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**DEPARTMENT OF HEALTH**  
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**4727.0050 GENERAL.**

Parts 4727.0050 to 4727.1250 are adopted pursuant to, and must be read in conjunction with, Minnesota Statutes, chapter 103I, relating to wells, borings, and underground uses.

**Statutory Authority:** *MS s 103I.101*

**History:** *28 SR 147*

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**4727.0100 DEFINITIONS.**

Subpart 1. **Scope.** The terms used in parts 4727.0050 to 4727.1250 have the meanings given them in this part and in Minnesota Statutes, section 103I.005.

Subp. 2. [Repealed, 28 SR 147]

Subp. 3. **Annular space.** "Annular space" means the space between two cylindrical objects one of which surrounds the other, such as the space between a drillhole and a casing pipe, or between a casing pipe and liner pipe.

Subp. 4. [Repealed, 28 SR 147]

Subp. 5. **Aquifer.** "Aquifer" means a stratum of saturated, permeable bedrock or unconsolidated material having a recognizable water table or potentiometric surface that is capable of producing water to supply a well.

Subp. 5a. **Bedrock.** "Bedrock" means a consolidated or coherent, hard, naturally formed aggregation of rock in the earth. Bedrock does not include alluvium, glacial drift, glacial outwash, glacial till, loess, saprolite, or soil.

Subp. 5b. **Bentonite.** "Bentonite" means an aluminum silicate clay that contains at least 85 percent of the mineral montmorillonite and meets API Specification 13A.

Subp. 6. **Casing.** "Casing" means an impervious durable pipe placed in an exploratory boring to prevent the walls from caving and to seal off surface drainage or undesirable water, gas, or other fluids to prevent their entering the boring and the groundwater.

Subp. 7. **Commissioner.** "Commissioner" means the commissioner of health or an authorized representative.

Subp. 8. **Concrete grout.** "Concrete grout" means a mixture of Portland cement, sand as described in part 4727.0920, subpart 4, item A, subitems (3) to (6), and water in the proportion of 94 pounds of Portland cement and an equal volume of dry sand and not more than six gallons of clean water. Admixtures to reduce permeability or control setting time must meet ASTM Standard C494-86.

Subp. 8a. **Confining layer.** "Confining layer" means a geological material that restricts water movement relative to an aquifer. A confining layer includes:

A. a stratum of unconsolidated materials or bedrock ten feet or more in vertical thickness that has a vertical hydraulic conductivity of  $10^{-6}$  centimeters per second or less;

B. a stratum of clay, sandy clay, or silty clay ten feet or more in vertical thickness, as defined in the Soil Survey Manual, incorporated by reference under part 4727.0150, item I; or

C. any portion of the Decorah, Glenwood, St. Lawrence, or Eau Claire sedimentary bedrock formations as described in Paleozoic Lithostratigraphy of Southeastern Minnesota, incorporated by reference under part 4727.0150, item H.

Subp. 9. [Repealed, 28 SR 147]

Subp. 9a. **Drilling machine.** "Drilling machine" means a machine or mechanical device that is used to excavate, drill, or bore an exploratory boring and is mounted on a truck, trailer, crawler, or skid. A drilling machine includes, but is not limited to, a core drill, cable tool, hollow rod, auger, sonic, or rotary tool.

Subp. 10. **Established ground surface.** "Established ground surface" means the intended or actual finished grade (elevation) of the surface of the ground at the site of the exploratory boring.

Subp. 11. **Exploratory boring.** "Exploratory boring" has the meaning given in Minnesota Statutes, section 1031.005, subdivision 9.

Subp. 12. **Explorer.** "Explorer" has the meaning given in Minnesota Statutes, section 1031.005, subdivision 10. For the purposes of this chapter, explorer includes a person licensed to construct or seal an exploratory boring.

Subp. 13. [Repealed, 28 SR 147]

Subp. 14. **Groundwater.** "Groundwater" has the meaning given in Minnesota Statutes, section 115.01, subdivision 6.

Subp. 15. **Grout.** "Grout" means a material used to fill the annular space around a casing or between casings or to seal an exploratory boring. Grout is either neat cement grout, concrete grout, kaolin clay in the kaolin clay portion of a boring, or high solids bentonite grout.

Subp. 16. [Repealed, 28 SR 147]

Subp. 16a. **High solids bentonite grout.** "High solids bentonite grout" means a fluid mixture of water and a minimum of 15 percent by weight of bentonite, with no additives to promote temporary viscosity. The bentonite must be marketed as a grout or well sealant and must be mixed according to the manufacturer's specifications.

Subp. 16b. **Hoist.** "Hoist" means a machine or mechanical device that is mounted on a truck, trailer, crawler, or skid and used to:

- A. remove or install a pump, pumping equipment, or casing;
- B. remove an obstruction from an exploratory boring;
- C. install a tremie pipe when sealing an exploratory boring; or
- D. conduct any other activity that requires an explorer's license.

A hoist does not include a drilling machine.

Subp. 16c. **Igneous or metamorphic bedrock.** "Igneous or metamorphic bedrock" means a mass of rock in the earth solidified from a molten state or formed as a result of pronounced changes in pressure and temperature, including granite and slate.

Subp. 16d. **Kaolin clay.** "Kaolin clay" means a hydrous aluminum silicate chiefly comprised of the mineral kaolinite.

Subp. 16e. **Licensee.** "Licensee" means a person who is licensed as an explorer under this chapter and Minnesota Statutes, chapter 103I.

Subp. 17. [Repealed, 28 SR 147]

Subp. 18. **Neat cement grout.** "Neat cement grout" means a mixture in the proportion of 94 pounds of Portland cement and not more than six gallons of clean water. Bentonite up to five percent by weight of cement (4.7 pounds of bentonite per 94 pounds of Portland cement) may be used to reduce shrinkage. Admixtures meeting the standard specifications of ASTM Standard C494-86 may be used to reduce permeability and/or control time of set.

Subp. 18a. **Permanent sealing.** "Permanent sealing" means the process of preparing an exploratory boring to be filled with grout and filling the exploratory boring with grout.

Subp. 19. **Person.** "Person" means an individual, firm, partnership, association, or corporation or any other entity including the United States government, any interstate body, the state, and any agency, department, or political subdivision of the state.

Subp. 20. **Pollution or contamination.** "Pollution" or "contamination" means the presence or addition of any substance to water which is or may become injurious to the health, safety, or welfare of the general public or private individuals and which is or may become injurious to domestic, commercial, industrial, agricultural, or other uses which are being made of such water.

Subp. 20a. **Portland cement.** "Portland cement" means a construction material that conforms to ASTM Standard C150-85a.

Subp. 20b. **Potable water.** "Potable water" means water that is safe for human consumption in that it is free from impurities in amounts sufficient to cause disease or harmful physiological effects.

Subp. 20c. **Rapid setting cement.** "Rapid setting cement" means a Type III Portland cement as designated in ASTM Standard C150-85a, a cement labeled as an API Class C cement, or any Portland cement containing calcium chloride, sodium chloride, or gypsum in an amount between two and four percent by weight of Portland cement.

Subp. 20d. **Regional flood.** "Regional flood" has the meaning given in Minnesota Statutes, section 103F.111, subdivision 10.

Subp. 21. **Responsible individual.** "Responsible individual" means a person who has met the qualifications prescribed in part 4727.0600 and has been approved for certification by the commissioner according to part 4727.0700.

Subp. 22. **Rock.** "Rock" means a naturally formed aggregation of mineral matter including rock described in part 4727.0920, subpart 4, item B.

Subp. 23. **Sealing.** "Sealing" means permanent sealing or temporary sealing.

Subp. 24. **Sedimentary bedrock.** "Sedimentary bedrock" means a consolidated or coherent naturally formed aggregation of mineral matter in the earth formed of clastic fragments of other rock or sediment or minerals formed by precipitation from solution in water and includes sandstone, shale, and limestone. Sedimentary bedrock does not include mineral matter deposited during, or more recently than, the Cretaceous geologic period.

Subp. 25. **Temporary sealing.** "Temporary sealing" means protecting an exploratory boring by following the construction and operation practices under parts 4727.0950 to 4727.0985 until the boring is permanently sealed.

Subp. 26. **Tremie pipe.** "Tremie pipe" means a pipe or hose used to insert grout into an annular space or to seal an exploratory boring.

Subp. 27. **Unconsolidated materials.** "Unconsolidated materials" means geologic materials that are not bedrock, including alluvium, glacial drift, glacial outwash, glacial till, loess, saprolite, soil, and those materials specified in part 4727.0920, subpart 4, item A.

**Statutory Authority:** *MS s 103I.101; 156A.01 to 156A.08*

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#### **4727.0150 INCORPORATION BY REFERENCE AND ABBREVIATIONS.**

This part lists documents, specifications, and standards that are incorporated by reference in this chapter. The material is not subject to frequent change and is available for loan or inspection through the Minitex interlibrary loan system. The abbreviations listed in parentheses after the source names are used in this chapter.

- A. Dictionary of Geological Terms (Robert L. Bates and Julia A. Jackson, eds., 3d ed. 1984).
- B. American Petroleum Institute (API), distributed by Global Engineering Documents, 15 Inverness Way East, Englewood, CO 80112-5776:
  - (1) API Specification 13A, "Oil Well Drilling Fluid Materials," 11th Edition, July 1985 and Supplement One to the 11th Edition; and
  - (2) API Specification 5L, "Line Pipe" (May 31, 1985).
- C. American National Standards Institute (ANSI), 1819 L Street NW, Suite 600, Washington, DC 20036:
  - (1) ANSI Schedule 5 and Schedule 40, "Dimensions of Welded and Stainless Steel Pipe" as contained in the appendix to ASTM Standard A312-86a; and
  - (2) ANSI Standard Z34.1-1987, "Third-Party Certification Program."
- D. ASTM International (ASTM), 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959:
  - (1) ASTM Standard A53-90b, "Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless";
  - (2) ASTM Standard A589-89a, "Standard Specification for Seamless and Welded Carbon Steel Water-Well Pipe," specifications for Type I, II, and III only;
  - (3) ASTM Standard A312-86a, "Standard Specification for Seamless and Welded Austenitic Stainless Steel Pipe," including the appendix;
  - (4) ASTM Standard C150-85a, "Standard Specification for Portland Cement";
  - (5) ASTM Standard C494-86, "Standard Specification for Chemical Admixtures for Concrete";
  - (6) ASTM Standard D2466-90a, "Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40";

(7) ASTM Standard D2487-85, "Standard Test Method for Classification of Soils for Engineering Purposes"; and

(8) ASTM Standard F480-88, "Standard Specification for Thermoplastic Water Well Casing Pipe and Couplings Made in Standard Dimension Ratios (SDR)."

E. Canadian Standards Association (CSA), 178 Rexdale Boulevard, Toronto, Ontario, M9W 1R3, Canada: "Diamond Core Drilling Equipment - General," CSA Standard M253.1 - M1981.

F. Diamond Core Drill Manufacturers Association, Inc., DCDMA Technical Manual (1991).

G. NSF International (NSF), 789 Dixboro Road, Ann Arbor, Michigan 48113:

(1) NSF Standard 14-1990, "Plastic Piping System Components and Related Materials";

(2) NSF Standard 60-1988, "Drinking Water Treatment Chemicals - Health Effects"; and

(3) NSF Standard 61-1991, "Drinking Water System Components - Health Effects."

H. George Austin, "Paleozoic Lithostratigraphy of Southeastern Minnesota," in *Geology of Minnesota: A Centennial Volume in Honor of George M. Schwartz* (P.K. Sims and G.B. Morey eds., 1972), pages 459 to 473.

I. United States Bureau of Plant Industry, Soils and Agricultural Engineering, Soil Survey Manual, United States Department of Agriculture Handbook, no. 18 (1951), pages 205 to 213.

**Statutory Authority:** *MS s 103I.101*

**History:** *28 SR 147*

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#### **4727.0200 APPLICABILITY; SCOPE.**

Parts 4727.0050 to 4727.1250 apply to all exploratory borings constructed in Minnesota, except those specifically exempted by Minnesota Statutes, section 103I.113. Those aspects covered are the licensing of explorers, the examination of responsible individuals, the construction of exploratory borings, and the proper sealing of exploratory borings to protect the quality of groundwater aquifers.

**Statutory Authority:** *MS s 103I.101; 156A.01 to 156A.08*

**History:** *17 SR 1279; 28 SR 147*

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#### **4727.0250 EXPLORER RESPONSIBILITIES.**

An explorer is responsible for the construction, maintenance, and sealing of all exploratory borings completed under the explorer's license. The explorer may transfer the responsibility for maintenance and sealing to another explorer. The transfer of responsibility must be described in a written agreement, signed by both parties, that identifies which party is responsible for filing notification, maintaining the boring, and sealing the boring. A copy of the agreement must be submitted to the commissioner.

**Statutory Authority:** *MS s 103I.101*

**History:** *28 SR 147*

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**4727.0300** [Repealed, 15 SR 1597]

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**4727.0350 VARIANCE.**

Subpart 1. **General.** The commissioner shall grant a variance to any provision of this chapter according to the procedures and criteria in parts 4717.7000 to 4717.7050. The variance request must be accompanied by the fee specified in Minnesota Statutes, section 103I.101, subdivision 6.

Subp. 2. **Construction, repair, or sealing variance requests.** In addition to the requirements of subpart 1, a request to vary a construction, repair, or sealing provision related to an exploratory boring in parts 4727.0925 to 4727.1250 must also include:

- A. the location of the exploratory boring in terms of township, range, and three-quarter sections;
- B. the Minnesota unique number, if assigned;
- C. the name, address, and telephone number of the explorer doing work and the property owner;
- D. a scaled map showing the location of the exploratory boring in relation to all property lines and structures;
- E. the proposed depth of the exploratory boring;
- F. the casing type, diameter, and depth;
- G. a description of the method of construction, grout materials, and method of emplacement;
- H. a description of the anticipated geologic conditions;
- I. the depth to water and hydrogeologic conditions; and
- J. information on special construction methods or precautions proposed to prevent contamination of the exploratory boring and groundwater.

**Statutory Authority:** *MS s 103I.101*

**History:** *28 SR 147*

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**LICENSING, CERTIFICATION, AND REGISTRATION OF  
EXPLORERS AND EQUIPMENT**

**4727.0400 LICENSING REQUIRED.**

Subpart 1. **License required.** No person shall drill, construct or otherwise cause to be made, repair, or seal an exploratory boring unless:

- A. the person possesses, or performs labor or services for a person who possesses, a valid explorer's license issued by the commissioner;
- B. the person is registered with, or is performing labor or services for a person who is registered with, the commissioner of natural resources according to Minnesota Statutes, section 103I.601, subdivision 3; and

C. the construction, repair, or sealing of the exploratory boring is supervised by a responsible individual.

Subp. 2. **Licensing requirements.** An explorer engaging in exploratory boring shall obtain a license according to parts 4727.0500 to 4727.0860.

**Statutory Authority:** *MS s 103I.101; 156A.01 to 156A.08*

**History:** *17 SR 1279; 28 SR 147*

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#### **4727.0500 LICENSE APPLICATION.**

A person shall annually apply for an explorer's license by submitting to the commissioner a properly completed application. The application form must include the name, address, and telephone number of the person applying for licensure. The application form must be signed by an officer or other legally authorized representative of the person making application for licensure. An explorer's license is effective for the calendar year for which it is issued. The person applying for an explorer's license shall include the name of the responsible individual who will supervise or oversee the location, construction, and sealing of exploratory borings on behalf of the explorer. If the person applying for the explorer's license does not designate a responsible individual, the commissioner shall issue a conditional license. A conditional license is not considered valid for the purpose of engaging in the construction of exploratory borings until a certified, responsible individual has been designated and the commissioner has been notified of the designation. The notification of designation shall be made at least ten days prior to the commencement of exploratory boring.

**Statutory Authority:** *MS s 103I.101; 156A.01 to 156A.08*

**History:** *28 SR 147*

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#### **4727.0550 LICENSE RENEWAL.**

Explorer's licenses expire on December 31 of each year. A licensee must submit an application for license renewal according to part 4727.0500 no later than December 31 of the year prior to that for which the licensee is seeking renewal.

**Statutory Authority:** *MS s 103I.101*

**History:** *28 SR 147*

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#### **4727.0600 CERTIFICATION AS RESPONSIBLE INDIVIDUAL.**

A person who seeks to qualify for certification as a responsible individual shall:

A. complete and submit an application for certification to the commissioner, including the name, address, telephone number, and signature of the person applying for certification; and

B. take and pass an examination relating to construction, location, and sealing of exploratory borings or document the fact that the person is a professional engineer licensed according to Minnesota



Statutes, sections 326.02 to 326.15, or a professional geologist licensed under Minnesota Statutes, sections 326.02 to 326.15, or certified by the American Institute of Professional Geologists. A person may take the examination as many times as desired. All applicants in any one examination session shall be given the same combination of written, oral, or practical work.

**Statutory Authority:** *MS s 103I.101; 156A.01 to 156A.08*

**History:** *17 SR 1279; 28 SR 147*

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#### **4727.0700 COMMISSIONER ACTION; RESPONSIBLE INDIVIDUAL.**

The commissioner shall not act upon the application for certification until the commissioner has received all the information required by part 4727.0600. When the commissioner determines that an individual has met all the qualifications prescribed in part 4727.0600, the commissioner shall notify the person and shall enter that person's name on a list of persons who are certified as responsible individuals. The person remains certified unless the person requests in writing that the person's name be removed or unless the certification is revoked or suspended according to part 4727.0830.

**Statutory Authority:** *MS s 103I.101; 156A.01 to 156A.08*

**History:** *17 SR 1279; 28 SR 147*

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#### **4727.0800** [Repealed, 28 SR 147]

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#### **4727.0830 DISCIPLINARY ACTION; RETURN OF DOCUMENTS.**

Subpart 1. **Commissioner action.** The commissioner may suspend, revoke, or impose limitations or conditions on a responsible individual or licensee if the responsible individual or licensee:

- A. violates a provision of this chapter or Minnesota Statutes, chapter 103I;
- B. obtains a license or certification through error, fraud, or cheating;
- C. provides false or fraudulent information on renewal forms, sealing reports, or other required reports;
- D. knowingly aids or allows an unlicensed person to engage in activities requiring a license under Minnesota Statutes, section 103I.601;
- E. engages in conduct, in the course of performing work requiring licensure, that is likely to harm the public or demonstrates a willful or careless disregard for the health or safety of a property owner or other person; or
- F. has been convicted during the previous five years of a felony or gross misdemeanor reasonably related to the business of exploratory boring.

Subp. 2. **Revoked license or certification.** A suspended or revoked license or certification must be returned to the commissioner when the license or certification is revoked or suspended.

**Statutory Authority:** *MS s 103I.101*

**History:** *28 SR 147*

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#### **4727.0840 REAPPLICATION AFTER REVOCATION.**

A person whose explorer's license has been revoked or whose certification as a responsible individual has been revoked may not reapply for licensure or certification for one year from the date of revocation. A person whose explorer's license has been revoked must reapply for licensure according to part 4727.0500. A person whose certification as a responsible individual has been revoked must reapply for certification according to part 4727.0600.

**Statutory Authority:** *MS s 103I.101*

**History:** *28 SR 147*

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#### **4727.0850 DRILLING MACHINE AND HOIST REGISTRATION.**

Subpart 1. **Registration required.** A drilling machine or hoist may not be used for exploratory boring, or for any drilling activity requiring a license, unless the drilling machine or hoist is registered with the commissioner. The licensee is responsible for ensuring that each drilling machine or hoist is registered before it is used to conduct exploratory boring. The explorer or drilling contractor must register each drilling machine or hoist used to conduct exploratory boring. The person registering a drilling machine or hoist must pay an annual registration fee for each machine or hoist according to Minnesota Statutes, section 103I.545. Drilling machine and hoist registrations expire on December 31 of each year. Upon receipt of the required fee and information, the commissioner shall issue a drilling machine or hoist registration card for identification purposes for each drilling machine and hoist registered. The card shall be carried on the drilling machine or hoist at all times and must be readily available for review by the commissioner.

Subp. 2. **Registration not transferable.** The registration card and decals furnished for a drilling machine or hoist are not transferable. The card and decals shall be returned to the commissioner when a drilling machine or hoist is sold, traded, or otherwise disposed of.

**Statutory Authority:** *MS s 103I.101*

**History:** *28 SR 147*

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#### **4727.0860 PLACEMENT OF LICENSE NUMBER AND DECALS.**

Subpart 1. **License number display.** Before beginning exploratory boring, the licensee must place the explorer's license number in a conspicuous location. The license number must be attached to both sides of each drilling machine or hoist or, if the licensee does not own the drilling machine or hoist, the license number must be attached to a portable sign that is displayed near the exploratory boring while work is being conducted. The license number figures must be at least three inches high and 1-1/2 inches wide and must be in a contrasting color to the rest of the machine, hoist, or sign.

Subp. 2. **Registration decal display.** Before beginning exploratory boring, the person registering the drilling machine or hoist is responsible for affixing the decals issued by the commissioner to the drilling machine or hoist. The licensee may not conduct exploratory boring unless the drilling machine or hoist is registered with the commissioner and has current decals issued by the commissioner.

**Statutory Authority:** *MS s 103I.101*

**History:** *28 SR 147*

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**4727.0900** [Repealed, 28 SR 147]

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## NOTIFICATION AND REPORTING

### 4727.0910 NOTIFICATION OF EXPLORATORY BORING.

This part applies to the construction or modification of exploratory borings.

A. An exploratory boring must not be drilled, deepened through a confining layer, or have casing installed or removed until notification is made to the commissioner.

B. The commissioner must be notified at least ten days before exploratory boring begins.

C. When notification is required, the explorer must submit to the commissioner of health and the commissioner of natural resources a written notification containing the following:

(1) a county road map having a scale of one-half inch to one mile, as prepared by the Department of Transportation, and showing the location of each proposed exploratory boring to the nearest estimated 40-acre parcel;

(2) the Minnesota unique number of each proposed exploratory boring, except that an explorer may submit the notification without the unique number identified and the commissioner shall assign the unique number and forward the corresponding sealing report form to the explorer;

(3) the name and license number of the explorer;

(4) the name of the certified responsible individual; and

(5) the name and address of the property owner.

D. If notification has been made according to item C and the explorer wishes to construct additional exploratory borings in the area shown by the map submitted under item C, the explorer is exempt from the ten-day notification period in item B so long as a new or amended map meeting the requirements of item C, subitem (1), is submitted before drilling.

E. The notification is valid for 180 days from the date it is filed.

**Statutory Authority:** *MS s 103I.101*

**History:** *28 SR 147*

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**4727.0920 TEMPORARY AND PERMANENT SEALING REPORT.****Subpart 1. General.**

A. A licensee must submit an exploratory boring sealing report to the commissioner that contains the information in subparts 2 and 3 within 30 days of temporary or permanent sealing. The report must be submitted on a form provided by the commissioner.

B. A permanent sealing report must be filed when a temporarily sealed exploratory boring is permanently sealed. A new temporary sealing report must be filed when a temporarily sealed exploratory boring is drilled deeper or otherwise reconstructed and the explorer again wants to temporarily seal the boring.

C. The average scintillometer reading of waste drill cuttings must be reported only for exploratory borings that are drilled to explore or prospect for uranium or other radioactive metallic minerals.

Subp. 2. **Temporary sealing report.** If an exploratory boring is not permanently sealed within 30 days of the completion of drilling, the licensee must submit a temporary sealing report to the commissioner. The sealing report must contain the following information:

- A. the name and address of the property owner;
- B. the name and license number of the explorer doing the work, the name of the drilling contractor performing the work, and the signature of the responsible individual;
- C. the date work was completed;
- D. the county, township, range, section, and three quartiles where the exploratory boring is located;
- E. a description of the geological materials penetrated by the boring according to subpart 4;
- F. the original and current exploratory boring depth;
- G. the date of construction;
- H. the drilling method;
- I. the drilling fluids used;
- J. the bore hole diameter and depth;
- K. the casing type, diameter, and depth, if present;
- L. the method of covering and protecting the casing;
- M. the open hole, screen, or perforation depth interval, if present;
- N. the static water level;
- O. the scintillometer reading, if required by subpart 1; and
- P. the materials and methods used to grout the annular space around the casing, if present.

Subp. 3. **Permanent sealing report.** In addition to the information in subpart 2, a permanent sealing report must contain the following information:

- A. the grout or sealing materials, quantities, and intervals where the grout was placed; and
- B. a description of any obstructions removed or remaining in the exploratory boring.

Subp. 4. **Geological materials.** A licensee must report the geological materials penetrated in drilling an exploratory boring. The report must include the rock or sediment types, color, and relative hardness. The grain size must be reported for unconsolidated sediments and may be based on field observation without technical size measurement. Descriptions must use terms contained in items A and B, the Dictionary of Geological Terms, or ASTM Standard D2487-85.

A. Unconsolidated materials:

Material	Diameter	
	Millimeters	Inches
(1) Clay	Up to 0.005	Up to 0.0002
(2) Silt	0.005 to 0.062	0.0002 to 0.0025
(3) Fine sand	0.062 to 0.250	0.0025 to 0.0100
(4) Medium sand	0.250 to 0.500	0.0100 to 0.0200
(5) Coarse sand	0.500 to 1.000	0.0200 to 0.0400
(6) Very coarse sand	1.000 to 2.000	0.0400 to 0.0800
(7) Fine gravel	2.000 to 4.000	0.0800 to 0.1600
(8) Coarse gravel	4.000 to 62.500	0.1600 to 2.5000
(9) Cobbles	62.500 to 250.000	2.5000 to 10.000

B. Rock:

(1) basalt, which is a very fine-grained, dark igneous rock, commonly black, dark gray, or dark red-brown, in which the mineral grains cannot be distinguished with the unaided eye;

(2) carbonate rock, which is a sedimentary rock consisting of limestone, dolomite, or dolostone;

(3) dolomite or dolostone, which is a sedimentary rock composed primarily of the mineral dolomite (calcium-magnesium carbonate), which effervesces weakly in dilute hydrochloric acid;

(4) gabbro, which is a dark-colored, basic intrusive igneous rock comprised principally of basic plagioclase (commonly labradorite or bytownite) and clinopyroxene (augite);

(5) gneiss, which is a foliated rock formed by regional metamorphism, in which bands or lenticles of granular minerals alternate with bands or lenticles in which minerals having flaky or elongate prismatic habits predominate;

(6) granite, which is a coarse-grained, light-colored igneous rock in which quartz constitutes 10 to 50 percent of the felsic components and in which the alkali feldspar/total feldspar ratio is generally restricted to the range of 65 to 90 percent;

(7) iron formation, which is a chemical sedimentary rock, typically thin-bedded or finely laminated, containing at least 15 percent iron of sedimentary origin, and commonly but not necessarily containing layers of chert;

(8) limestone, which is a sedimentary rock composed primarily of the mineral calcite (calcium carbonate), which effervesces freely in dilute hydrochloric acid;

(9) metasedimentary rock, which is a sedimentary rock that shows evidence of having been subjected to metamorphism;

(10) metavolcanic rock, which is a volcanic rock that shows evidence of having been subjected to metamorphism;

(11) quartzite, which is a very hard sandstone, consisting chiefly of quartz grains that have been so completely and solidly cemented with secondary silica that the rock breaks across or through the grains rather than around them or a granoblastic metamorphic rock consisting mainly of quartz, which is formed by recrystallization of sandstone or chert by metamorphism;

(12) sandstone, which is a sedimentary rock consisting of cemented or otherwise compacted sediment and composed predominantly of sand-sized particles generally of quartz;

(13) schist, which is a strongly foliated crystalline rock, formed by dynamic metamorphism, that can be readily split into thin flakes or slabs due to the well-developed parallelism of more than 50 percent of the minerals;

(14) shale, which is a sedimentary rock consisting of compacted or cemented silt and clay;

(15) slate, which is a fine-grained, hard, dark-colored metamorphic rock derived from shale and which typically is gray and splits readily into flat pieces; and

(16) volcanic rock, which is generally a finely crystalline or glassy igneous rock resulting from volcanic action at or near the earth's surface.

**Statutory Authority:** *MS s 103I.101*

**History:** *28 SR 147*

**Published Electronically:** *September 15, 2003*

## CONSTRUCTION AND USE OF EXPLORATORY BORINGS

### 4727.0922 SCOPE.

Parts 4727.0925 to 4727.0985 apply to the construction and use of all exploratory borings until the boring is permanently sealed.

**Statutory Authority:** *MS s 103I.101*

**History:** *28 SR 147*

**Published Electronically:** *September 15, 2003*

### 4727.0925 USE OF EXPLORATORY BORINGS.

Subpart 1. **Injection or disposal prohibited.** An exploratory boring must not be used for injection or disposal of surface water, groundwater, or any other liquid, gas, or chemical.

Subp. 2. **Other uses.** An exploratory boring must not be used for purposes regulated under chapter 4725, unless the boring is constructed according to that chapter by a person licensed or registered to construct the well or boring.

**Statutory Authority:** *MS s 103I.101*

**History:** *28 SR 147*

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#### **4727.0930 LOCATION OF EXPLORATORY BORINGS.**

The isolation distances in items A and B apply to exploratory borings being constructed and to exploratory borings that are temporarily sealed.

A. An exploratory boring must be at least ten feet horizontally from a pipe with flammable or volatile gas, an overhead or underground electric transmission line, or a liquid propane tank, except a temporary liquid propane tank used during construction or sealing of an exploratory boring. If an electric transmission line is in excess of 50 kilovolts or of unknown voltage, an exploratory boring must be at least 25 feet horizontally from the electric transmission line.

B. An exploratory boring must be at least three feet horizontally from the farthest exterior projection of a building, including the walls, roofs, decks, and overhangs. An exploratory boring must not be located inside a building unless the boring is permanently sealed within 30 days of completion of drilling.

**Statutory Authority:** *MS s 103I.101*

**History:** *28 SR 147*

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#### **4727.0935 DRILLING FLUIDS.**

Subpart 1. **Water.** Water used for drilling, repair, or sealing of an exploratory boring must:

A. come from a potable water system, the boring itself, an exploratory boring of similar use and construction, or surface water. Surface water may be used only if the exploratory boring is located in a remote area where a potable water source is not available and the water has been disinfected by mixing sufficient chlorine so that after a minimum 30-minute contact time a chlorine residual exists;

B. contain a free chlorine residual at all times, except for water taken from the boring itself; and

C. if transported, be conveyed in clean and sanitary tanks, storage vessels, and water lines.

Subp. 2. **Drilling additives.** Drilling additives must meet the requirements of NSF Standard 60-1988 as determined by a person accredited by ANSI under ANSI Standard Z34.1-1987. A drilling additive is a substance added to the air or water used in the fluid system of drilling an exploratory boring.

**Statutory Authority:** *MS s 103I.101*

**History:** *28 SR 147*

**Published Electronically:** *September 15, 2003*

**4727.0940 DISPOSAL OF MATERIALS; RECIRCULATION PITS.**

Subpart 1. **Disposal of materials.** Drilling mud, cuttings, treatment chemicals, and discharged water must be disposed of according to applicable federal, state, and local requirements. Drilling mud, cuttings, treatment chemicals, and discharged water must not be disposed of in a manner that creates a health or environmental hazard.

Subp. 2. **Backfilling pits.** Oil or other hazardous materials must be removed from drilling fluid recirculation pits before backfilling. Pits must be backfilled with clean soil materials, leveled, and graded.

**Statutory Authority:** *MS s 103I.101*

**History:** *28 SR 147*

**Published Electronically:** *September 15, 2003*

**4727.0942 GROUNDWATER PROTECTION.**

During the drilling process and until an exploratory boring is permanently sealed, the boring shall be:

A. constructed and maintained to prevent the introduction of surface contaminants into the boring and to prevent the passage of water from one aquifer to another; and

B. covered and protected to prevent vandalism or entry of debris into the boring.

**Statutory Authority:** *MS s 103I.101*

**History:** *28 SR 147*

**Published Electronically:** *September 15, 2003*

**4727.0945 NUCLEAR LOGGING.**

Exploratory borings logged with naturally occurring or accelerator-produced radioactive materials, as defined in part 4730.0100, must comply with part 4730.2750.

**Statutory Authority:** *MS s 103I.101*

**History:** *28 SR 147*

**Published Electronically:** *September 15, 2003*

**CONSTRUCTION OF TEMPORARILY SEALED EXPLORATORY BORINGS****4727.0947 SCOPE.**

Exploratory borings that are not permanently sealed within 30 days of the completion of drilling must be temporarily sealed and must be constructed according to parts 4727.0950 to 4727.0985.

**Statutory Authority:** *MS s 103I.101*

**History:** *28 SR 147*

**Published Electronically:** *September 15, 2003*



**4727.0950 CASING REQUIREMENTS FOR TEMPORARILY SEALED EXPLORATORY BORINGS.**

Subpart 1. **Casing types.** If casing is used in a temporarily sealed exploratory boring, the casing must be:

- A. steel casing as specified in subpart 15;
- B. stainless steel casing as specified in subpart 16; or
- C. plastic casing as specified in subparts 17 and 18.

Subp. 2. **Watertight casing required.** All casing must be watertight throughout its length, with threaded, solvent welded, or welded joints. Recessed couplings, reamed and drifted couplings, integral flush-threads, or other couplings that match the design, taper, and thread type of the casing must be used on threaded casing. Thread must not be exposed on the exterior of the pipe when the casing is joined to the coupling or when the pipe sections are joined together.

Subp. 3. **New casing required.** Casing installed in a temporarily sealed exploratory boring must be new casing produced to specifications. Casing removed from an exploratory boring is acceptable for reuse in an exploratory boring if the casing meets the specifications for new casing.

Subp. 4. **Casing markings required.** Casing must be marked by the manufacturer according to casing specifications in subparts 15 to 18. Markings must be rolled, stamped, or stenciled by the manufacturer.

Subp. 5. **Casing testing.** Casing rejected by the manufacturer must not be used. The commissioner may require that casing be submitted to an independent testing agency to evaluate whether it meets or exceeds specifications when the casing:

- A. lacks markings or has illegible or altered markings;
- B. contains pits, cracks, patches, partial welds, bends, or other manufacturing defects; or
- C. lacks mill certification papers from the original manufacturer.

Subp. 6. **Casing rejection.** The commissioner shall reject casing if:

- A. the casing is not submitted for evaluation and verification when required by the commissioner;
- B. the casing fails to meet the specifications in subparts 15 to 18; or
- C. the lot of casing contains defective lengths, including casing with girth-welded joints or casing with welded patches.

Subp. 7. **Removed casing.** Casing that is installed during drilling, sometimes referred to as surface casing, and that is removed upon completion of drilling is not required to meet the specifications for casing in subparts 15 to 18, but must be of sufficient strength to withstand the structural load imposed by conditions both inside and outside the exploratory boring.

Subp. 8. **Outer casing; unconsolidated materials.** An outer casing installed in unconsolidated materials is not required to meet the specifications for casing in subparts 15 to 18 if:

- A. the casing is of sufficient strength to withstand the structural load imposed by conditions both inside and outside the boring;
- B. an inner casing meeting the requirements of subpart 1 is installed; and

C. the annular space between the casings is filled with neat cement grout.

Subp. 9. **Inner and outer casing.** The annular space between an inner casing and an outer casing must be grouted for its entire length by pumping neat cement grout through a tremie pipe, a drill rod, or the casing as specified in part 4727.0980.

Subp. 10. **Casing height.** All casings of a temporarily sealed exploratory boring must extend vertically at least one foot above the established ground surface and at least five feet above the regional flood level. The established ground surface immediately adjacent to the casing must be graded to divert water away from the casing. Termination of the top of the casing below the established ground surface, such as in a vault or pit, is prohibited.

Subp. 11. **Casing offsets.** Casing offsets are prohibited.

Subp. 12. **Minimum casing depth.** An exploratory boring that is temporarily sealed must be cased according to items A to C. Borings that flow must meet the special requirements in part 4727.0985.

A. A boring that terminates in unconsolidated materials must be cased from a point one foot above the established ground surface and at least five feet above the regional flood level to the bottom of the boring.

B. A boring that terminates in igneous or metamorphic bedrock must be cased from a point one foot above the established ground surface and at least five feet above the regional flood level into igneous or metamorphic bedrock.

C. A boring that terminates in sedimentary bedrock must be cased from a point of one foot above the established ground surface and at least five feet above the regional flood level into sedimentary bedrock. When a confining layer is encountered, the boring must be cased according to part 4727.0975.

Subp. 13. **Casing cover.** The casing of a temporarily sealed exploratory boring must be covered with a water tight and insect-proof cap or cover equivalent to the casing in weight and strength consisting of:

A. an overlapping cap with compression gasket; or

B. a threaded or welded cover or cap.

Subp. 14. **Casing protection.** The casing of an exploratory boring that is temporarily sealed must be protected by at least one of the following methods:

A. surrounding the casing with a concrete pyramid or cone that has horizontal dimensions of at least 24 inches by 24 inches at the established ground surface, rises 12 inches above the established ground surface at the casing, and has a base with a volume of at least three cubic feet below the established ground surface;

B. installing a steel outer protective casing meeting the specifications of subpart 15 that is at least 3.25 inches in diameter larger than the inner casing, extends at least two feet above the established ground surface and four feet below the established ground surface, and has neat cement grout or concrete grout in the annular space between the casings from the bottom of the outer protective casing to the established ground surface;

C. placing three posts at least four inches square or four inches in diameter around the boring at equal distances from each other and two feet from the exploratory boring. The posts must extend two feet above the established ground surface and four feet below the established ground surface, or to a depth of two feet if each post is set in concrete to a depth of two feet. The posts must be made of reinforced concrete,

decay-resistant wood, or steel pipe meeting the specifications of subpart 15. Steel pipe must be covered with an overlapping, threaded, or welded steel or iron cap or be filled with concrete or cement; or

D. extending the casing vertically at least four feet above the established ground surface and reporting the accurate location of the exploratory boring on the temporary sealing report. The location must be determined and reported by using either a differential global positioning system or a survey with bearings and distances taken from property corners or a permanent survey control point.

**Subp. 15. Steel casing requirements.**

A. Steel casing used in the construction of a temporarily sealed exploratory boring must be produced to the following specifications:

- (1) ASTM Standard A53-90b;
- (2) ASTM Standard A589-89a, Types I, II, and III;
- (3) API Specification 5L;
- (4) DCDMA Technical Manual, section B designations C80, R80, or RC100, and section D flush joint casing standards; or
- (5) CSA Standard M253.1 - M1981 for flush joint casing.

B. Steel casing must have the minimum weights and thicknesses specified in this item, subject to the tolerance in the specifications in item A.

	Size in Inches	Plain End	Wgt. Lbs. Per Ft. Thrds. & Cplgs.*	Thrds. R&D Cplgs.	Thickness in Inches
S	1	1.68	1.68	1.70	.133
c	1-1/4	2.27	2.28	2.30	.140
h	1-1/2	2.72	2.73	2.75	.145
e	2	3.65	3.68	3.75	.154
d	2-1/2	5.79	5.82	5.90	.203
u	3	7.58	7.62	7.70	.216
l	3-1/2	9.11	9.20	9.25	.226
e	4	10.79	10.89	11.00	.237
	5	14.62	14.81	15.00	.258
4	6	18.97	19.18	19.45	.280
0	8	28.55	29.35		.322
	10	40.48	41.85		.365
S	12	49.56	51.15		.375
t	14	54.57	57.00		.375

a	16	62.58	65.30	.375
n	18	70.59	73.00	.375
d	20	78.60	81.00	.375
a	22	86.61		.375
r	24	94.62		.375
d	26	102.63		.375
	30	118.65		.375
W	32	126.66		.375
g	34	134.67		.375
t	36	142.68		.375

\* Nominal weight based on length of 20 feet including coupling.

Steel casing up to ten inches in diameter must be Schedule 40. Larger diameter casing must be standard weight.

Diameter-Inches		Thrds. per Inch	Couplings	
External	Internal		Minimum External Diameter Inches	Minimum Length Inches
1.315	1.049	11-1/2	1.576	2-5/8
1.660	1.380	11-1/2	1.900	2-3/4
1.900	1.610	11-1/2	2.200	2-3/4
2.375	2.067	11-1/2	2.750	2-7/8
2.875	2.469	8	3.250	3-15/16
3.500	3.068	8	4.000	4-1/16
4.000	3.548	8	4.625	4-3/16
4.500	4.026	8	5.200	4-5/16
5.563	5.047	8	6.296	4-1/2
6.625	6.065	8	7.390	4-11/16
8.625	7.981	8	9.625	5-1/16
10.750	10.020	8	11.750	5-9/16
12.750	12.000	8	14.000	5-15/16
14.000	13.250	8	15.000	6-3/8

16.000	15.250	8	17.000	6-3/4
18.000	17.250	8	19.000	7-1/8
20.000	19.250	8	21.000	7-5/8
22.000	21.250			
24.000	23.250			
26.000	25.250			
30.000	29.250			
32.000	31.250			
34.000	33.250			
36.000	35.250			

Subp. 16. **Stainless steel casing requirements.** Stainless steel casing used in the construction of a temporarily sealed exploratory boring must meet ASTM Standard A312-86a and meet at least:

- A. ANSI Schedule 5 for welded joints; and
- B. ANSI Schedule 40 for threaded joints.

Subp. 17. **Plastic casing requirements.** Plastic casing and couplings used in the construction of a temporarily sealed exploratory boring must:

- A. meet ASTM Standard F480-88;
- B. withstand internal pressures of 200 pounds per square inch (psi); and
- C. have a minimum standard dimension ratio (SDR) of 21.

Subp. 18. **Additional approved plastic couplings.** In addition to plastic couplings approved under subpart 17, couplings meeting the following requirements are also approved:

- A. couplings with socket dimensions meeting the requirements of ASTM Standard F480-88, Table 3; and
- B. ANSI Schedule 40, four-inch and five-inch diameter slip x female thread and five-inch diameter slip x male thread couplings meeting the requirements of ASTM Standard D2466-90a.

Subp. 19. **NSF standard for plastic material.** All plastic casings, couplings, components, and related joining materials, including solvents, cements, or primers, used in the construction of a temporarily sealed exploratory boring must conform with the requirements of NSF Standard 61-1991 or the health effects portion of NSF Standard 14-1990 and be tested as conforming by an agency certified by ANSI. Conformance to the NSF standard must be coded, stamped, or marked on the casings, couplings, and components, as well as on the containers of related joining materials, including solvents, cements, or primers.

Subp. 20. **Plastic casing installation.**

- A. When preparing to install plastic casing, a person must:
  - (1) inspect casing and couplings carefully for cuts, gouges, deep scratches, damaged ends, and other major imperfections. Any plastic casing or coupling having such defects or imperfections shall not be used;

(2) use solvent cement meeting the requirements of the specifications for the plastic that will be used;

(3) use only casing and coupling combinations that give interference fits; and

(4) use plastic couplings with molded or formed threads and thread lubricants suitable for the plastic material that will be used.

B. When cutting plastic casing, casing ends must be cut square using fine-tooth blades with little or no set or a plastic pipe cutter equipped with extra wide rollers and thin cutting wheels. Standard steel pipe or tubing cutters must not be used for cutting plastic casing.

C. All dirt, dust, and moisture must be cleaned from casing ends and couplings using chemical or mechanical cleaners suitable for the particular plastic material. All burrs must be removed from casing ends and couplings.

D. A primer must be used when required or recommended by the solvent cement label instructions.

E. An even coat of solvent cement must be applied to the inside of the couplings to cover the distance of the joining surface only. An even coat of solvent cement must then be applied to the outside of the casing being joined to a distance equal to the depth of the casing coupling socket.

F. When assembling plastic casing, a person must:

(1) make the joint with solvent cement before the solvent cement dries;

(2) reapply cement before assembling if the solvent cement dries partially;

(3) turn the casing to evenly distribute the solvent cement while inserting the coupling into the coupling socket;

(4) insert the casing to the full depth of the coupling socket and assemble casing;

(5) remove excess solvent cement from the exterior of the joint with a clean, dry cloth;

(6) tighten a threaded joint by no more than one full turn using a strap wrench;

(7) not disturb the coupling joint until after the solvent cement has set; and

(8) allow sufficient time for the solvent cemented joint to set.

G. Screws must not be used to join plastic casing.

H. A person must not drill inside plastic casing. Drilling tools such as drill bits must not be inserted in plastic casing.

I. Plastic casing must not be used as an outside casing in exploratory borings cased more than five feet into limestone or dolomite bedrock. In limestone or dolomite bedrock, plastic casing may be used as an inner casing if surrounded by an outer steel casing.

J. Plastic casing must not be driven.

K. A person installing plastic casing must either seal the exploratory boring or remove and replace all casing when:

(1) the plastic casing cannot be installed without driving the casing; or

(2) the casing fails during construction.

**Statutory Authority:** *MS s 103I.101*

**History:** *28 SR 147*

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#### **4727.0975 INTERCONNECTION OF AQUIFERS PROHIBITED.**

A temporarily sealed exploratory boring must not be constructed to interconnect aquifers separated by a confining layer.

**Statutory Authority:** *MS s 103I.101*

**History:** *28 SR 147*

**Published Electronically:** *September 15, 2003*

#### **4727.0980 GROUTING OF TEMPORARILY SEALED EXPLORATORY BORINGS.**

Subpart 1. **Grouting requirements.** All annular space surrounding the casing of a temporarily sealed exploratory boring must be grouted from the bottom of the casing to the established ground surface. When constructing the exploratory boring with a method such as mud or air rotary, auger, coring, or jetting that creates an open annular space, a grouting material specified in subpart 2 and the grouting methods specified in subpart 3 must be used to fill the annular space between the casing and the bore hole. Driven casing must be grouted according to subpart 6.

Subp. 2. **Grouting materials.** The following grout materials are approved for use in temporarily sealed exploratory borings:

- A. neat cement grout, except that rapid setting cement must not be used with plastic casing;
- B. concrete grout when used in the dry portion of the open annular space;
- C. high solids bentonite grout when used in unconsolidated materials; and
- D. kaolin clay in the kaolin clay portion of the boring.

Subp. 3. **Grouting methods.** Grouting must start immediately on completion of drilling and testing an exploratory boring. Grout must be pumped into the annular space from the bottom up through the casing, drill rods, or a tremie pipe. Neat cement grout or concrete grout must be allowed to set a minimum of 48 hours. Rapid setting cement must be allowed to set a minimum of 12 hours. Drilling is prohibited during the time the cement is setting.

Subp. 4. **Alternative methods and materials for grout loss.**

A. If the grout level fails to rise after insertion of more than one cubic yard of grout or the quantity of grout necessary to fill ten vertical feet of hole, or if a cavity more than twice the diameter of the bore hole exits, then the following grouting materials and methods may be used in the portions where the conditions exist:

(1) pouring a mixture of gravel or stone aggregate not larger than one-half inch in diameter while simultaneously pumping neat cement grout or concrete grout in a ratio not to exceed five parts aggregate to one part grout;

(2) pumping a mixture of gravel or stone aggregate not larger than one-half inch in diameter and concrete grout or neat cement grout in a ratio not to exceed five parts aggregate to one part Portland cement; or

(3) alternately pumping concrete or neat cement grout and pouring gravel or stone aggregate not larger than one-half inch in diameter in layers of equal thickness. Individual layers of aggregate must not exceed ten feet in thickness. Aggregate must not be placed in a confining layer.

B. Neat cement grout or concrete grout must be pumped through the casing or a tremie pipe. The aggregate must be poured into the bore hole at a rate that prevents bridging.

Subp. 5. **Grouting between casings.** The annular space between an inner casing and an outer casing must be filled with neat cement grout according to subpart 3.

Subp. 6. **Driving casing.** When driving casing, a cone-shaped depression or temporary outer casing filled with high solids bentonite grout, bentonite powder, or granular bentonite must be maintained around the outside of the casing. The bottom of driven casing must be equipped with a drive shoe. Casing may only be driven in unconsolidated materials or sandstone bedrock.

**Statutory Authority:** *MS s 103I.101*

**History:** *28 SR 147*

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#### **4727.0985 TEMPORARILY SEALED EXPLORATORY BORINGS THAT FLOW.**

Subpart 1. **General construction.** A temporarily sealed exploratory boring from which groundwater flows above the established ground surface without pumping and which does not require special construction under subpart 2 must be constructed to prevent erosion of the aquifer and confining layer. Casing must be installed into the flowing aquifer to prevent water flowing up the outside of the casing by either:

- A. driving steel casing into the flowing aquifer according to part 4727.0980, subpart 6; or
- B. grouting the annular space surrounding the casing with neat cement grout according to part 4727.0980, subpart 3.

Subp. 2. **Special construction required.** A temporarily sealed exploratory boring must be constructed according to subpart 3 when:

- A. the artesian flow rate at the established ground surface is greater than 70 gallons per minute;
  - B. the artesian pressure at the established ground surface exceeds ten pounds per square inch;
- or

C. the commissioner designates an area where the use of standard construction techniques have resulted in uncontrolled flows or where hydrogeologic conditions such as eroded or unstable confining layers require special construction to successfully complete an exploratory boring and confine the artesian pressure.

Subp. 3. **Special construction standards.** A temporarily sealed exploratory boring requiring special construction under subpart 2 must be constructed by:

- A. installing an outer steel casing into, but not penetrating the entire thickness of, the confining layer overlying the flowing aquifer by:
  - (1) driving steel casing according to part 4727.0980, subpart 6; or



(2) drilling a bore hole a minimum of 3.25 inches larger than the outside diameter of the casing or couplings, whichever is larger, installing steel casing into the confining layer, and pumping neat cement grout into the annular space surrounding the casing from the bottom of the casing to the established ground surface;

B. drilling through the confining layer into the aquifer;

C. installing an inner casing, which is 3.25 inches smaller than the bore hole, into the aquifer; and

D. grouting the annular space surrounding the inner casing with neat cement grout according to part 4727.0980, subpart 3.

Subp. 4. **Flow control.** A temporarily sealed flowing exploratory boring must be provided with flow control capable of stopping all flow.

**Statutory Authority:** *MS s 103I.101*

**History:** *28 SR 147*

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### SEALING EXPLORATORY BORINGS

#### 4727.1000 SEALING EXPLORATORY BORINGS.

Sealing of exploratory borings shall be carried out according to Minnesota Statutes, chapter 103I and parts 4727.0050 to 4727.1250. Sealing, whether temporary or permanent, shall be undertaken within 30 days of completion of drilling activities. The commissioner may order that an exploratory boring be sampled and any contamination be removed prior to sealing. If an exploratory boring provides a potential or actual source or channel of contamination for an aquifer, the commissioner may order that the boring be permanently sealed. The explorer is responsible for temporary and permanent sealing of exploratory borings constructed by the explorer except when a written agreement exists, as provided in part 4727.0250, that assigns the responsibility to another.

**Statutory Authority:** *MS s 103I.101; 156A.01 to 156A.08*

**History:** *28 SR 147*

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#### 4727.1100 TEMPORARY SEALING OF EXPLORATORY BORINGS.

Subpart 1. **General.** A temporarily sealed exploratory boring must be constructed according to parts 4727.0922 to 4727.0985 and shall be maintained so that it is not a source or channel of contamination for any aquifer.

Until a boring is permanently sealed, all provisions for protection of the groundwater against contamination and pollution and for maintaining satisfactory sanitary conditions around the boring shall be carried out.

Subp. 2. **Time limit for temporarily sealing.** An exploratory boring must not be temporarily sealed for more than ten years. The boring must be permanently sealed at the end of the tenth year, or sooner if:

A. the explorer determines that an exploratory boring need not remain open any longer;

- B. any legal or contractual right necessary for the explorer to seal the boring will expire within 30 days;
- C. the boring is required to be sealed under Minnesota Statutes, chapter 103I;
- D. a license or registration required under Minnesota Statutes, section 103I.601, will expire within 30 days and the explorer has not applied to renew or is not qualified to renew the license or registration; or
- E. any registration bond or security required by the commissioner of natural resources will expire within 30 days and the explorer has not submitted a new bond or security.

**Statutory Authority:** *MS s 103I.101; 156A.01 to 156A.08*

**History:** *28 SR 147*

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**4727.1200** [Repealed, 28 SR 147]

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#### **4727.1250 PERMANENT SEALING OF EXPLORATORY BORINGS.**

Subpart 1. **Permanent sealing required.** The explorer must permanently seal an exploratory boring that is not temporarily sealed or that is required to be permanently sealed under part 4727.1100, subpart 2.

Subp. 2. **Sealing with grout.** An exploratory boring must be permanently sealed by filling the boring, including any open annular space, with grout. The grout must be pumped through a tremie pipe or the casing from the bottom of the annular space or boring upward to within two feet of the established ground surface. The bottom of the tremie pipe must remain submerged in grout while grouting.

Subp. 3. **Removal of obstruction, debris.** Materials, debris, and obstructions that may interfere with permanent sealing must be removed from the exploratory boring. Casing may be salvaged, except casing that has been cemented in place.

Subp. 4. **Grouting an annular space.** Open annular space surrounding a casing must be grouted by:

- A. filling the annular space with grout according to subpart 2;
- B. removing the casing and filling the boring with grout. If casing is to be removed from a collapsing formation, grout must be inserted so the bottom of the casing remains submerged in grout;
- C. perforating the casing with a minimum of one 1/2-square-inch hole in each foot of casing and forcing grout through the perforations; or
- D. ripping a minimum of five feet of casing for every 20 feet of casing and forcing grout through the ripped casing, except that casing must be ripped through the entire length of a confining layer.

Subp. 5. **Additional sealing requirements; unconsolidated materials.** The additional requirements in items A and B apply to the permanent sealing of a boring in unconsolidated materials.

A. The portion of a boring in unconsolidated material must be filled with high solids bentonite grout or neat cement grout. Concrete grout is approved for grouting only in the dry portion of the hole. The grout must be pumped through a tremie pipe or the casing from the bottom of the boring upward to within two feet of the established ground surface.

B. The portion of a boring in kaolin clay may be sealed with kaolin clay in addition to the grout materials in item A. Up to 20 percent water by volume may be added to the kaolin clay to allow for placement. The kaolin clay, or kaolin clay and water mixture, must be inserted through a tremie pipe or the casing.

Subp. 6. **Additional sealing requirements; bedrock.** The additional requirements in items A and B apply to the permanent sealing of a boring in bedrock.

A. The portion of a boring in bedrock must be filled and sealed through the entire interval of the bedrock with neat cement grout, except that:

- (1) concrete grout may be used above the water level;
- (2) in that portion of igneous or metamorphic bedrock that does not contain water-bearing fractures or voids and that is at least 250 feet below the top of the igneous or metamorphic bedrock, a plug or packer may be installed. The bore hole above the packer must be filled with grout and the bore hole below the packer may be left without grout; and
- (3) if the grout level fails to rise after insertion of more than one cubic yard of grout or the quantity of grout necessary to fill ten vertical feet of hole, or if a cavity more than twice the diameter of the bore hole exists, then the following grouting materials and methods may be used in the portions where the conditions exist:
  - (a) pouring a mixture of gravel or stone aggregate not larger than one-half inch in diameter while simultaneously pumping neat cement grout or concrete grout in a ratio not to exceed five parts aggregate to one part grout;
  - (b) pumping a mixture of gravel or stone aggregate not larger than one-half inch in diameter and concrete grout or neat cement grout in a ratio not to exceed five parts gravel to one part Portland cement; or
  - (c) alternately pumping concrete or neat cement grout and pouring gravel or stone aggregate not larger than one-half inch in diameter in layers of equal thickness. Individual layers of aggregate must not exceed ten feet in thickness. Aggregate must not be placed in a confining layer.

B. Neat cement grout or concrete grout must be pumped through the casing or a tremie pipe. The aggregate must be poured into the bore hole at a rate that prevents bridging.

Subp. 7. **Sealing flowing boring.** An exploratory boring from which groundwater flows above the established ground surface must be permanently sealed with neat cement grout. The discharge from a flowing exploratory boring must be stopped and the boring sealed according to this part.

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