

# CHAPTER XX

## WELLS AND BOREHOLES

### SECTION XX01 GENERAL

**XX01.1 General.** The purpose of this Chapter is to protect the quality of the ground-water resources of the Spring Creek Watershed. Within the Watershed, ground water supplies 99% of the public and private water use. Improper construction of wells and boreholes can provide short-circuit flow pathways for surface and subsurface contaminants to impact ground-water quality. This Chapter sets forth standards for the construction of wells and boreholes that are not otherwise regulated.

**XX01.2 Scope.** The scope of this Chapter applies to the construction, modification, alteration, termination, and abandonment of all wells and boreholes that penetrate more than 20 feet (6096 mm) below grade, including but not limited to domestic water supply wells, geothermal heat system wells and/or boreholes, geotechnical borings, test borings, agricultural wells, irrigation wells, commercial wells, industrial wells, etc. The following are exempt from the requirements of this Chapter:

1. Wells and/or boreholes associated with water supply wells for public water systems (defined by the Pennsylvania Department of Environmental Protection as consisting of at least 15 service connections or regularly serving no fewer than 25 individuals daily at least 60 days out of the year).
2. Horizontal geothermal heat exchangers constructed in pits, trenches, ditches, or in horizontal directional borings.
3. Monitoring wells whose construction and operation is overseen by the Pennsylvania Department of Environmental Protection.
4. Borings (such as shot holes, exploratory borings, etc.) at a mining site associated with mining activities whose construction and operation are overseen by the Pennsylvania Department of Environmental Protection.
5. Utility trenches.

6. Foundations, pilings, and other soil and/or bedrock penetrations which are an integral part of building construction.
7. Normal routine maintenance and minor repairs to keep a well or borehole in good working order.
8. Wells that are completed and fully operational as of the effective date of this code.

### SECTION XX02 DEFINITIONS

**ABANDONED WATER SUPPLY WELL.** A water supply well, the regular use of which has been discontinued for a period of one year or more, or which is in such a state of disrepair that continued use for the purpose of obtaining ground water is impracticable, or which has been replaced by a new well or public water supply.

**ALTERATION.** Any action which necessitates entering a well with drilling tools; treating a well to increase yield, altering the physical structure of depth of the well; blasting; removal or replacement of well casing.

**ANNULAR SPACE.** The space between two (2) cylindrical objects, one of which surrounds the other, such as the space between a drill hole and a casing pipe.

**ANSI.** American National Standards Institute.

**API.** American Petroleum Institute.

**APPROVED GROUT.** Neat cement, cement plus bentonite, bentonite, bentonite plus silica sand, or low-permeability sealing material as approved for use by the Code Official. Approved grout is to be mixed and applied according to manufacturer's specifications (e.g., water content and viscosity) for use in grouting wells and/or geothermal boreholes.

**AQUIFER.** A geologic formation, group of formations, or part of a formation that contains sufficient saturated permeable material to yield significant quantities of water to wells and springs.

**ASTM.** American Society for Testing and Materials.

**BACK SIPHONAGE.** The flowing back of used, contaminated or polluted water from a plumbing fixture or vessel or other sources into a potable water supply pipe due to negative pressure in such pipe.

**BENTONITE.** A highly plastic, colloidal clay composed largely of the mineral montmorillonite.

**BORING/BOREHOLE.** A penetration of soil and, or rock that is augered, drilled, cored, bored, washed, driven, dug, jetted, or otherwise constructed which is generally cylindrical in shape and whose diameter is generally smaller than its depth of penetration.

**BRIDGING MATERIAL.** Solids added to a drilling fluid to bridge across the pore throat or fractures of an exposed rock thereby building a filter cake to prevent loss of whole mud or excessive filtrate.

**CASING.** An impervious durable pipe placed in a well to prevent the walls from caving and to seal off surface drainage or undesirable water, gas or other fluids and prevent their entering the well.

**CHIP BENTONITE GROUT.** Chip bentonite grout is composed of dry 3/8 inch (9.5 mm) or 1/2 inch (12.7 mm) sized chips of bentonite.

**CLOSED-LOOP GEOTHERMAL SYSTEM.** A type of geothermal heating and, or cooling system that utilizes a pressurized heat exchanger consisting of pipe, a circulating pump, and a water-source heat pump in which the heat transfer fluid is not exposed to the atmosphere. The heat transfer fluid is potable or beneficial reuse water and may have approved antifreeze added.

**COLIFORM.** All of the aerobic and facultative anaerobic, gram negative, non-spore forming, rod-shaped bacteria which are capable of fermenting lactose with gas formation within forty-eight (48) hours at thirty-five (35 °C) degrees Celsius.

**COMMUNITY WATER SYSTEM.** A water system which serves at least 15 service connections used by year round residents or regularly serves at least 25 year round residents.

**CONSTRUCTION OF WELLS.** All acts necessary to obtain groundwater, or artificially recharge groundwater. Provided, however, such term does not include an excavation made for the purpose of obtaining or prospecting for oil, natural gas, minerals,

or products of mining or quarrying, or for inserting media to repressure oil or natural gas formations or for storing petroleum, natural gas, or other products and services. Construction of wells includes the location and excavation or drilling of the well, but excludes the installation of pumps and pumping equipment.

**CONTRACTOR.** Any individual, partnership, company, association, corporation, group or entity employed, hired, contracted or otherwise engaged by the Owner to perform defined services for compensation.

**CROSS CONNECTION.** An arrangement allowing either direct or indirect connection through which backflow, including back siphonage, can occur between the drinking water in a public water system and a system containing a potential source of contamination.

**CURING TIME.** Minimum time required for particular types of cementing or grouting materials to harden or set up before drilling or other construction operations can be resumed.

**DECOMMISSIONING.** The act of rendering a well or borehole to a condition where there is no pathway present for surface or subsurface contaminants to travel down to the water table.

**DECOMMISSIONED VERTICAL CLOSED LOOP BOREHOLE.** A vertical closed loop borehole whose original purpose and use have been permanently discontinued or which is in such a state of disrepair that its original purpose cannot be reasonably achieved.

**DEP.** Pennsylvania Department of Environmental Protection.

**DCNR.** Pennsylvania Department of Conservation and Natural Resources.

**DIRECT EXCHANGE (DX) GEOTHERMAL SYSTEM.** A type of geothermal heating and, or cooling system where the heat pump refrigerant is circulated through metal piping installed in vertical, inclined, or horizontal boreholes. This type of geothermal system must use a cement-based, special grout in the boreholes and must have electronic corrosion protection for the metal piping.

**DRILLING MUD.** A fluid composed of water and bentonite used in the drilling operation to remove cuttings from the hole, to clean and cool the bit, to

reduce friction between the drill stem and the sides of the hole, and to plaster the sides of the hole. Such fluids range from relatively clear water to carefully prepared mixtures of special purpose compounds.

**FLOWABLE FILL.** Flowable fill is a mixture of Portland cement (ASTM C150), potable water, sand, and a fluidizing agent. This mixture is predominately sand. An example mixture of flowable fill contains approximately 85 percent sand, 9 percent water, 4 percent Portland cement, 2 percent finely ground slag, and a fluidizing agent. Flowable fill and other bridging agents do not meet the permeability requirements to protect ground water quality and prevent flow between aquifer zones.

**FLOWING WELL.** A well that yields water by artesian pressure at the ground surface.

**FUSE.** To make a plastic pipe joint by heat and pressure in accordance with the pipe manufacturer's specifications.

**GEOHERMAL HEATING AND, OR COOLING SYSTEM.** A system that uses a heat pump to extract heat from the earth in heating mode and/or reject heat into the earth in cooling mode. It is also called a geothermal heat pump system, a ground-coupled heat pump system, an earth-source heat pump system, and a GeoExchange system.

**GROUND-COUPLED HEAT PUMP.** A geothermal heat pump that uses the earth itself as a heat source and heat sink. It is coupled to the ground by means of a closed-loop heat exchanger installed horizontally or vertically underground.

**GROUNDWATER.** Water within the earth below the water table within the zone of saturation. Groundwater includes both water under water table conditions and confined within deep aquifers.

**GROUT.** A high-solids fluid mixture of cement or bentonite and potable water of a consistency that can be pumped through a tremie pipe and placed as required. Various additives, such as sand or bentonite may be included in the mixture to meet certain requirements

**GROUTING, POSITIVE EMPLACEMENT.** A technique of the installation of grouting materials whereby emplacement is achieved by positive pumping pressure through a tremie pipe from the bottom of the zone upward.

**HEAT PUMP.** A mechanical device used for heating and/or cooling which operates by pumping heat from a cooler to a warmer location.

**HYDROLOGIC BALANCE.** This term refers to the condition where, in the long term, the rate of local groundwater pumping from an aquifer does not exceed the rate of local groundwater recharge to the aquifer.

**IGSHPA.** The International Ground Source Heat Pump Association.

**INDIVIDUAL WATER SUPPLY.** A system including wells, pumps, and piping equipment, which supplies water to a private home.

**INSTALLATION OF PUMPS AND PUMPING EQUIPMENT.** The procedure employed in the placement and preparation for operation of pumps and pumping equipment, including all construction involved in making entrance to the well and establishing seals but not including repairs to existing installations.

**MAJOR ALTERATION OF A WELL AND/OR BOREHOLE.** Any alteration of a regulated well or borehole which can increase the potential for rapid vertical flow of water into groundwater or which can otherwise increase the potential to pollute groundwater. Examples of major alterations include, but are not limited to, deepening of an existing well, conversion of a well to another use (such as geothermal heating), etc.

**MINOR ALTERATION.** Any alteration that is not otherwise defined as a major alteration.

**NEAT CEMENT GROUT.** A fluid mixture of hydraulic cement and water, with or without admixtures in the following proportions; one bag of cement (94 pounds (42.6 kg)) to not less than 5 gallons (18.9 l) nor more than 7 gallons (26.5 l) of water.

**NON-COMMUNITY WATER SYSTEMS.** A public water system which is not a community water system.

**N.S.F.** National Sanitation Foundation.

**OPEN-LOOP GEOTHERMAL SYSTEM.** A type of geothermal heating and/or cooling system that utilizes a water-supply well and a water pump to deliver ground water to a water-source heat pump. The discharge water from the water-source heat

pump may be returned to the subsurface through a recharge well or infiltration bed, or may be discharged into a pond, lake, or stream. A spring may also be the source of the ground water supply.

**OTHER FILL AND BRIDGING MATERIALS.**

Under some limited circumstances, borehole completion without grout (below the minimum 20 foot depth of the approved grout surface formation seal), may be necessary. Acceptable fill materials are site specific and may include, but may not be limited to: bentonite chips, cuttings removed from the borehole; clean sand, gravel, or a mixture of sand and gravel; and/or cement and water or concrete mixes.

**OTHER GROUT AND FILL PLACEMENT**

**METHODS.** Other methods of grout or fill placement shall be accepted if such methods allow verification of completion. Such methods must ensure that the grout or fill placement provides environmental protection and the intended system performance.

**OWNER.** Any person vested with sole or partial, legal or equitable ownership of the subject property.

**PACKER.** A mechanical device that is placed in a borehole to prevent the vertical movement of water or grout.

**PERMEABILITY.** A measure of the relative ease with which a porous medium can transmit a liquid under a potential gradient. It is a property of the medium alone and is independent of the nature of the liquid and of the force field causing movement. It is a property of the medium that is dependent upon the shape and size of the pores.

**PERSON.** Shall mean any individual, partnership, company, association, corporation or other group or legal entity.

**PITLESS ADAPTOR.** A device or assembly of parts which will permit water to pass through the wall of the well casing or extension thereof, and which provides access to the well and to the parts of the water system within the well in a manner to prevent entrance of pollution into the well and the water produced.

**POLYMER.** A substance consisting of molecules characterized by the repetition of one or more types of monomeric units.

**POTABLE WATER.** Water suitable for human consumption.

**PORTLAND CEMENT (NEAT CEMENT)**

**GROUT.** A mixture of Portland cement (ASTM C150 Standard Specification for Portland Cement) and not more than 6 gallons (22.7 l) of potable water per bag (1 cubic foot (28.3 l) or 94 pounds (42.6 kg)) of cement shall be used according to the manufacturer's specifications.

**PUBLIC WATER SYSTEM.** A system which provides water to the public for human consumption which has at least 15 service connections or regularly serves an average of at least 25 individuals daily at least 60 days out of the year. The term is either a community or non-community system and includes collection, treatment, storage and distribution facilities under the control of the operator of the system and used in connection with the system. The term also includes a system which provides water for bottling or bulk hauling for human consumption.

**PUMPABLE BENTONITE GROUT.** Pumpable bentonite grout is a high solids mixture of sodium bentonite powder or granules and potable water mixed according to the manufacturer's specifications.

**RETURN WELL.** A well design and constructed for the return of water to the ground.

**SAND-CEMENT GROUT.** A mixture of Portland cement - Type I (ASTM C150), sand and water in the proportion of not more than two parts by weight of sand to one part of cement with not more than 6 gallons (22.7 l) of potable water per bag of cement (1 cubic foot (28.3 l) or 94 pounds (42.6 kg)) shall be used according to the manufacturer's specifications.

**SEMI-PUBLIC WATER SUPPLY.** A water supply which services one or several facilities such as industrial or commercial establishments, parks, camps, hotels, motels, schools, institutions, eating and drinking establishments or a water supply which services two (2) or more dwelling units and is not a public water system as defined by the Pennsylvania Safe Drinking Water Act (35 P.S. 721.1 et. seq.).

**STANDING-COLUMN GEOTHERMAL**

**SYSTEM.** A type of open-loop geothermal heating and/or cooling system that circulates ground water from a water well through a water-source heat pump and returns the discharge water from the water-source heat pump to the same water well it was pumped from. The water withdrawal and return locations within the water well bore are separated as far as is possible. Some standing-column geothermal systems

discharge some of the circulating ground water to enhance their heat transfer.

**THERMALLY-ENHANCED BENTONITE BASED GROUT.** Thermally-enhanced bentonite based grout is a high solids mixture of sodium bentonite, inert additives such as sand or rock dust that enhance thermal conductivity, and potable water mixed according to the manufacturer's specifications. The sand must be clean so as to not introduce contaminants into the grout mixture. The use of special additives to alter permeability, increase thermal conductivity, increase fluidity, control grout loss, and/or control time of set, and the composition of the resultant slurry, must be used in accordance with the manufacturer's specifications.

**TREMIE PIPE.** A rigid or flexible pipe or a hose that carries the grouting materials to the bottom of the zone being grouted. The tremie pipe is withdrawn as the grout material fills the annular space outside the casing or fills the space between the loop pipes and the borehole wall. The end of the tremie pipe is kept submerged just below the surface of the grout material.

**TREMIE PLACEMENT METHOD FOR FILL AND BRIDGING MATERIALS.** The tremie pipe shall be lowered to the bottom of the zone being filled, and raised slowly as the fill material is introduced. When using the tremie pipe method to install fills, the bottom of the tremie should be maintained as close as possible to, but not inside of, the emplaced fill.

**TREMIE PLACEMENT METHOD FOR GROUT.** After water or other drilling fluid has been circulated in the annular space sufficient to clear obstructions, grout shall be placed by pressure pumping through a tremie pipe. The tremie pipe shall be lowered to the bottom of the zone being grouted, and raised slowly as the material is introduced.

**VERTICAL CLOSED-LOOP BOREHOLE.** A borehole which is constructed to receive heat-exchanger loop pipes and grout material. Fill material may be used below a minimum depth of 20 feet below grade as the subsurface conditions warrant.

**WATER-SOURCE HEAT PUMP.** A heat pump that uses a water-to-refrigerant heat exchanger to extract heat from the heat source.

**WATER SUPPLY WELL.** Any well that is constructed to remove or return water to the ground.

**WATER TABLE.** That surface in an unconfined groundwater body at which the pressure is atmospheric. It is defined by the levels at which water stands in wells that penetrate the water body just far enough to hold standing water.

**WELL.** Any excavation that is drilled, cored, bored, washed, driven, dug, jetted, or otherwise constructed when the intended use of such excavation is for the location, acquisition, monitoring, or artificial recharge of groundwater. This includes but is not limited to test wells, test borings, and monitoring wells, in addition to wells to be utilized as individual or semi-public water supplies.

**WELL DRILLER.** An individual or company that is permitted or licensed by the State of Pennsylvania to drill wells in Pennsylvania.

**WELL SCREEN.** A filtering device that allows ground water from unconsolidated and semiconsolidated aquifers to enter the well while at the same time keeping the majority of sand and gravel out of the well and out of the pump. A screen also supports the aquifer material and prevents the borehole from collapsing.

**WELL SEAL.** An approved device or method used to protect a well casing or water system from the entrance of any external pollutant at the point of entrance into the casing of a pipe, electric conduit or water level measuring device.

**ZONE OF SATURATION.** The zone below the water table in which all interstices are filled with ground water.

## **SECTION XX03 PERMITS**

**XX03.1 Permit required.** No person, firm, or corporation shall make a penetration of soil and, or rock that is augered, drilled, cored, bored, washed, driven, dug, jetted, or otherwise constructed that is regulated by this code until a drilling permit has been issued by the code official.

**XX03.2 Permit application.** Applications for permits shall be made to the Centre Region Code Administration Office on forms furnished by said office.

**XX03.3 Fees.** The drilling permit fee shall be established by resolution of the Municipality.

**XX03.3.1 Payment of fees.** A *permit* shall not be valid until the fees prescribed by law have been paid, nor shall an amendment to a *permit* be released until the additional fee, if any, has been paid.

**XX03.4 Action on application.** The *building official* shall examine or cause to be examined applications for *permits* and amendments thereto within a reasonable time after filing. If the application or the *construction documents* do not conform to the requirements of this code, the *building official* shall reject such application in writing, stating the reasons therefore. If the *building official* is satisfied that the proposed work conforms to the requirements of this code and laws and ordinances applicable thereto, the *building official* shall issue a *permit* therefore as soon as practicable.

**XX03.5 Time limitation of application.** An application for a *permit* for any proposed work shall be deemed to have been abandoned 180 days after the date of filing, unless such application has been pursued in good faith or a *permit* has been issued; except that the *building official* is authorized to grant one or more extensions of time for additional periods not exceeding 90 days each. The extension shall be requested in writing and justifiable cause demonstrated.

**XX03.6 Validity of permit.** The issuance or granting of a drilling permit shall not be construed to be a permit for, or an approval of, any violation of any of the provisions of this code or of any other ordinance of the jurisdiction. Drilling *permits* presuming to give authority to violate or cancel the provisions of this code or other ordinances of the jurisdiction shall not be valid. The issuance of a drilling permit based on *construction documents* and other data shall not prevent the *building official* from requiring the correction of errors in the *construction documents* and other data. The *building official* is also authorized to prevent occupancy or use of a structure where in violation of this code or of any other ordinances of this jurisdiction.

**XX03.7 Expiration.** Every *permit* issued shall become invalid unless the work on the site authorized by such *permit* is commenced within 180 days after its issuance, or if the work authorized on the site by such *permit* is suspended or abandoned for a period of 180 days after the time the work is commenced. The *building official* is authorized to grant, in writing, one or more extensions of time, for periods not more than 180 days each. The extension shall be

requested in writing and justifiable cause demonstrated.

**XX03.8 Suspension or revocation.** The *building official* is authorized to suspend or revoke a *permit* issued under the provisions of this code wherever the *permit* is issued in error or on the basis of incorrect, inaccurate or incomplete information, or in violation of any ordinance or regulation or any of the provisions of this code.

**XX03.9 Placement of permit.** The building *permit* or copy shall be kept on the site of the work until the completion of the project.

**XX03.10 Time.** The building code official shall grant or deny a permit application, in whole or in part, within 15 business days of the filing date for permits associated with 1 and 2 family dwelling and within 30 business days of the filing date for permits associated with other systems. Reasons for denial shall be in writing and given to the applicant. The building code official and the permit applicant may agree to extend the deadline by a specific number of days.

**XX03.11 Stamp.** The building code official shall stamp or place a notation on each page of the set of reviewed construction documents that the documents were reviewed and approved for compliance with this code before the permit is issued. The building code official shall clearly mark any required non-design changes on the construction documents. The building code official shall return a set of the construction documents with this notation and any required changed to the applicant. The permit holder shall keep a copy of the construction documents at the work site open to inspection by the building code official.

## SECTION XX04 SUBMITTAL DOCUMENTS

**1004.1 General.** Submittal documents consisting of *construction documents*, statement of *special inspections*, and other data shall be submitted in two or more sets with each drilling *permit* application. The *construction documents* shall be prepared by a *registered design professional* where construction is not associated with a 1 and 2 family dwelling. Where special conditions exist, the *building official* is authorized to require additional *construction documents* to be prepared by a *registered design professional*.

**XX04.2 Construction documents.** Construction documents shall be in accordance with Sections XX04.2.1 through XX04.2.2.

**XX04.2.1 Information on construction documents.** *Construction documents* shall be dimensioned and drawn upon suitable material. Electronic media documents are permitted to be submitted when *approved by the building official*. *Construction documents* shall be of sufficient clarity to indicate the location, nature and extent of the work proposed and show in detail that it will conform to the provisions of this code and relevant laws, ordinances, rules and regulations, as determined by the *building official*.

**XX04.2.2 Site plan.** The *construction documents* submitted with the application for *permit* shall be accompanied by a site plan showing to scale the size and location of new well construction, proposed buildings, existing and proposed on-lot sewage treatment systems, and existing structures on the site, distances from *lot lines*, as applicable, flood hazard areas, floodways, and *design flood* elevations; and it shall be drawn in accordance with an accurate boundary line survey. In the case of demolition or abandonment, the site plan shall show construction to be demolished or abandoned and the location and size of existing structures and construction that are to remain on the site or plot. The *building official* is authorized to waive or modify the requirement for a site plan when the application for *permit* is for *alteration* or repair or when otherwise warranted.

**XX04.3 Examination of documents.** The *building official* shall examine or cause to be examined the accompanying submittal documents and shall ascertain by such examinations whether the construction indicated and described is in accordance with the requirements of this code and other pertinent laws or ordinances.

**XX04.4 Amended construction documents.** Work shall be installed in accordance with the *approved construction documents*, and any changes made during construction that are not in compliance with the *approved construction documents* shall be resubmitted for approval as an amended set of *construction documents*.

## SECTION XX05 WATER SUPPLY WELL AND BOREHOLE LOCATION

**XX05.1 Minimum water supply well depth.** The source of supply for a water supply well shall be from a water bearing formation drawn not less than 20 feet (6096 mm) from the ground surface. Wells shall be located at a point free from flooding and may not be located within a FEMA FIRM floodplain unless conforming to the requirements of Section 1005.1.1; and shall be at a higher elevation and at the minimum setback distances to existing or potential sources of pollution set forth in Section XX05.2.

**XX05.1.1 Water supply well construction in a floodplain.** If a well is proposed to be located within a floodplain then the well application must include a letter from a Registered Professional Engineer in the Commonwealth of Pennsylvania documenting why the necessity of placement of the well within the floodplain, the documented height of the 100- year flood level, and what mitigation measures, including but not limited to, the extension of the casing above the elevation of the 100-year flood elevation, are to be used to mitigate the contamination hazard.

**XX05.2 Minimum set back distance.** Wells and boreholes regulated by this code shall be located using the minimum setback distances to existing or potential sources of pollution listed in Table XX05.2. For closed loop geothermal wells and boreholes which due to infeasibility cannot conform to the requirements of Table XX05.2 an appeal to the Code Official can be made detailing the infeasibility, and the proposed location. Upon review, the code official may reduce the required set back distances with written approval of the Municipality.

## SECTION XX06 WATER SUPPLY WELL CONSTRUCTION REQUIREMENTS

**XX06.1 Casing.** All wells supplying individual or semi-public potable water supplies and all wells supplying open loop geothermal heating and/or cooling systems and all wells for the return and recharge of geothermal heating and cooling system discharge water shall be equipped with watertight and durable casing constructed of listed material and minimum wall thickness:

1. Wrought iron - 0.1875 inches (4.76 mm)
2. Steel - 0.1875 inches (4.76 mm)
3. Polyvinyl chloride (PVC) plastic 0.175 inches (4.445 mm)

**XX06.1.1 Joining.** The sections of casing shall be joined together by threaded couplings, or full circumferential welding for ferrous materials, and threaded couplings or solvent welding in accordance with ANSI/NSF Standard 14 for PVC. Other nonferrous casing joining must meet AWWA Standard A100.

**XX06.1.2 Minimum depth.** The casing shall be carried to a minimum depth of 20 feet (6096 mm) and grouted in place.

**XX06.1.3 Grouting.** Casing and grouting must be compatible. Pressure grouting is required for all wells by running tremie pipe to bottom of the annular space outside the casing.

Table XX05.2.  
Minimum Well and Borehole Setback Distances

<b>Setback From</b>	<b>Potable Water Supply Well (feet [meters])</b>	<b>Borehole and Geothermal Supply and Geothermal Return Well (feet [meters])</b>
Lakes, ponds, streams or other surface waters	25 [7.62]	25 [7.62]
Storm drains, retention basins, stabilization ponds or stormwater management facilities	10 [3.05]	10 [3.05]
Preparation area or storage area of hazardous spray materials, fertilizers or chemicals, salt piles	100 [30.48]	100 [30.48]
Gravity sewer lines and drains carrying domestic sewage or industrial waste	50 [15.24]	10 [3.05] or according to easement
Existing water and forced sewer buried utilities and/or utility trenches	Outside existing easement or, if no easement exists, no less than 15 feet [4,572 mm] from the utility or trench centerline.	
Septic tanks, aerobic tanks or holding tanks	50 [15.24]	25 [7.62]
Subsurface sewage disposal systems, elevated sand mounds, other sewage disposal fields	100 [30.48]	25 [7.62]
Sewage seepage pits, cesspools	100 [30.48]	25 [7.62]
Farm silos, barnyards, privies and fuel tanks	100 [30.48]	25 [7.62]
Rainwater pits, ditches	25 [7.62]	10 [3.05]
Spray irrigation sites, sewage sludge and septage disposal sites	100 [30.48]	25 [7.62]
Dedicated public right-of-way	20 [6.10]	10 [3.05]
Building foundations (except for buildings enclosing water wells and/or water well pumps and any other source of pollution as approved)	30 [9.14]	10 [3.05]

**XX06.1.4 Minimum borehole diameter.** The borehole should be 3 inches (76.2 mm) larger in diameter than the outside diameter of casing to allow for a minimum of 1-1/2 inches (38.1 mm) of annular space for grout placement.

**XX06.1.5 Minimum extension above grade.** Casing shall extend at least 12 inches (304.8 mm) above ground surface. The casing may be terminated at grade or just below grade if fitted with a waterproof and airtight cap and is located within a box-type enclosure with an access lid such as a small meter vault.

**Exception:** Airtight and watertight sealed open loop return wells can be direct buried.

**XX06.1.6 Ferrous casing.** Ferrous Casing shall be new pipe meeting ASTM or API specifications for water supply well construction. It shall be equipped with a drive shoe or other effective casing seal and have full circumference welds or threaded pipe joints.

**XX06.1.7 Non-ferrous casing.** Non-Ferrous Casing shall meet appropriate ANSI, ASTM or NSF standards for water well casing applications. It shall not be driven.

**XX06.2 Grouting.** An annular space shall be provided between the well casing and the earth formation. The annular space shall be completely filled with approved grout materials in one continuous operation under pressure from a minimum depth of 20 feet (6096 mm) below grade to the natural ground surface within 24 hours of completion of drilling. No activity in and around the well shall occur within 24 hours after grouting of the casing with neat cement or cement with bentonite and using a curing accelerant, or within 1/2 hour if using bentonite.

In the event that grouting is done following completion of all drilling operations, all obstructions must be completely cleared prior to placement of grout material.

**XX06.2.1 Pitless adaptor.** During the installation of a pitless adaptor, grout material may be removed from the exterior of the casing in order to provide a watertight seal between the casing and this adaptor. For the installation of a pitless adaptor, a ditch at least 3 feet (914.4 mm) deep is required along with conduits, stone, dust or sand. A sanitary well cap shall be incorporated for protection from leakage and identification of the well respectively.

**XX06.2.2 Geothermal.** Geothermal heating and/or cooling system vertical heat exchange boreholes containing loop pipes may be filled with approved grout or bridging or fill materials from their total depth up to a minimum depth of 20 feet (6096 mm) below grade. These vertical heat exchange boreholes must be filled with only approved grout from a minimum depth of 20 feet (6096 mm) below grade up to the ground surface. If the annular space around the loop pipes from a minimum depth of 20 feet (6096 mm) below grade up to the ground surface is free from standing water, the approved grout may be emplaced without pressure pumping through a tremie pipe.

**XX06.3 Packer.** Packers when used shall be of material that will not impart adverse taste, odor, toxic substances or bacterial contamination to the well water.

**XX06.4 Pitless installations.** Pitless installations are those where the casing terminates above the ground surface or below grade as specified in Section XX06.1. Where used, they shall be effectively sealed. All buried suction lines shall be encased. The access casing shall be protected against corrosion and shall extend at least 12 inches (304.87 mm) above the natural ground surface and to a depth of at least 20 feet (6096 mm) below the ground surface. Pitless adaptors cannot be installed through a ferrous casing by cutting the hole with a torch or flame, but must be installed by using a hole saw or drill to make the hole through the ferrous casing.

**XX06.5 Well screens.** Well screens shall provide maximum amount of open area while still maintaining structural strength. They shall have the size of openings based on a sieve analysis to preclude entry by sand, silt, and other undesirable elements.

**XX06.6 Well cap.** All installations shall install a secure, screened, varmint free well cap on all wells to prevent any surface pollutants from entering the well or any vandalism to the well or aquifer. In the event of a flowing well, the well cap must stop overflow from the well. Casing terminated at grade or just below grade, shall have a waterproof and airtight well cap installed.

**XX06.7 Venting.** Where venting is required, an overlapping cover or pipe with an opening facing downward shall be required. In no case shall openings be less than 12 inches (304.8 mm) above the ground.

**XX06.8 Monitoring wells.** Monitoring wells shall be designed and installed such as to minimize potential contamination of the aquifer and to maximize the information obtained from each such well.

**XX06.9 Heat pumps.** Heat pump (geothermal) installations shall be designed and constructed to provide an effective watertight seal with the well casing or water storage reservoir and to prevent contamination from reaching the water chamber or interior pump surfaces. In closed loop systems, boreholes must be grouted from a minimum depth of 20 feet (6096 mm) below grade to the ground surface with an approved grout. Open loop systems must conform to same requirements as water wells.

**XX06.10 Power pump installations.** The pump base installed directly over a well casing or pipe sleeve shall be designed to provide a watertight seal. It shall be located in a flood-free area. The pump and related equipment shall permit convenient access, removal, maintenance and repair. The suction opening shall be placed at least 2 feet (609.6 mm) below the maximum drawdown of the water in the well. The suction opening shall also be located at a sufficient distance from the bottom of the well so as to prevent agitation of accumulated sediment.

**XX06.11 Abandoned water supplies.** Existing wells that are to be abandoned shall be mitigated in accordance with Sections XX06.11.1 through XX06.11.3.

**XX06.11.1 Drilled wells.** Drilled wells shall be filled and sealed by approved grout.

**XX06.11.2 Hand dug wells.** Hand dug wells shall be filled with stone to within 4 feet (1219 mm) of the top of the well, then filled with compacted earth to ground level.

**XX06.11.3 Dry wells.** Dry wells being abandoned must be filled with stone and the top 20 feet (6096 mm) filled with approved grout; however, the top 2 feet (609.6 mm) may be covered with topsoil.

**XX06.12 Disinfection.** Following completion of construction, the well shall be pumped continuously until the water discharge is clear. It shall be filled with water containing concentration of not less than 100 parts per million of free chlorine. A portion of this solution shall be recirculated directly to the well in order to insure proper agitation. The water shall not be used for a period of 24 hours. Other combinations of water and chlorine concentration and

time interval may be used if demonstrated equally effective to the building code official. Disposal of the purged water shall be at a point so as to minimize adverse effects to aquatic life and in no way directed into any subsurface sewage disposal system.

1 ounce (29.57 ml) of dry calcium hypochlorite dissolved in 52.5 gallons (198.7 l) of water makes the proper strength disinfectant solution. Household bleach may be used for disinfection as given in Table XX06.12(1):

**XX06.13 Cross-connections.** All check valves and backflow protection shall be properly installed. Backflow protectors must be incorporated into the system and be used as needed for each outside water hose connectors. At a minimum two check valves shall be incorporated into each water system that derives water from a well.

**Exception:** Where not practical, a cross-connection prevention assembly shall be provided. For semi-public water supplies, the cross-connection prevention assembly device is shall be installed at any fixed potable water outlet to which a hose may be connected.

**XX06.14 Testing.** The assembled loop system shall be pressure tested with water at 100 psi (690 kPa) for 30 minutes with no observed leaks before connection (header) trenches are backfilled. Flow rates and pressure drops shall be compared to calculated values. If actual flow rate or pressure drop figures differ from calculated values by more than 10 percent, the problem shall be identified and corrected.

**XX06.15 Completion report.** Upon completion of the well or borehole, submit 2 copies of DCNR's water well completion report form 8700-FM-TG-5001S, as may be amended, to the code official and 1 copy of this form to the owner. If a geothermal well is constructed, a report shall be filed with the Centre Region Code Administration by the driller indicating the well was constructed in accordance with this Code.

Table XX06.12(1)  
Volume of Chlorine Bleach for Shock Chlorination of Wells and Springs

Water Depth	Well Diameter					
	6 in (152.4 mm)	8 in (203.2 mm)	10 in (254 mm)	24 in (609.6 mm)	32 (812.8 mm)	36 in (914.4 mm)
10 ft (3.05 m)	1 c (236.6 ml)	1 c (236.6 ml)	2 c (473.2 ml)	12 c (2839 ml)	16 c (3785 ml)	24 c (5678 ml)
20 ft (6.10 m)	1 c (236.6 ml)	2 c (473.2 ml)	4 c (946.4 ml)	20 c (4732 ml)	32 c (7571 ml)	40 c (9464 ml)
30 ft (9.14 m)	2 c (473.2 ml)	4 c (946.4 ml)	6 c (1420 ml)			
40 ft (12.19 m)	2 c (473.2 ml)	4 c (946.4 ml)	8 c (1893 ml)			
60 ft (18.29 m)	4 c (946.4 ml)	6 c (1420 ml)	12 c (2839 ml)			
80 ft (24.38 m)	4 c (946.4 ml)	8 c (1893 ml)	14 c (3312 ml)			
100 ft (30.48 m)	6 c (1420 ml)	10 c (2366 ml)	16 c (3785 ml)			
150 ft (45.72 m)	10 c (2366 ml)	16 c (3785 ml)				

■ Cup (c) is defined as 8 liquid ounces

## **SECTION XX07 BOREHOLE CONSTRUCTION REQUIREMENTS**

**XX07.1 Cased boreholes.** If casing is to be left in place permanently, then the boring shall conform to the requirements for water supply wells stated in Section 1006.

**XX07.2 Non-cased boreholes.** If no casing is utilized, then the boring shall be grouted using approved grout for not less than 20 feet (6096 mm) below grade.

**XX07.3 Temporary casing.** If a temporary casing is removed or retracted, this shall be accomplished immediately after grout has been placed or else before the grout has hardened or cured.

**XX07.4 Construction standard.** All materials and construction practices shall conform to the requirements stated in Closed-Loop / Geothermal Heat Pump Systems Design and Installation Standards, such as, but not limited to, standards for pressure testing, heat transfer fluids, etc. All materials and construction practices shall effectively prevent contamination of groundwater.

**XX07.5 Testing.** The assembled loop system shall be pressure tested with water at 100 psi (690 kPa) for 30 minutes with no observed leaks before connection (header) trenches are backfilled. Flow rates and pressure drops shall be compared to calculated values. If actual flow rate or pressure drop figures differ from calculated values by more than 10 percent, the problem shall be identified and corrected.

## **SECTION XX08 MAJOR ALTERATIONS**

**1008.1 General.** When major alterations are made to wells and boreholes regulated by this code, these alterations shall conform to Sections XX06 and XX07 with the following modifications.

**XX08.1.1 Existing non-grouted wells and boreholes.** If major alterations are made to an existing well or boring which is not grouted with an approved grout, then the following measures may be taken in lieu of the grouting requirements of Sections XX06 and XX07.

1. Remove soil from the uppermost 2 feet (609.6 mm) of the casing to a diameter of no less than 1 foot (304.8 mm) outside the existing casing.

2. Fill the exposed annular space with an approved grout to grade.
3. Place a compacted earth mound around the well casing. The compacted earth mound shall be no less than 6 inches high (152.4 mm) and shall extend no less than 1 foot (304.8 mm) away from the casing in all directions. The purpose of the compacted earth mound is to divert surface water away from the well, so the compacted earth mound shall be non-erodible.

This exception applies only to wells and, or borings that were in existence prior to the effective date of this code.

## **SECTION XX09 CROSS-CONNECTIONS**

**XX09.1 General.** Cross connections between an individual or semi-public water supply and a public water system shall be prohibited.

## **SECTION XX10 VIOLATIONS**

**XX10.1 General.** No well or borehole regulated by this code shall be used until compliance with this code has been obtained.

## **SECTION 1011 DISCLAIMER**

**XX11.1 General.** Approval of this application and issuance of a permit for a well and, or boring on the above described property does not constitute any guarantee or warranty by the Municipality or the Center Region Code Administration regarding quantity or quality of water that may be obtained as a result of any well drilled under this permit. The approved permit solely provides the approval to drill a well and, or boring at the site shown on the application, and does not provide any other guarantees, approval, or warranties.



## CHAPTER 11 REFERENCED STANDARDS

This chapter lists the standards that are referenced in various sections of this document. The standards are listed herein by the promulgating agency of the standard, the standard identification, the effective date and title and the section or sections of this document that reference the standard. The application of the referenced standards shall be as specified in Section 102.7.

<b>ANSI</b>	American National Standards Institute 1819 L Street, NW, 6 <sup>th</sup> Floor Washington, DC 20036	Referenced in code section number
Standard reference number	Title	section number
14-2008e	Plastics Piping System Components and Related Materials	XX06.1.1

<b>AWWA</b>	American Water Works Association 6666 Quincy Avenue Denver, CO 80235	Referenced in code section number
Standard reference number	Title	section number
A100—2006	AWWA Standard for Water Wells	XX06.1.1

<b>IGSHPA</b>	International Ground Source Heat Pump Association 374 Cordell South, Oklahoma State University Stillwater, OK 74078-8018	Referenced in code section number
Standard reference number	Title	section number
CLGHPS-08	Closed-Loop / Geothermal Heat Pump Systems, Design and Installation Manual	XX07.4

