wells results in:

- a. Elimination of physical hazards.
- b. Prevention of contamination of ground water.
- c. Conserving yield and hydrostatic head of aquifers.
- d. Prevention of intermingling of desirable and undesirable waters.

Wherever feasible the wells should be filled with concrete grout or other approved materials. (Note recommended grouting procedures in the appendix to this chapter.)

At no time shall any sewage or other contaminated or toxic materials be discharged into an abandoned well.

20. **Organic polymers.** The use of biodegradable organic polymers as a drilling fluid additive has resulted in persistent microbiological contamination of ground water supplies. Organic polymer shall be used only when approved in writing by the department for a specific well construction project.

History: Amended effective January 1, 1984; September 1, 1986; April 1, 1997.

General Authority: NDCC 43-35-19, 43-35-19.1

Law Implemented: NDCC 43-35-19, 43-35-19.1

33-18-01-07. Pump installation for water wells.

1. **Pumphouse appurtenances.** The installation of necessary appurtenances for public wells shall be as illustrated in pump installation details contained in the diagrams attached to this chapter.
 - a. **Floor drain.** The pumphouse floor shall be watertight and shall slope away from the pump base. The pumphouse floor shall be provided with a floor drain discharging to a sump at least twenty-five feet [7.62 meters] from the well.
 - b. **Vents.** Provisions shall be made for venting the well casing to atmosphere. There shall be no holes in the pump base which might allow wastewater or other material to enter the well. A breather tube shall be installed of sufficient size to permit air to enter and leave the well freely with the changing of water elevation caused by starting and stopping the pump. The breather tube shall terminate in a full one hundred eighty degree bend at least eighteen inches [45.72 centimeters] above the floor, securely screened with sixteen mesh wire screen. If the breather tube or a depth gauge line passes

through the base of the pump or through the seal connection into the well, the hole about the tube shall be sealed.

- c. **Water level measurement.** An access plug for a measuring tape or an air line and drawdown gauge for determining location of the water level shall be installed during the installation of the pump on all public wells. Installation of permanent water level measuring equipment shall be made using corrosion-resistant materials firmly attached, in a vertical position, to the drop pipe or pump column in such a manner as to prevent entrance of foreign materials. The air line shall extend from the top of the well to several feet [meters] below the lowest anticipated water level. The length of the air line shall be accurately measured and the length recorded.
2. **Cutting of well casing.** No casing shall be cut off or cut into below ground level except to install a pitless unit or adapter.
 3. **Pitless unit and adapter.**
 - a. Pitless unit. Pitless units designed to replace a section of well casing must meet the standards of the national sanitation foundation or the water systems council and must:
 - (1) Be factory fabricated from point of connection with the well casing to the unit cap or cover. The materials used must be durable, at least equal in quality to the well casing, to prevent excessive corrosion.
 - (2) Form an unbroken extension of the well casing from the point of discharge to a point above ground level as specified for upper well terminals.
 - (3) Have an inside diameter equal to or greater than the inside diameter of the well casing to facilitate work and repair on the well, pump, or well screen. Any deviation from this paragraph must be approved in writing by the department.
 - (4) Conduct water from a well casing without exposing the well to contamination through openings in the casing.
 - (5) Have access to the casing for disinfection of the well.
 - (6) Be capped with a cover having a downward flange which will overlap the edge of the unit. The cover must be securely fastened to the unit and must be sufficiently snug to the unit to be verminproof or watertight if required

The cover must provide for watertight entrance of electrical cables, vent piping, and an air line or a tap for wetted tape measurements of depth to water level of a well.
 - (7) Be installed by threaded, welded, or compression flange gasketed connection to the cutoff casing. The threaded, welded, or compression flange gasketed connection to the cutoff casing must be watertight. If the connection to the casing is to be a field weld, the factory-assembled unit must be designed specifically for field welding.

- (8) Have all field connections between the pitless unit and the water service pipe threaded, flanged, or mechanical joint.
- b. Pitless adapter. Commercially manufactured clamp-on or weld-on pitless adapters for attachment to the exterior of a well casing may be installed when approved by the department. Pitless adapters must be installed according to manufacturer's specifications and meet the standards of the national sanitation foundation. A list of approved pitless adapters is available from the department.
- (1) Pitless adapters must be constructed and installed so as to prevent the entrance of contaminants into the well or water supply through openings in the well casing.
 - (2) The pitless adapter must provide adequate clearance within the well to permit insertion and withdrawal of the pump and system components through the upper terminal of the well casing.
 - (3) The pitless adapter must be connected to the well casing with clamps-and-gasket or by welding and must be watertight. To assure a watertight connection between the pitless adapter and the well casing, care must be used in cutting the hole in the well casing, preferably with a hole-cutting saw. All burrs from the cutting process must be removed. Both the outside and the inside surfaces of well casing surrounding the hole must be smooth.
 - (4) A pitless cap or cover must enclose the upper terminal of the well casing. The cap, entrance of electrical cables, vent piping, air lines, etc., must be as specified for pitless units.
 - (5) All field connections between the pitless adapter and the water service pipe must be threaded, flanged, or mechanical joint.
 - (6) All other aspects of pitless adapter requirements must be as specified for pitless units.
- c. Freezing. Water service piping must be installed below recorded frost penetration. A minimum depth of seven feet [2.28 meters] below grade is recommended to prevent freezing.
4. **Over-the-well pumps.** Power-driven pumps located over a well shall be installed on a concrete base of sufficient height to permit the outside casing to extend one inch [2.54 centimeters] above the concrete base. On all public water wells the annular opening between the drill hole and casing shall be filled with cement grout before the pump base and pumphouse floor are constructed. If the well is of the gravel wall type, the outer casing shall extend at least twelve inches [30.48 centimeters] above the pumphouse floor with suitable provisions made for adding gravel. The inner casing shall extend one inch [2.54 centimeters] above the pump base. Note diagrams No. 1 and No. 2, pump installation details, in the diagrams attached to this chapter.

A sanitary well seal shall be installed at the top of the well casings to prevent the entrance of contaminated water or objectional material.

5. **Pump column.** A separate pump column, suction or discharge pipe shall be installed inside the well casing in all instances, whether the well is to be pumped by suction, airlift, or deep well pump.

6. **Submersible pumps.** The discharge line installed inside of the well casing must meet the standards for ferrous or nonferrous well casing in subsections 2 and 3 of section 33-18-01-06. The discharge line shall leave the well at the top of the casing. The opening between the discharge line and casing or pipe sleeve shall be sealed watertight with an expanding rubber seal or equivalent device. When an underground discharge is desired, a properly installed pitless unit or, when approved by the department, a pitless adapter shall be used.

The electrical cable shall be firmly attached to the pump riser at intervals of twenty feet [6.10 meters] or less. When a check valve is not part of the pump, a check valve shall be installed on the pump discharge line within the well.

A check valve on the pump discharge line is not required on nonpressurized wells for livestock use that would be damaged by freezing, when an airgap or other cross-connection control protection is provided.

7. **Offset pumps.** Pumps offset from public wells shall be located in an aboveground pumphouse or other building. All portions of suction lines buried below the ground surface between the well and the pump shall be enclosed in a protective pipe of standard thickness and be sealed watertight at both ends.

This requirement shall be considered satisfied if the suction line lies within a pressure discharge line.

Offset pumps for private wells may be located in a basement provided that the pumps and all suction pipes are elevated at least twelve inches [30.48 centimeters] above the floor.

8. **Hand pumps.** Hand pumps shall be of the force type equipped with a packing gland around the pump rod, a delivery spout which is closed and downward directed, and a one-piece bell type base which is part of the pump stand or is attached to the pump column in a watertight manner.

The bell base of the pump shall be bolted with a gasket to a flange which is securely attached to the casing or pipe sleeve.

9. **Pump controls.**

- a. Public water wells. Pump controls for public water wells must be installed in accordance with the manufacturer's recommendations as shown on approved plans and specifications.
- b. Private water wells. Pump controls for private water wells should be installed in accordance with manufacturer's recommendations and must include:
 - (1) A pressure activated pump switch.
 - (2) A thermal overload switch.
 - (3) A flow control orifice or a low water level cutoff switch on all pumps having an output in excess of the well capacity.
 - (4) A pressure relief valve on positive displacement pumps.

- (5) The installation of necessary appurtenances for private water wells should be as illustrated in diagram No. 4 - pitless unit and appurtenances for private wells.

History: Amended effective January 1, 1984; September 1, 1986; April 1, 1997.

General Authority: NDCC 43-35-19, 43-35-19.1

Law Implemented: NDCC 43-35-19, 43-35-19.1

33-18-01-08. Storage tanks.

1. **Public water systems.** Storage equipment for public water systems must be as shown on approved plans and specifications.
2. **Private water systems.** Storage equipment must be as follows:
 - a. All tanks must be certified under water system council standards for size and pressure.
 - b. Hydropneumatic tanks must have a working pressure rating in excess of the maximum system pressure but not less than seventy-five pounds per square inch [34.02 kilograms per 6.45 square centimeters].
 - c. All tanks must be coated or made of materials resistant to corrosion.
 - d. All tanks must be constructed of materials or coatings which are nontoxic.
 - e. All tanks must be provided with a means of draining.
 - f. Atmospheric storage tanks must be provided with a cover to prevent the entrance of unauthorized persons, dirt, or vermin. The cover must be vented with a return bend vent pipe having an area not less than the area of the downfeed riser pipe and the vent must be screened with corrosion-resistant screen having not less than fourteen and not more than twenty openings per linear inch [2.54 centimeters].

History: Effective September 1, 1986.

General Authority: NDCC 43-35-19, 43-35-19.1

Law Implemented: NDCC 43-35-19, 43-35-19.1

33-18-01-09. Materials for water distribution.

1. **Water service pipe.**
 - a. Public water systems. Water service pipe from the well to the point of entrance to a pumphouse or building must be as shown on approved plans and specifications.
 - b. Private water systems. Water service pipe from the well to point of entrance to a pumphouse or building must be made of copper, galvanized steel, or approved plastic. Approved plastic

(polyvinyl chloride, polyethylene, or polybutylene) must have a minimum pressure rating of one hundred sixty pounds per square inch at seventy-three degrees Fahrenheit [11.25 kilograms per square centimeter at 22.8 degrees Celsius]. Copper tube when used underground may not be less than type L. All threaded ferrous pipe and fittings must be galvanized or cement lined and, when used underground in corrosive soil or filled ground, must be coal tar enamel coated and threaded joints must be coated and wrapped when installed.

All piping must comply with applicable standards for such piping. Polyvinyl chloride, polyethylene, and polybutylene pipe shall carry the seal of the national sanitation foundation.

Permeation through polyethylene and polybutylene pipes by organic contaminants (including petroleum byproducts) can occur resulting in contamination of water supplies. Where there is known contamination of soils by organics or a high probability that contamination of soils by organics may occur, it is recommended that polyethylene and polybutylene pipe not be used to construct water supply lines.

2. **Fittings.** The materials of which water supply system pipe fittings are made must be compatible with the type of piping materials used in the water supply system.
3. **Material strength.**
 - a. All materials used for water piping must be suitable for use with the maximum temperature, pressure, and velocity that may be encountered in the installation, including temporary increases and surges.
 - b. When the standards for the piping material used for hot and cold water distribution limit the working pressure or temperature to values lower than usually encountered, the relief valve may be set no higher than the limits of the standard.

History: Effective September 1, 1986.

General Authority: NDCC 43-35-19, 43-35-19.1

Law Implemented: NDCC 43-35-19, 43-35-19.1

33-18-01-10. Cross-connection control - Backflow protection. All wells discharging to sources of contamination such as livestock watering tanks must be provided with an approved backflow prevention device or an airgap to prevent the backflow or siphonage of contaminants into the well. The airgap should provide a minimum vertical distance between the potable water pipe outlet and the water surface of not less than twice the diameter of the outlet pipe. Greater distances are preferable.

Overflow lines from stock watering tanks or other sources of contamination may not discharge to the well. Please consult the North Dakota state plumbing code for details.

History: Effective September 1, 1986.

General Authority: NDCC 43-35-19, 43-35-19.1

Law Implemented: NDCC 43-35-19, 43-35-19.1

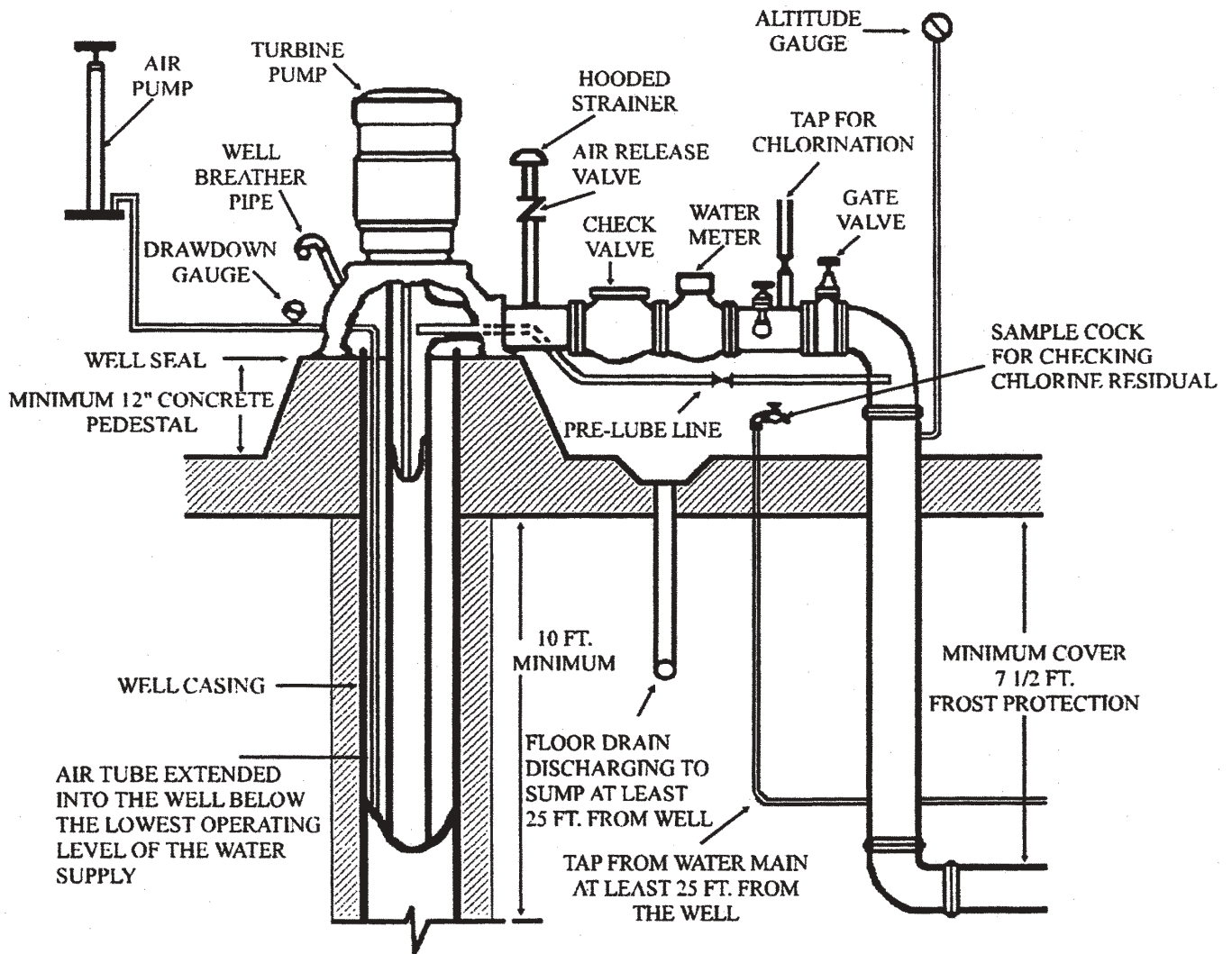


DIAGRAM NO. 1 TURBINE TYPE PUMP AND APPURTENANCES

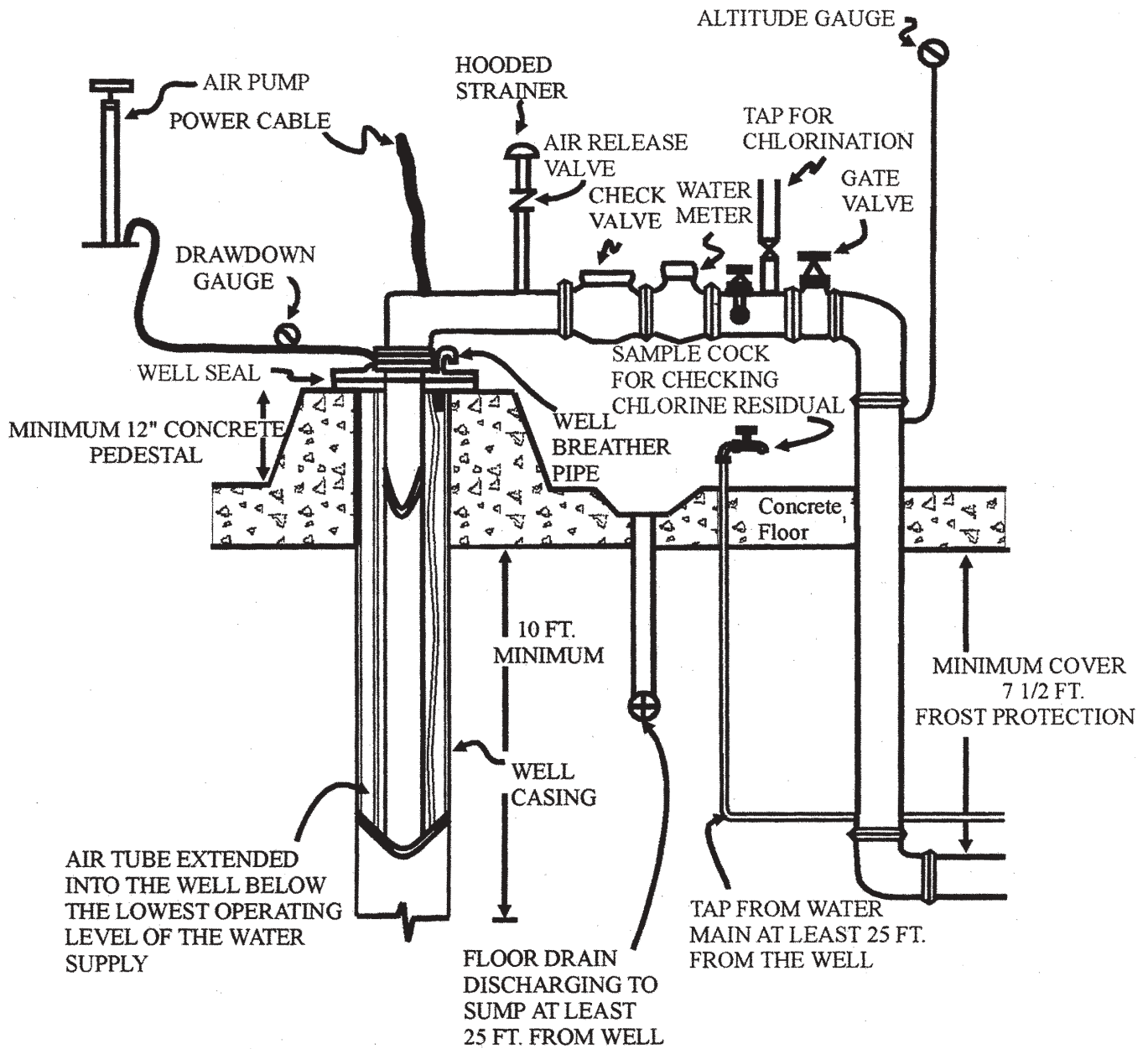


DIAGRAM NO. 2. SUBMERSIBLE TYPE PUMP AND APPURTENANCES

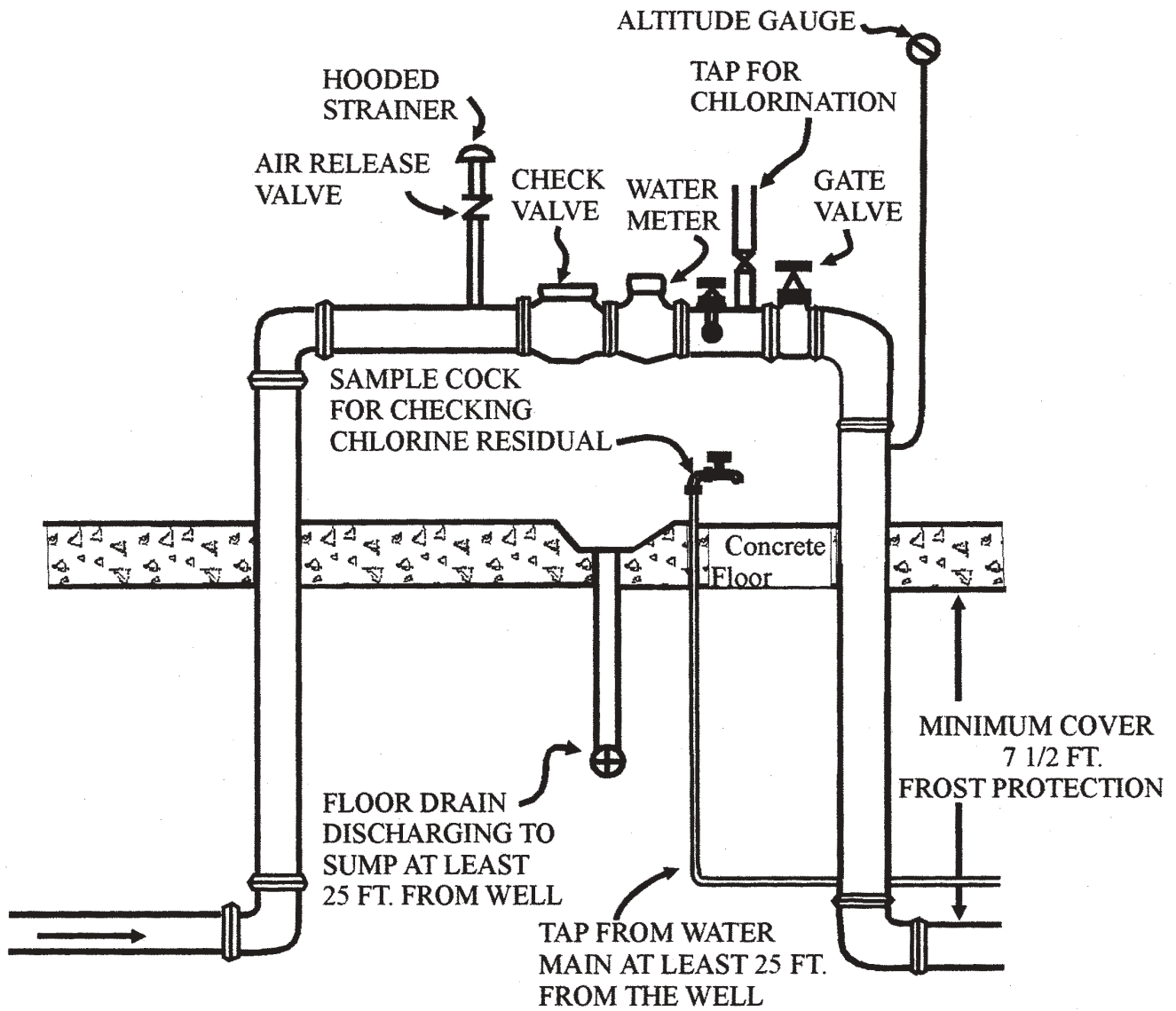


DIAGRAM NO. 3. PITLESS UNIT APPURTENANCES

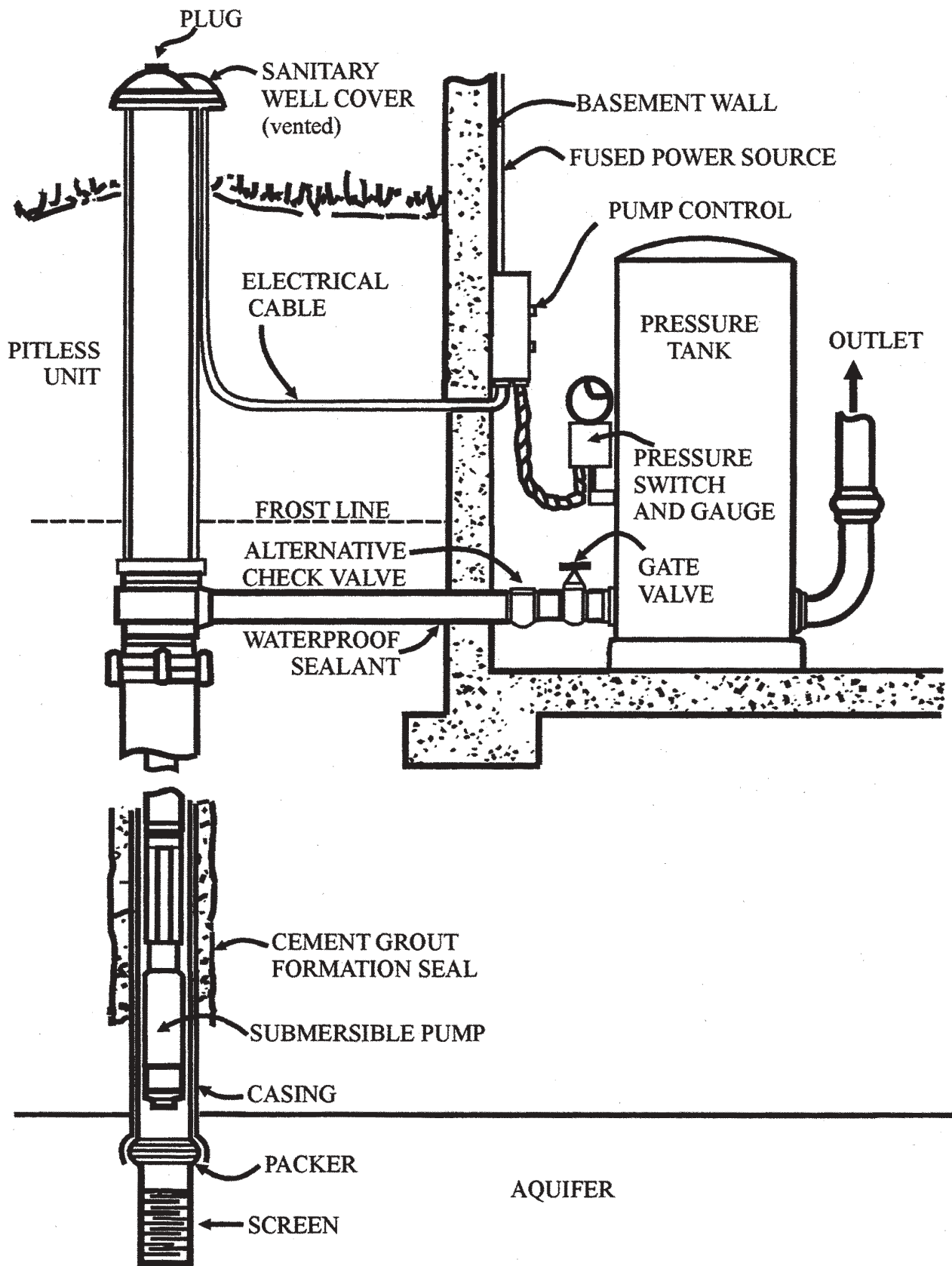


DIAGRAM NO. 4. PITLESS UNIT AND APPURTENANCES FOR PRIVATE WELLS