Title 26 DEPARTMENT OF THE ENVIRONMENT
Subtitle 04 REGULATION OF WATER SUPPLY, SEWAGE DISPOSAL, AND SOLID WASTE

Sections .01-.20

Chapter 04 Well Construction

Authority: Environment Article, §§9-1305 and 9-1305.1, Annotated Code of Maryland

.01 Purpose and Administrative Responsibilities.
A. Purpose. This chapter establishes the standards and procedures applicable to the construction, abandonment and maintenance of wells in Maryland.
B. Pre-emption of Local Authority. In accordance with Environment Article, §9-1304, AnnotatedCode of Maryland, the regulations of this chapter are the only procedures and standardsapplicable to construction of wells.

.02 Definitions.
A. In this chapter, the following terms have the meanings indicated.
B. Terms Defined.
(1) “Abandonment” means to discontinue the use of a well permanently.
(2) “Annular space” means the space between casings or between the casing and borehole.
(3) “Approving Authority” means the Secretary of the Environment or the Secretary’s designee.
(4) “Aquifer” means a formation, group of formations, or part of a formation that contains sufficient saturated permeable material to yield significant quantities of water to a well.
(5) Bedrock.
(a) “Bedrock” means solid rock that underlies gravel, soil, or other superficial material.
(b) “Bedrock” also means in absolute terms material that a 6-inch auger, equipped with carbide cutting teeth, penetrates at a rate of less than 1 inch in 3 minutes.
(6) “Bentonite” means a colloidal clay, composed of at least 85 percent sodium montmorillonite.
(7) “Bored well” means any excavation made using power driven equipment where the drill consists of a continuous spiral of metal solid or hollow stem auger or bucket attached to a shaft and where the excavated material is brought to the ground surface by upward movement along the surface of the spiral or removed by lifting the spiral or bucket.

(8) “Borehole” means a hole drilled or bored into the earth, into which casing, screen, liners,
grout, gravel pack and other physical objects that may be installed to construct a well. The generalized term includes the excavations for dug, driven, and jetted wells.
(9) “Casing” means any metal, plastic or other pipe installed from the surface to either the bedrock or screened aquifer in the borehole.
(10) “Cathodic protection well” means a well constructed to minimize the electrolytic corrosion of metallic equipment that comes in contact with the ground.
(11) “Cluster” means a group of wells that are constructed for the same use on the same property.
(12) “Confined aquifer” means an aquifer that is bounded above and below by beds of distinctly lower permeability than that of the aquifer itself and contains ground water under pressure greater than that of the atmosphere. This term is synonymous with the term “artesian aquifer”.
(13) “Confining layer” means a body of impermeable or of distinctly less permeable material stratigraphically adjacent to one or more aquifers.
(14) “Department” means the Department of the Environment.
(15) “Development” means the process whereby a well is pumped, surged, bailed, airlifted, swabbed, or jetted to remove any material that may be blocking the well screen or fractures within the borehole.
(16) “Disinfection” means the inactivation or removal of those agents that may cause infection.
(17) “Domestic well” means a well used to supply potable water to one or more dwellings.
(18) “Driven well” means any well in which the casing is manually or mechanically driven into the ground with little or no material excavated during well construction.
(19) “Dug well” means any well made using only hand tools.
(20) “Emergency condition” means:
(a) The lack of water poses an immediate and significant danger to the health and welfare of persons, livestock, domestic fowl, or crops; or
(b) The Approving Authority has determined that other exceptional circumstances exist.
(21) “Geothermal well” means a well used to transfer heat to or from the ground or ground water.
(22) “Grout” or “grouting material” means a stable, impervious bonding material that is reasonably free of shrinkage and is capable of providing a watertight seal in the annular space
throughout the depth required.

(23) “Hydrofracturing” means a method of developing or reworking an existing well whereby water is pumped down the borehole under pressure in an attempt to increase the well's yield.
(24) “Industrial well” means a well used to supply water to an industrial or commercial facility for use in processing, washing, or manufacturing of goods and services.
(25) “Injection well” means any hole made in the ground to inject fluids into any underground formation from which ground water may be produced.
(26) “Irrigation well” means a well that is used for watering crops other than residential lawns and gardens.
(27) “Jetted well” means any well made using water under pressure as a means of drilling or penetrating the ground.
(28) “Jetted-driven well” means a jetted well where the diameter of the excavation is less than the diameter of the well casing used and the well casing is driven into the excavation.
(29) “Liner” means a pipe that is installed inside a completed and cased well or borehole to:
(a) Protect the integrity of the borehole;
(b) Seal off zones of undesirable quality;
(c) Repair compromised casing or;
(d) Repair compromised screens.
(30) “Monitoring well” means a permanent well used for:
(a) Determining the water table;
(b) Determining the potentiometric surface of an aquifer;
(c) Obtaining a ground water sample; or
(d) Ground water withdrawal for remediation purposes.
(31) “Non-potable well” means a well that is not used or intended to be used as a drinking water supply.
(32) “Person” means the federal government, the State, any county, municipal corporation, or other political subdivision of the State, or any of their units, an individual, receiver, trustee, guardian, executor, administrator, fiduciary, or representative of any kind, or any partnership, firm, association, public or private corporation, or any other entity.
(33) “Piezometer” means a nonpumping well of a temporary nature to measure water tables.
(34) “Pitless adapter” means a device designed for attachment to the exterior of a well casing and equipped with lateral connections designed for the attachment of pipes leading from the well for purposes of conducting water to a distribution system and allowing extension of well casing above grade.
(35) “Pitless unit” means a device designed to replace a section of casing with lateral connections designed for the attachment of pipes leading from the well for the purposes of conducting water to a distribution system and allowing extension of well casing above grade.

(36) “Pollution” means any contamination or other alteration of the physical, chemical, or biological properties of any waters of the State, including a change in temperature, taste, color, turbidity, or odor of the waters, or the discharge or deposit of any organic matter, harmful organism, or liquid, gaseous, solid, radioactive, or other substance into any waters of this State that will render the waters harmful or detrimental to:
(a) Public health, safety, or welfare;
(b) Domestic commercial, industrial, agricultural, recreational, or other legitimate beneficial uses;
(c) Livestock, wild animals, or birds; or
(d) Fish or other aquatic life.
(37) “Potable water” means water that is free from impurities in amounts sufficient to cause disease or harmful physiological effects and that conforms with the maximum contaminant levels as adopted by the United States Environmental Protection Agency and listed in 40 CFR §141, Subpart G as amended.
(38) “Public well” means a well that is used to supply water to a public water system as defined in COMAR 26.04.01.
(39) “Replacement well” means a well that is to replace any existing water supply.
(40) Reworking.
(a) “Reworking” means the rehabilitation or modification of a well.
(b) “Reworking” includes but is not limited to:
(i) Removing and replacing well screen;
(ii) Placing a new screen in a well;
(iii) Placing liner pipe in a well; and
(iv) Redevelopment of a well.
(c) “Reworking” does not include:
(i) Increasing the diameter of a well; or
(ii) Deepening of a well.
(41) “Standby well” means a water supply well that is a backup to the primarily used water supply well which meets the construction and potability standards of this chapter.
(42) “Test well” means a well used for the purpose of exploring for ground water for a water supply and used to determine aquifer properties.
(43) “Unconfined aquifer” means an aquifer that is not bounded above by a bed of distinctly lower permeability than that of the aquifer itself and contains ground water under pressure approximately equal to that of the atmosphere. This term is synonymous with the term “water table aquifer”.
(44) “Variance” means a deviation from the requirements of these regulations granted by the Department according to the provisions of Regulation .37.
(45) “Water supply well” means every type of well, except monitoring and closed loop geothermal wells.

(46) “Well” means a hole made in the ground:
(a) To explore for ground water;
(b) To obtain or monitor ground water;
(c) To inject water into any underground formation from which ground water may be produced; or
(d) To transfer heat to or from the ground or ground water, if the hole:
(i) Extends more than 20 feet below the surface of the ground; and
(ii) Is not a well for obtaining geothermal resources under Environment Article, §5-601,
Annotated Code of Maryland.

.03 Application for a Well Construction Permit.
A. An application for a well construction permit shall be made on the forms provided by the Approving Authority.
B. A separate application shall be made for each well, except that a single application may be made for a cluster of wells under one of the following conditions:
(1) The cluster is for closed loop geothermal or dewatering wells and the maximum number of wells drilled per application is 20; or
(2) The cluster is for piezometers used in spill control investigations and other groundwater investigations required by the Department.
C. If piezometers are converted to permanent monitoring wells, a tag must be obtained for each one.
D. An application shall be legible and complete. An illegible or incomplete application may be returned to the applicant with a statement of the reason for rejection.
E. An application for a well construction permit shall be submitted to the Approving Authority for review, except for:
(1) An application for a test well for a public water supply system or a public well, which shall be submitted to the Department through the Approving Authority; and
(2) An application for a water supply well for use on a dairy farm, which shall be submitted to the Approving Authority who shall submit to the Department of Health and Mental Hygiene for review prior to issuance.
F. An application for an injection well shall be submitted to the Department through the Approving Authority.
G. An application for dewatering wells shall be made to the Approving Authority if:
(1) The wells will be deeper than 30 feet;
(2) The well will be in use for greater than 30 days; or
(3) The well will contain pumping equipment.
H. An application for a cluster of wells shall include a drawing indicating the location of each proposed well on the property.

I. For a well permitted as part of a cluster that is proposed to be converted to a permanent monitoring well a separate application shall be made.
J. The Approving Authority may request additional information deemed necessary to consider
the application.

.04 Review and Approval of an Application for a Well Construction Permit.
A. Application Review and Approval.
(1) The Approving Authority shall review the application for completeness and notify the applicant of any additional information needed.
(2) The Approving Authority shall approve the application if:
(a) The application is complete;
(b) The proposed well meets the criteria of §B of this regulation;
(c) The proposed source or sources of drilling water meets the requirements of this chapter;
(d) The Approving Authority has received the required well permit fee, if applicable; and
(e) One of the following conditions regarding water appropriation or use permitting is met:
(i) An application for an appropriation or use permit has been submitted, if required, in accordance with applicable State law and regulation; or
(ii) A notice of exemption, if required under Environment Article, §5-502, Annotated Code of Maryland, has been made with the Department.
(3) If it approves the application, the Approving Authority shall sign the application and issue a well construction permit.
(4) An application that has been disapproved by the Approving Authority shall be returned to the applicant with a statement of the reasons for disapproval.
B. Criteria for Approval.
(1) A proposed well construction shall be in accordance with the applicable Master Water and Sewer Plan, promulgated in accordance with Environment Article, Title 9, Subtitle 5, Annotated Code of Maryland.
(2) A proposed well location for a water supply or open loop geothermal well shall satisfy the following minimum horizontal distance requirements:
(a) 10 feet from a property line;
(b) 15 feet from a road or dedicated right-of-way;
(c) 30 feet from a building foundation;
(d) 100 feet from identifiable sources of contamination and designated subsurface sewage disposal areas if the proposed well will utilize an unconfined aquifer as a water supply source;
(e) 50 feet from identifiable sources of contamination and designated subsurface sewage disposal areas if the proposed well will utilize a confined aquifer as a water supply source; and

(f) Except as provided in §B(3) of this regulation, 50 feet from any sewage gravity or force main.
(3) If a force main is constructed of materials approved by the Department and has passed a leakage test in accordance with the recommended standards for sewage works, and, if required by the Approving Authority, concrete encasement of sewage force main joints have been emplaced within a 50-foot radius of the proposed well, then the distance from any force main may be 10 feet.
(4) A proposed well location for a closed loop geothermal well shall satisfy the following minimum distance requirements:
(a) 10 feet from a property line;
(b) 15 feet from a road or dedicated right-of-way:
(c) 50 feet from potential sources of contamination: and
(d) 50 feet from any gravity sewer line, except the distance of removal shall be at least 10 feet when the sewer is constructed of:
(i) Cast iron pipe with either water-tight lead caulked joints or joints fitted with neoprene gaskets;
(ii) Solvent welded Scheduled 40 (or SDR equivalent) or better polyvinyl chloride (PVC) pipe; or
(iii) Thermally welded high density polyethylene (HDPE) pipe.
(5) A water supply well may not be located within or under any building other than a separate structure constructed specifically for the housing of pumping equipment.
(6) The Approving Authority may approve a monitoring or closed loop geothermal well location within a building, if unobstructed access to the well is provided.
(7) All wells shall be located so as to be accessible for cleaning, treatment, repair, testing, inspection, and other requirements that may be necessary.
(8) The location of a water supply well shall be in accordance with any conditions on well spacing that may be imposed by the Department through an appropriation or use permit.
C. Notwithstanding satisfaction of the criteria of this regulation, the Approving Authority, before approving a permit, shall determine the acceptability of a proposed well location with regard to all identifiable sources of contamination, topography, surface drainage, easements, and ground water conditions.
D. Upon written request, deviation from the distance criteria may be permitted by the Approving Authority without a variance approved by the Department per Regulation .37 of this chapter for a domestic well constructed on an individual lot in those cases where the property owner has initiated or completed construction of the residential dwelling for that lot in compliance with all other State, county, or municipal laws and regulations. The request shall describe the need for a deviation and shall contain a statement signed by the owner confirming the basis for a deviation.

.05 Issuance of Well Construction Permits.

A. A well may not be constructed until the Approving Authority has issued a permit to drill the well, except as provided in Regulation .06 of this chapter.

B. The Approving Authority may issue a well construction permit only to a person licensed by the State Board of Well Drillers as a master well driller.

C. Except as provided in Regulation .06 of this chapter, the Approving Authority may issue a well construction permit after receipt and review of a completed application submitted in accordance with this chapter.

D. The Approving Authority may impose special conditions on the permit that are necessary to protect the public health and environment.

E. The Approving Authority shall issue a separate permit for each well, except that the Approving Authority may permit a well cluster under one permit.

F. The permit, if necessary, authorizes the construction of a temporary well to supply drilling water for construction of the permitted well. The temporary well shall be sealed within 48 hours of completion of construction of the permitted well, in accordance with this chapter.

G. Written Permit and Well Identification Tag.

(1) Issuance of a well construction permit shall consist of a written permit and a durable well identification tag.

(2) Written Permit.

(a) The permit shall state pertinent information and requirements applicable to the approved well.

(b) A permit shall be valid for a period of 12 months from the date of issuance by the Approving Authority.

(c) Upon written request by the well driller, a permit may be extended in 6-month increments by the Approving Authority.

(3) Well Identification Tag.

(a) The well driller, immediately after grouting the well, shall permanently attach to the well the identification tag furnished by the Approving Authority.

(b) The identification tag shall be permanently fastened to the well casing above the finished grade by means of a stainless steel band.

(c) For wells where a pitless adapter or pitless unit is not used, the identification tag shall be permanently attached or fastened to a concrete base where this base completely surrounds the casing.

(d) For closed loop geothermal wells, the well identification tag shall be supplied to the owner.

(e) If the identification tag is removed from the well during later work on the well, it shall be replaced in the proper position and manner by the person who removes it.

.06 Emergency Procedure to Obtain a Well Construction Permit.

A. The Approving Authority may permit emergency construction of wells for the conditions specified in Regulation .02B(20) of this chapter or for the following types of wells:
(1) Monitoring wells at pollution spill sites to control the spread of the pollution as required by the Department; or
(2) Geothermal wells if a loss of heating or cooling poses a health threat or significant loss of goods or livestock.
B. If an emergency condition occurs during normal business hours, the Approving Authority may grant an emergency permit in accordance with the following procedures:
(1) The existence of an emergency condition shall be verified by the Approving Authority;
(2) If the emergency is verified to the satisfaction of the Approving Authority, the Approving Authority may issue a verbal emergency permit number to a master well driller;
(3) The permit number shall be in the possession of the permittee during construction of the well, and shall constitute authorization to construct the well;
(4) The emergency permit shall become null and void if well construction is not started within 2 days after issuance of the emergency permit number; and
(5) Within 3 business days after the start of construction of the well, the master well driller shall submit to the Approving Authority a completed, written application, including the emergency permit number.
C. If an emergency condition occurs during nonbusiness hours:
(1) The master well driller shall attempt to contact the Approving Authority through the Approving Authority's nonbusiness-hours emergency telephone number;
(2) If the Approving Authority cannot be contacted, then the well may be constructed without receiving a verbal permit number provided that not later than the first business day following the start of well construction activity, an application is submitted to the Approving Authority; and
(3) The Approving Authority shall verify the emergency condition before the issuance of a permit.
D. Any well constructed under an emergency condition shall be constructed in conformance with all applicable laws and regulations of the Approving Authority.
E. If the new well location is found to be unacceptable by the Approving Authority, the well shall be sealed in accordance with this chapter.

.07 Verbal Authorization to Construct a Well.
A. The Approving Authority may grant verbal authorization to a master well driller to construct a well when:
(1) The application has been submitted and approved by the Approving Authority; or

(2) The authorization is for an emergency well.
B. Verbal Authorization and Permit Number.
(1) Verbal authorization shall be accompanied by the issuance of a well construction permit number.
(2) Upon request by Approving Authority personnel, the well driller shall supply the well construction permit number for the well being drilled.
C. Verbal authorization may not be granted if the well is to provide water for a use requiring a
permit to appropriate or use water, and this permit has not been obtained or is not valid.
D. Any well constructed with verbal authorization shall be constructed in conformance with all applicable laws and the regulations of this chapter.

.08 Transfer of Permit.
A. A well construction permit may be transferred from the permittee to another master well driller provided:
(1) The well has not been completed;
(2) The permit has not expired;
(3) The permittee obtains the Approving Authority's approval to transfer the permit; and
(4) The transferee notifies the Approving Authority in writing of their intention to accept the permit.
B. The transferee shall be responsible for complying with all laws and regulations applicable to the construction of the well.
C. The transferee may not begin well construction before obtaining the permit and well tag from the permittee and receiving the approval of the transfer from the Approving Authority.
D. The Approving Authority shall maintain a separate log of permit transfers.

.09 Permit Invalidation.
A. A permit is invalid if, prior to well completion, the Maryland Board of Well Drillers suspends or revokes the license of the master well driller permit holder.
B. The Approving Authority may invalidate a permit after a finding that information submitted to support the application was inaccurate.
C. The Approving Authority may invalidate a permit after a finding that information submitted to support the application is no longer applicable to the site.
D. The Approving Authority shall notify the permittee that a permit has been invalidated.

.10 Permittee's Responsibilities.

A. The master well driller to whom a well construction permit is issued is responsible for construction of the well in accordance with the permit and applicable laws and regulations.
B. All other persons working on a well or potable water supply system, including but not limited to a pump installer, a water-conditioner installer, an electrician, or a master plumber, also shall be responsible for their phase of the work and its conformance to applicable laws and regulations.
C. Only the permittee, or his licensed employee or licensed agent, is authorized to construct the well.
D. The permittee, or his licensed employee or licensed agent, shall be present on-site to supervise the work of constructing a well.
E. Permit information shall be available on-site during construction of the well and made available upon request to the Approving Authority.
F. The permittee, upon completion of the well, shall prepare, sign, and submit to the Approving Authority a legible well completion report. The requirements for well completion reports are set forth in Regulation .29 of this chapter.

.11 Permits for Reworked and Deepened Wells.
A. A well construction permit is not required if an existing well requires only reworking or repairing, and not deepening.
B. If reworking the well includes hydrofracturing, the well driller shall submit a Hydrofracture of Well Report within 45 days after completion of the work as required in Regulation .28 of this chapter.
C. If an existing well requires deepening, and the well identification number is verifiable by means of the well identification tag or prior permit, a well construction permit is not required except in areas of known water quality problems, however, upon completion, the well driller shall submit to the Approving Authority the well identification number and an updated completion report in accordance with the regulations of this chapter.
D. If a well requires deepening and the well driller cannot provide the well identification
number, the well driller shall apply for a well construction permit.
E. If a well which is governed by a water appropriation and use permit requires deepening permission must be obtained from the Department.

.12 Procedure for Authorizing Conversions of Test Wells.
A. A permitted test well that is found to produce the required amount of water may be converted to a water supply well if:
(1) It has been constructed in conformance with the regulations of this chapter for the use for which conversion is sought and COMAR 26.17.06;
(2) Upon written request, the conversion is approved by the Approving Authority;

(3) For wells that are to supply water for a public water supply system, the request is approved by the Department; and
(4) For wells that are to supply water for use on a dairy farm, the request is approved by the Department of Health and Mental Hygiene.
B. A test well may be converted to a monitoring well when requested in writing and approved by the Approving Authority.
C. A test well may be converted to a standby well when requested in writing and approved by the Approving Authority.
D. A test well shall be abandoned and sealed in accordance with this chapter within 180 days
after completion unless a longer period of time is approved by the Approving Authority or the Approving Authority has approved its conversion to a water supply well, a monitoring well, or a geothermal well.

.13 Relocation During Construction.
A. If it is necessary to relocate a well under construction in order to obtain sufficient yield or potable water or because of a well construction problem, the well driller may relocate the well construction site under authority of the original permit if:
(1) The new site meets the requirements of this chapter and the requirements of the Approving Authority; and
(2) The permittee provides a drawing of the new well location on the well completion report.
B. If the new well location is found to not meet the requirements of this chapter the well shall be abandoned in accordance with this chapter.

.14 Notification of Well Construction Activities.
A. Water Supply Wells.
(1) The permittee shall notify the Approving Authority on the business day prior to commencing well drilling activities to allow the Approving Authority the opportunity to inspect.
(2) The Approving Authority may require that the permittee provide notice before commencing a yield test in Hydrogeologic Area 3.
(3) The Approving Authority may require that the permittee provide notice before the installation of the pitless adapter or pitless unit.
(4) The Approving Authority may require that the permittee provide notification prior to commencing grouting activities to allow them the opportunity to inspect.
B. Nonpotable, Monitoring, and Geothermal Wells.
(1) The Approving Authority may require the permittee give notice in advance of commencing well construction activities on monitoring wells and nonpotable wells.
(2) The permittee shall notify the Approving Authority one business day prior to commencing well drilling activities of geothermal wells.

C. A well driller shall notify a municipality if the well will be drilled inside the municipality's corporate boundary line or if the well will be drilled 1 mile or less outside the municipality's corporate boundary line.

.15 Construction Standards—Hydrogeologic Areas.

A. Geologic and hydrologic conditions in Maryland require varying well construction standards. For the purposes of this chapter, the State has been divided into five hydrogeologic areas. A mapof the approximate hydrogeologic area boundaries is in Regulation .39 of this chapter.

B. The Five HydrogeologicAreas.

(1) Hydrogeologic Area 1. The area where the unconfined Quaternary aquifer of the Maryland Coastal Plain is of major importance; the area described in "United States Geological Survey (USGS) Professional Paper 822, Water Resources of the Delmarva Peninsula, 1973" and "Maryland Geological Survey (MGS), Report of Investigation No. 40, The Columbia Aquifer of the Eastern Shore of Maryland, Part 1 Hydrogeology, 1984", which is incorporated by reference.

(2) Hydrogeologic Area 2. The area where the confined aquifers of the Maryland Coastal Plain are of major importance as described in "MGS, Open File Report 72-02-1, A User's Guide for the Artesian Aquifers of the Maryland Coastal Plain, 1972".

(3) Hydrogeologic Area 3. The rocks of the Maryland Piedmont and Blue Ridge as described in "MGS, Report of Investigation 10, Ground Water Occurrence in the Maryland Piedmont, 1969", and "MGS, Open File Report 69-02-1, Ground Water Aquifers and Mineral Commodities of Maryland, 1969", exclusive of the carbonate rocks.

(4) Hydrogeologic Area 4. The sedimentary rocks of the Maryland Appalachian Highlands and Valley and Ridge Provinces, exclusive of carbonate rocks, as described in the references listed in Hydrogeologic Area 3.

(5) Hydrogeologic Area 5. The carbonate rocks as defined by the "Maryland Geological Survey, Geologic Map of Maryland", Scale: 1:250,000 dated 1968.

.16 Construction Standards — General.

A. Sanitary Protection During Well Construction.

(1) During well construction, the permittee shall protect against pollution of the well and any water-bearing geologic formations by any cause, including surface water drainage.

(2) Whenever construction ceases before the well is grouted, the open annular space shall be covered by the permittee and the well shall be capped.

B. Water for Well Construction.

(1) Only water from a source approved by the Approving Authority in accordance with this section may be used in the construction and development of a well.

(2) Water used for construction of a well shall be taken from the best source available to the well driller.
(3) The best source, in order of preference, shall be:
(a) A public water supply system meeting the requirements of COMAR 26.04.01 for water quality;
(b) Any other potable water supply;
(c) A nonpotable well;
(d) A temporary well, constructed specifically for the purposes of obtaining water for the construction of the well.
(4) Water used for the construction or development of a well shall:
(a) Have a turbidity of not more than 25 standard units, except when the turbidity is due to the oxidation of dissolved iron or manganese;
(b) Be transported, when necessary, in tank trucks used only for the purpose of transportingdrilling or potable water;
(c) Be treated with chlorine in amounts indicated in §B(5) of this regulation;
(d) Have a color of not more than 25 standard units; and
(e) Contain no objectionable odor.
(5) Chlorine treatment required in §B(4)(c) of this regulation, shall be as follows:
(a) For water from a public supply approved under COMAR 26.04.01, a chlorine compound shall be added to the water to produce a free chlorine residual of at least 1.0 mg/l when delivered at the drilling site;
(b) For water from any other potable water supply, the free chlorine residual of at least 3.0 mg/l in the water delivered at the drilling site;
(c) Water from a nonpotable well shall be dosed with chlorine to produce a minimum free chlorine residual of 50 mg/l.
C. Screening in More Than One Aquifer Prohibited. A well may not be screened in more than one aquifer.
D. Sealing-Off Strata. In order to preserve the quality of ground water, the Approving Authority may include a special condition in a well construction permit requiring that aquifers and other strata be sealed off.
E. Well Development. All wells shall be developed according to the following requirements:
(1) Well development means the process whereby a well is pumped, surged, bailed, airlifted, swabbed or jetted to remove any material that may be blocking the well screen or fractures within the borehole;
(2) Development shall continue until formation cuttings, drilling fluids, and additives are removed from the well;
(3) For wells in Hydrogeologic Areas 1 and 2, well development shall remove the fine sand, silt, and clay from the water-bearing zone surrounding the well screen;
(4) Any hydrofracturing shall be performed in accordance with Regulation .28 of this chapter; and
(5) Every well shall be developed in order to obtain the full yield of the well and a water quality that meets all of the following requirements:

(a) Contains less than 5 milligrams sand or larger sized particles per liter of water, where particles with a diameter between 0.0625 and 2.0 mm are considered to be sand; and
(b) Has a turbidity of less than 10 NTU (nephelometric turbidity unit) as determined by methods designated in 40 CFR §141.74(a)(1), except if the turbidity is due to the oxidation of dissolved iron or manganese naturally occurring in the water.

.17 Construction Standards—Casing.
A. Well Casing.
(1) Markings.
(a) Except as provided in §A(1)(b) of this regulation, all casing shall be marked by the manufacturer sufficiently to allow identification of the casing.
(b) Well casing for monitoring wells is exempt from displaying markings.
(c) The well driller shall provide, upon request, sufficient information to allow identification of casing used for monitoring wells.
(2) Plastic Well Casing.
(a) Plastic well casing shall be polyvinyl chloride, PVC, manufactured to meet the standards of the American Society of Testing and Materials (ASTM) Standard F-480.
(b) Plastic well casing shall be installed in accordance with the maximum depth limits specified:

Table 1
Depth Limit, In Feet, for Plastic Water Well Casing
PVC Cell Class 12454, PVC 1120, Type I

Diameter (inches)	SDR	SDR	SDR	SDR	SCH	SCH
	26	21	17	13.5	40	80
2	136	265	517	1085	708	2185
3	“	“	“	“	604	1730
4	“	“	“	“	400	1139
4.5	“	“	“	“	310	M
5	“	“	“	“	242	807
6	“	“	“	“	180	724
8	“	“	“	“	125	498
10	“	“	“	“	92	424
12	“	“	“	“	76	387
16	“	“	“	“	72	-

(c) In Hydrogeologic Areas 3, 4 ,and 5, plastic well casing may not be used for the main casing where caving conditions occur before casing placement.

(d) Plastic well casing 4 inches or less in diameter shall be a minimum of schedule 40.
(e) All plastic well casing greater than 4 inches in diameter shall be a minimum of SDR 26.
(3) Metal Well Casing.
(a) Metal well casing shall meet one of the following standards:
(i) ASTM standard A-53 or A-589;
(ii) American Petroleum Institute standard 5A or 5L; or
(iii) ASTM standard A-312, type 304 minimum, for stainless steel.
(b) Metal well casing of 4 inches or less, nominal size, shall be schedule 40 or better.
(c) Metal well casing greater than 4 inches, nominal size, shall have a minimum nominal wall thickness of 0.188 inches.
(d) The Approving Authority may require that Schedule 40 or Standard Schedule metal well casing be used where there is corrosive water, soil, or geology.
(e) Metal casing shall be new, prime pipe, being free of pits or breaks.
(4) Casing material is not permitted which will cause the delivered water to be toxic or violate State or federal primary drinking water standards in effect at the time the well is constructed.
(5) Other types and sizes of well casing may be approved by the Approving Authority for special applications, upon written request by the well driller.
B. Minimum Casing Length.
(1) In Hydrogeologic Areas 1 and 2, the casing shall extend to the top of or into the aquifer used.
(2) In Hydrogeologic Areas 3, 4, and 5, the casing shall extend through the weathered zone and be seated a minimum of 2 feet into bedrock.
(3) Less than 20 feet of casing may not be used in any area except as provided in Regulation .23of this chapter.
(4) In Hydrogeologic Area 4, the minimum casing length is 40 feet.
C. Minimum Casing Diameter.
(1) Potable water supply wells shall have a minimum main casing diameter of 4 inches in all hydrogeologic areas of the State.
(2) In Hydrogeologic Areas 1 and 2, for potable water supply wells, the 4-inch minimum main casing diameter shall extend to, whichever comes first:
(a) A minimum of 250 feet; or
(b) The top of the aquifer used.
(3) Criteria for Variance for Telescoping Casing.
(a) The Approving Authority shall submit a report to the Department for approval prior to granting variances to §C(2) of this regulation for increasing or decreasing the minimum depth of the 4-inch minimum main casing diameter.
(b) The report shall contain at a minimum the following information:
(i) Area of county where variance is being considered;
(ii) Aquifer for which variance is being considered;

(iii) Discussion of current aquifer usage and predicted aquifer usage; and
(iv) Proposed variance wording.
(c) The report shall be incorporated in the county Master Water and Sewer Plan prior to implementation.
D. Well Casing Joints.
(1) Joints shall be watertight.
(2) Joints for metal casing may be either electrically welded or threaded.
(3) Joints for plastic well casing may be either threaded, solvent welded, or sordering.
(4) Screws or other mechanical devices may only be used to join PVC well liner:
(i) For solvent welded joints used in liners;
(ii) With nonpenetrating stainless steel screws;
(iii) And per the recommendations of the pipe manufacturer to maintain their warranty.
E. Other Installation Requirements.
(1) Liners shall meet the standards for well casing under §§A and D of this regulation.
(2) Well casing may not be cut off or cut into below ground except to install a pitless unit.
(3) Well casing shall extend at least 8 inches above the finished grade.

.18 Construction Standards — Screen.
A. Well Screens.
(1) All wells that obtain water from aquifers in Hydrogeologic Areas 1 and 2 shall be equipped with a screen that shall adequately prevent the entrance of formation material into the well during use.
(2) Well screens shall have sufficient structural strength to accomplish the purpose for which they are installed.
(3) Well screen openings shall provide, so far as is practical, the maximum amount of open area, consistent with strength of screen material and sediment grain size of the water-bearing formation to permit maximum transmission without clogging.
(4) Well screens, other than those made commercially, constructed by creating openings or slots in the casing, or liner, or both, by any mechanical contrivance are prohibited unless approved by the Approving Authority in a special permit condition.
(5) The well screen shall be provided with fittings necessary to seal the screen to the casing. If the screen diameter is smaller than the casing diameter, then extension of the screen blank section to at least 20 feet above the base of the main casing is required, or a packer or a reducer fitting shall be used.
(6) A fitting shall be provided to close the bottom of the screen.
B. Gravel-Packed Wells.

(1) Gravel, which is packed in the annular space, shall be water-washed, disinfected, and free from clay, silt, and organic material.
(2) Gravel pack may not connect aquifers.

.19 Construction Standards — Grouting.
A. All wells shall be grouted in accordance with this regulation.
B. Time Limits.
(1) All wells shall be grouted as soon as possible but not later than 24 hours after the well casing has been set in place in Hydrogeological Area's 1 & 2.
(2) In Hydrogeological Area's 3, 4 & 5 all wells shall be grouted within 72 hours after the permanent casing has been set.
(3) After grouting is completed, there shall be a minimum curing time before drilling may be resumed of:
(a) 18 hours for Type I and Type II Portland cement; and
(b) 12 hours for Type III Portland cement.
C. Grouting Materials.
(1) Cement.
(a) The annular space may be filled with neat Portland or quick-setting cement in a ratio of not over 6 gallons of water per 94-pound sack of cement.
(b) Bentonite may be added to the neat cement grout in an amount not to exceed 6 pounds per 94-pound sack of cement. If bentonite is added to the neat cement grout, then additional water may be added at the ratio of 1 gallon of water per 2 pounds of bentonite.
(2) Bentonite.
(a) Bentonite with a minimum solids content of 20 percent may be used to fill the annular space in accordance with the following:
(i) When mixed as a slurry, at 2 pounds bentonite per gallon of water; or
(ii) In chip or pellet form and if hydrated per the manufacturer specifications, when the annular space is less than 20 feet in depth.
(b) Bentonite may not be used for grouting where it will come into contact with ground water having a pH below 4.0 or a total dissolved solids content greater than 1,000 mg/l.
(3) Thermal Enhanced Bentonite Grout.
(a) Bentonite slurry shall be mixed per manufacturer specifications.
(b) The sand-bentonite ratio may not be greater than 250 pounds of sand per 50 pounds of bentonite.
(c) Sand shall be "000" well gravel that meets the following:
(i) 95 percent silica sand;
(ii) Have a uniformity coefficient not greater than 1.7; and
(iii) Have a particle size range of 0.60 mm to 0.15 mm.
(4) Thermally Enhanced Cementatious Grout:
(a) Shall be mixed per manufacturers specifications; and
(b) Have a permeability rating not less than $1 \times 10^{-} 7$.

(5) Cement alone or bentonite alone may be required as a special condition in a well construction permit for any well.
(6) If rapid loss of grout material occurs during grout emplacement, coarse fill material may be used in the zone or zones in which the loss is occurring.
(7) Other grouting materials or mixtures may be authorized as a special condition in a well construction permit for any well after review and approval by the Department.
D. Standards for Grouting Unconfined Aquifer Wells in Hydrogeologic Areas 1 and 2. For wells screened in an unconfined aquifer under this section, the annular space shall be grouted to a depth of at least 20 feet.
E. Standards for Grouting Confined Aquifer Wells in Hydrogeologic Area 2. Under this section:
(1) The depth of grouting may not be less than 30 feet;
(2) The annular space above the screen and below the grout shall be completely filled with clay,
drill cuttings, or sand before grouting operations begin;
(3) For two part (lapped) telescoped wells, the drilling fluid may be used as fill material in the annular space if the drill fluid has a weight greater than 11 pounds per gallon;
(4) Drilling fluid less than 11 pounds per gallon may not be used as an acceptable fill material;
(5) For wells intended to have a yield greater than 5,000 gallons per day, the grout shall extend from a minimum of 5 feet into the confining bed, immediately above the aquifer being used, to the land surface; and
(6) For wells intended to have a yield of less than 5,000 gallons per day, the grout shall extend from a minimum of 5 feet into the first confining bed, which is at least 5 feet thick, to the land surface.
(7) Relative depths to confining layers are described in “MGS, Open File Report No. 12-02-20,
Maryland Coastal Plain Aquifer Information System: Hydrogeologic Framework, 2013”, which is incorporated by reference.
F. Standards for Grouting Wells in Hydrogeologic Areas 3, 4, and 5.
(1) The annular space shall be grouted completely from the bottom of the casing to the land surface.
(2) The minimum depth of grout may not be less than 18 feet in Hydrogeologic Areas 3 and, and may not be less than 38 feet in Hydrogeologic Area 4 and 5.
(3) If caving conditions are experienced on wells with greater than 30 feet of casing, the annular space shall be grouted from the point where caving occurred or from a depth of 30 feet,whichever is greater, to the land surface.
G. If the annular space cannot be grouted in accordance with these regulations, the well shall be abandoned and sealed in accordance with this chapter.
H. Deviation from Grouting Standards.

(1) Deviation from the grouting standards given in §§D, E, and F of this regulation may be approved by the Approving Authority for unusual conditions that prevent conformance with those standards.
(2) The deviation from the grouting standard shall be requested on a form provided by the Approving Authority. The request shall be submitted to the Approving Authority within 5 days after the well is completed. The Approving Authority shall reject or approve the request within 5
business days.
I. Grout Height.
(1) For wells where a pump is not to be installed, the final grout height shall be at ground grade.
(2) For wells where a pump is to be installed, the final grout height shall be immediately below the pitless adapter or pitless unit.

.20 Construction Standards — Methods of Grouting.
A. All grout shall be emplaced in one continuous operation upward from the bottom of the casing or depth specified in these regulations.
B. Pouring, dumping, or shoveling of grout slurries into the annular space or well bore are prohibited.
C. The drilling fluids in the annular space shall be thinned before grouting to a density less than that of the intended grout density.
D. Grout shall be emplaced so that it completely displaces the fluid in the annular space from the bottom of the interval being grouted to the ground surface.
E. The following are approved methods of grouting when performed in accordance with the conditions specified:
(1) Grout Pipe Outside of Casing (Tremie Pipe).
(a) The annular space shall be a minimum of 1½ inches.
(b) All grout shall be placed by pumping through the grout pipe.
(c) The entire interval to be grouted shall be open and without obstructions; washing or jetting with water is recommended for cleaning the borehole and may serve to remove obstructions caused by caving which otherwise would prevent a proper grout.
(d) The grout pipe shall extend from the surface to the bottom of the interval to be grouted.
(e) The grout pipe may remain extended to the bottom of the interval during and after grouting, or it may be raised slowly as the grout is placed provided that the discharge end of the grout pipe remains submerged in the emplaced grout at all times until grouting is completed.
(f) In the event of interruption in the grouting operations, the bottom of the grout pipe shall be raised above the grout level and should not be resubmerged until the air and water have been displaced from the grout pipe.

(g) Grouting Depths of 20 feet or Less. Grout may be placed by a grout pipe inserted only 10 feet into the annular space, provided that:
(i) The entire interval to be grouted is clearly visible from the surface and is dry; and
(ii) An annular space larger than the minimum 1½ inches may be required to assure visibility from the surface.
(2) Grout Pipe — Inside Casing.
(a) The bottom of the casing is fitted with a cementing shoe or float shoe and the casing is placed in the borehole a short distance off the bottom;
(b) The grout pipe is placed in the casing a short distance from the float shoe or is mechanically attached to the float shoe; and
(c) Grout is pumped through the grout pipe until grout appears at the land surface.
(3) Grouting with Bentonite Chips or Pellets. A well may be grouted using bentonite chips or pellets under the following conditions:
(a) The grouting depth is 20 feet or less;
(b) The annular space is open and free of obstruction;
(c) The annular space is at least 1½ inches;
(d) The drilling fluid, if present, is thinned to a viscosity of less than 30 seconds and the weight is less than 9 pounds per gallon;
(e) The bentonite chips or pellets may be poured down the annular space; and
(f) The annular space is continuously measured to assure proper filling without bridging.
(g) If bridging occurs and the annular space cannot be completely filled then:
(i) The annular space shall be jetted to remove the bentonite; or
(ii) The well shall be abandoned and sealed in accordance with this chapter.
(4) The Approving Authority may approve other grouting methods not specifically identified by this regulation.