WEST VIRGINIA
SECRETARY OF STATE
BETTY IRELAND
ADMINISTRATIVE LAW DIVISION

Form #2

Do Not Mark In This Box

NOTICE OF A COMMENT PERIOD ON A PROPOSED RULE

AGENCY: DHHR - Bureau for Public Health TITLE NUMBER: 64

RULE TYPE: Legislative CITE AUTHORITY: §§16-1-4, 16-1-6-(n), 16-1-9 and 16-1-9a

AMENDMENT TO AN EXISTING RULE: YES X NO ____

IF YES, SERIES NUMBER OF RULE BEING AMENDED: 46

TITLE OF RULE BEING AMENDED: WATER WELL DESIGN STANDARDS

IF NO, SERIES NUMBER OF RULE BEING PROPOSED: ____

TITLE OF RULE BEING PROPOSED: ____

IN LIEU OF A PUBLIC HEARING, A COMMENT PERIOD HAS BEEN ESTABLISHED DURING WHICH ANY INTERESTED PERSON MAY SEND COMMENTS CONCERNING THESE PROPOSED RULES. THIS COMMENT PERIOD WILL END ON 27 July 2007 AT 12:00 PM ONLY WRITTEN COMMENTS WILL BE ACCEPTED AND ARE TO BE MAILED TO THE FOLLOWING ADDRESS:

John Law and Ann Spaner
Bureau for Public Health
350 Capitol Street, Rm. 702
Charleston, WV 25301

OR

William Toomey, Office of Environmental Health Services
1 Davis Square, Suite 200
Charleston, WV 25301-1798

THE ISSUES TO BE HEARD SHALL BE LIMITED TO THIS PROPOSED RULE.

Martha Yeager Walker
Authorized Signature

ATTACH A **BRIEF** SUMMARY OF YOUR PROPOSAL

Department of Health and Human Resources
Bureau for Public Health
Legislative Rule
Title 64, Series 46

WATER WELL DESIGN STANDARDS

BRIEF SUMMARY OF PROPOSED RULE

The rule proposes to amend the Water Well Design Standards due to new technologies developed since the original rules were developed in 1984. This rule enhances a regulatory program that ensures protection of the State's ground water and public health. The major changes are as follows:

1. Expanding the scope of the design standards to include pumps and pumping equipment.
2. Requires the minimum casing wall thicknesses increase from 0.142 inch to 0.188 inches for greater protection.
3. Requires the minimum length of well casing change from 11 feet (10 feet below ground/one foot above ground) to 21 feet (20 feet below ground/one foot above ground) for greater protection.
4. Amends grouting requirements for a well from one sack of cement to grouting the full length of the well casing from the lower terminus to the ground surface.
5. Requires a vector proof well cap and pump installation requirements.
6. Requires disinfection of both new and existing wells when returned to service after maintenance or repairs.
7. Establishes design standards to be used in designing heat pump systems.
8. Abandonment of wells will require complete filling with grout rather than just the upper ten (10) feet to prevent groundwater contamination.
9. Authorizes the commissioner to specify more stringent design standards in specific locations when deemed necessary to protect public health or prevent ground water contamination. The more stringent standards are to be based on hydrologic conditions and contaminant characteristics, and are to be reviewed by the advisory board prior to implementation.
10. Authorizes the commissioner to grant variances where the strict application of a standard presents practical difficulties or unusual hardships, and establishes the conditions under which variances may be granted.

Economic Impact

West Virginia growth and welfare depend upon an adequate and safe water supply for potable, commercial, and agricultural uses. Approximately 3,500 wells are permitted each year for domestic purposes. It is expected that any costs associated with these rules will not place an unwarranted financial burden on the majority of the public. It is anticipated that these rule changes will provide better health protection to the consumer. Any increase in cost is more than offset by better trained water well professionals more equipped to protect domestic water supplies and the State's groundwater.

Jobs Impact

The revised rules are not expected to have an adverse impact on jobs in the regulated industry, since the permit and certification fees remain a relatively small portion of overall business cost. Costs are generally passed on to the customer at the time of service. Since no significant changes in the procedural requirements or permitting restrictions associated with the permitting program have been proposed, no significant gain or loss of jobs is anticipated. However, any job related changes are expected to be positive due to the improvement in the skills of water well professionals, and increase the quality of their workmanship. These changes are anticipated to increase the availability of new workers.

Environmental Impact

West Virginia relies heavily upon ground water supplies for drinking water, agriculture, industry, and commercial processes. The State's water resources continue to be threatened by degradation and/or depletion by a variety of factors, including point and non-point source contamination. Therefore, the rules proposed will have a positive environmental impact by continuing to ensure proper drilling, construction, operation, and sealing of any well by an appropriately certified individual. This is vital in protecting West Virginia waters against these threats.

QUESTIONNAIRE

(Please include a copy of this form with each filing of your rule: Notice of Public Hearing or Comment Period; Proposed Rule, and if needed, Emergency and Modified Rule.)

DATE: _____

TO: LEGISLATIVE RULE-MAKING REVIEW COMMITTEE

FROM: (*Agency Name, Address & Phone No.*) Health and Human Resources
Bureau for Public Health
Office of Environmental Health Services
Capitol and Washington Streets
1 Davis Square, Suite 200
Charleston, WV 25301-1798

LEGISLATIVE RULE TITLE: 64CSR46 Water Well Design Standards

1. Authorizing statute(s) citation WVA Code § 16-1-4,16-1-6(n), 16-1-9, and 16-1-9a

2. a. Date filed in State Register with Notice of Hearing or Public Comment Period:

   b. What other notice, including advertising, did you give of the hearing?

   c. Date of Public Hearing(s) ***or*** Public Comment Period ended:

   d. Attach list of persons who appeared at hearing, comments received, amendments, reasons for amendments.

   Attached _____ No comments received _____

e. Date you filed in State Register the agency approved proposed Legislative Rule following public hearing: (be exact)

f. **Name, title, address and <u>phone/fax/e-mail numbers</u>** of agency person(s) to receive all *written correspondence* regarding this rule: (Please type)

John D. Law
Department of Health and Human Resources
Building 3, Room 206, State Capitol Complex, Charleston
(304) 558-7899
Ann Spaner, Attorney
~~Director, Public Health Regulations~~
Bureau for Public Health, 350 Capitol Street, Room 702, Charleston, 25301-3712
(304) 558-0035

g. **<u>IF DIFFERENT</u> FROM ITEM 'f'**, please give **Name, title, address and phone number(s)** of agency person(s) who wrote and/or has responsibility for the contents of this rule: (Please type)

Barb Taylor, Director Office of Environmental Health Services
Capitol and Washington Streets, 1 Davis Square, Suite 200
Charleston, WV 25301-1798
(304) 558-2229, fax 558-1291, e-mail: barbtaylor@wvdhhr.org
William J. Toomey, Source Water Assessment and Protection Manager
~~Address same. (304) 558-6746, fax 558-0324, e-mail: wtoomey@wvdhhr.org~~
Walter Ivey. Environmental Engineering Division Director
Address same. (304) 558-6715, fax 558-0289, e-mail: walterivey@wvdhhr.org

3. If the statute under which you promulgated the submitted rules requires certain findings and determinations to be made as a condition precedent to their promulgation:

a. Give the date upon which you filed in the State Register a notice of the time and place of a hearing for the taking of evidence and a general description of the issues to be decided.

b. Date of hearing or comment period:

_____

c. On what date did you file in the State Register the findings and determinations required together with the reasons therefor?

_____

d. Attach findings and determinations and reasons:

Attached _____

FISCAL NOTE FOR PROPOSED RULES

Rule Title: 64CSR46 - Water Well Design Standards

Type of Rule: x Legislative _____ Interpretive _____ Procedural

Agency: Health and Human Resources
Address: Building 3, Room 206
Capitol Complex
Charleston, West Virginia 25305

Phone Number: (304)558-2971 Email: annspaner@wvdhhr.org

Fiscal Note Summary

Summarize in a clear and concise manner what effect this measure will have on costs and revenues of state government.

The state is currently implementing the regulations and only minimal additional costs are expected with the adoptions of these rules.

Fiscal Note Detail

Show over-all effect in Item 1 and 2 and, in Item 3, give an explanation of Breakdown by fiscal year, including long-range effect.

Effect of Proposal	Fiscal Year		
	2008 Increase/Decrease (use"-")	2009 Increase/Decrease (use"-")	Fiscal Year (Upon Full Implementation)
1. Estimated Total Cost	0	0	0
Personal Services	0	0	0
Current Expenses	0	0	0
Repairs and Alterations	0	0	0
Equipment	0	0	0
Other	0	0	0
2. Estimated Total Revenues	0	0	0

3. Explanation of above estimates (including long-range effect):

Please include any increase or decrease in fees in your estimated total revenues.

Memorandum

Please identify any areas of vagueness, technical defects, reasons the proposed rule **would not** have a fiscal impact, and/or any special issues **not** captured elsewhere on this form.

The Department has evaluated these rules, and has determined that they are necessary, reasonable, and proper for the purpose as proposed. West Virginia economic growth and welfare depend upon an adequate and safe water supply for potable, commercial, and agricultural uses. The proposed revisions are expected to have an indirect positive economic benefit on the general public.

Date

Agency

Department of Health and Human Resources

Authorized Representative

Martha Yeager Walker

Martha Walker

Secretary

TITLE 64
LEGISLATIVE RULE
DEPARTMENT OF HEALTH AND HUMAN RESOURCES
BUREAU FOR PUBLIC HEALTH

SERIES 46
WATER WELL DESIGN STANDARDS

§64-46-1. General.

1.1. Scope. -- These interpretive rules establish the design standards for the installation of water wells, pumps and pumping equipment to protect public health and groundwater aquifers from contamination and pollution.

1.2. Authority. -- WV Code §§16-1-4, 16-1-6(n), 16-1-9 and 16-1-9a.

1.3. Filing Date. --

1.4. Effective Date. --

1.5. Repeal of Former Rule -- This rule repeals and replaces West Virginia Department of Health Interpretive Rule, 64CSR46, Water Well Design Standards, 1984.

§64-46-2. Application.

2.1. These interpretive rules shall apply to all water wells, pumps and pumping equipment installations other than those used to supply public water systems. Water wells for public water systems are installed, altered, and deepened in accordance with the West Virginia Bureau for Public Health Public Water System Design Standards 64CSR 77.

§64-46-3. Definitions.

3.1. Abandoned -- A water well whose use has been determined to be discontinued and pronounced abandoned by the owner or if the Commissioner has determined that the well presents a threat to groundwater or public health.

3.2. Abandonment -- The act of properly sealing a water well in accordance with applicable standards.

3.3. ANSI -- American National Standards Institute. ANSI creates standards for many water well applications, especially materials and equipment.

3.4. Annular Space -- The space between a borehole wall and a permanent casing or between a temporary casing and a permanent casing or both.

3.5. API -- American Petroleum Institute. API has specifications for steel casing.

3.6. Aquifer -- A geological formation, group of formations, or part of a formation that yields ground water to a well.

3.7. ASHRAE – American Society of Heating, Refrigeration and Air – Conditioning Engineers. ASHRAE applications mainly relate to geothermal systems.

3.8. ASTM -- American Society for Testing Materials. ASTM develops standards nationally and internationally for a wide array of materials and processes.

3.9. AWWA -- American Water Works

Association. AWWA is a non-profit scientific and educational society dedicated to the improvement of drinking water quality and supply.

3.10. Barnyard -- A fenced area for animals, which generally adjoins the barn on a farm. It applies to traffic alleys, holding pens convalescent pens, maternity pens, calf pens and confined exercise yards.

3.11. Bedrock -- Solid rock exposed at the surface or overlain by unconsolidated materials.

3.12. Bentonite -- A plastic, colloidal clay derived from volcanic ash consisting of at least 85% montmorillonite, with an ability to absorb fresh water and swell in volume.

3.12.a. Bentonite granules -- Commercially manufactured pure bentonite, without additives, with a diameter of 3/8 inch or less.

3.12.b. Bentonite pellets -- Commercially manufactured tablets made by compressing pure bentonite, without additives, into forms with a diameter ranging from 1/4 to 1/2 of an inch.

3.12.c. Bentonite chips -- Commercially processed angular fragments of pure bentonite, without additives. Size ranges from 3/8 to 3/4 of an inch.

3.13. Bureau -- The Bureau for Public Health of the West Virginia Department of Health and Human Resources.

3.14. Casing -- Pipe or tubing, constructed of specific materials with specified dimensions and weights, that is installed in a borehole during or after completion of the borehole to support the side of the hole and thereby prevent caving, to allow completion of the well, to prevent formation material from entering the well, and to prevent entry of undesirable water into the well.

3.15. Closed-Loop Heat Pump Well -- Fluid is circulated in a continuous unbroken pipe beneath the surface of the earth or in a medium where the system can obtain a sufficient cooling or heat exchange. Depths of installation vary and is dependent upon the type and size of closed-loop system, the land area available, soils/formation, climate, and seasonal variation in ground temperature, etc.

3.16. Commissioner -- Commissioner of the West Virginia Bureau for Public Health or his or her designee.

3.17. Commercial Well -- A well that serves small businesses and facilities in which water is the prime ingredient of the service rendered, such as a car wash or laundromat.

3.18. Confined Water Table -- Groundwater confined by an impervious layer of rock or other material under sufficient pressure to raise the water level above the upper level of the saturated zone when penetrated by a well.

3.19. Confined Aquifer -- An aquifer bounded above and below by beds of distinctly lower permeability than that of the aquifer itself containing groundwater under pressure greater than that of the atmosphere. The term is synonymous with the term "artesian aquifer".

3.20. Contaminant -- Any substances either manmade or natural, which is concentrated enough to degrade water quality to a degree making such water harmful to public health or to the environment.

3.21. Contamination -- Any manmade, man-induced or natural alteration of the

chemical, physical, or biological integrity of the ground water, resulting from activities regulated under the West Virginia Ground Water Protection Act, in excess of existing ground water quality, unless that site has been granted a deviation or variance from existing quality as provided for in the West Virginia Ground Water Protection Act, or is subject to an order, permit, or other regulatory action that requires restoration or maintenance of ground water quality at a different concentration or level.

3.22. Dewatering Well -- A well used to lower groundwater levels to allow for construction of footings, sewer lines, building foundations, dams, etc.

3.23. Disinfection -- The inactivation of pathogenic organisms in water by chemical oxidants or equivalent agents, ultraviolet light, ozonation, or other methods approved by the Commissioner.

3.24. Drive Shoe -- A device fastened to the bottom of a length of casing to protect casing during driving.

3.25. Direct Exchange Well (DX) -- A small diameter bore hole constructed for the purpose of sinking or sourcing thermal energy between the direct exchange loop and the earth. The refrigerant circulates throughout the heat exchange loop.

3.26. Feedlot -- Area where livestock are confined at sufficient density so that grass or a cover crop cannot be maintained.

3.27. Filter Pack -- Sand, gravel, or both placed in direct contact with the well screen.

3.28. Grout or Grout Material -- A stable and impervious bonding material, with minimum shrinkage, capable of producing a watertight seal to protect against contamination, approved by the Commissioner.

3.29. Grouting -- The placement of grout into the annular space to seal the annular space, and prevent the infiltration or migration of surface water and contaminants into to the ground water aquifer.

3.30. Hand Dug Well -- A manually excavated well of permanent nature installed for water supply.

3.31. Heat pump or Geothermal Well -- Any well constructed to utilize the heat exchange properties of either groundwater or of geologic material penetrated by the well.

3.32. IGSHPA -- International Ground Source Heat Pump Association. IGSHPA is a non-profit organization, established in 1987 to advance ground source heat pump technology and applications.

3.33. Inactive Well -- A well that is no longer actively used. It shall have a sanitary well cap and remain in a state of repair to prevent contamination from entering the well. It may be used in the future or be properly abandoned.

3.34. Industrial Well -- A well used in industrial processing, fire protection, washing, packing, or manufacturing of a product excluding food and beverages, or similar non-potable uses.

3.35. Irrigation Well -- A well used to provide water for plants, livestock, or other agricultural processes.

3.36. Installation -- The installation, alteration or deepening of a water well, pump and pump equipment.

3.37. Location -- The designation of the well site by using longitude and latitude or other approved means.

3.38. NSF -- The National Sanitation

Foundation. The NSF assists in educational and research programs, and develops standards pertinent to the areas of environmental sanitation and health.

3.39. NSF Potable Water (PW) -- Product standards for pressure-rated potable water applications as required by ANSI/NSF Standard 14 and ANSI/NSF Standard 61 for health effects.

3.40. Neat Cement -- A mixture of Portland cement (ASTM C-150) and water in the proportion of 5 to 6 gallons of clean potable water per bag (94 pounds or 1 cubic foot) of cement.

3.41. Open-Loop Heat Pump Supply Water Well -- A well drilled to supply water for heat transfer. Water quality, quantity and disposal are primary concerns with open-loop systems.

3.42. Permanent Casing -- A durable, impervious pipe placed or driven into the borehole and left in place to maintain the well opening.

3.43. Pitless Adapter -- A device approved by the Commissioner for attachment to one (1) or more openings through a well casing and constructed to prevent the entry of contamination into the well. The adapter is used to transfer water from the well, decrease the probability of frozen water lines and provide access to the well and water system components within the well.

3.44. Pitless Well Cap -- An approved watertight, sanitary device, approved by the Commissioner, that covers and encloses the upper termination of a pitless well unit or the well casing.

3.45. Pitless Unit -- A preassembled device approved by the Commissioner which extends from the upper end of a well casing to above grade, provided with an approved well cap, and constructed to prevent the entry of contamination into the well. The unit is used to conduct water from the well, prevent the water from freezing and provide access to the well and water system components within the well.

3.46. Potable Water -- Water free from impurities in amounts sufficient to cause disease or harmful physiological effects, with bacteriological, chemical, physical and radiological quality conforming to applicable regulations and standards of the Bureau for Public Health.

3.47. Potable Water Well -- Any water well that provides potable water, other than a public water supply for the provision of water for human consumption.

3.48. PPI -- Plastics Pipe Institute. Founded in 1950, The Plastics Pipe Institute Inc. (PPI) is the major trade association representing all segments of the plastics piping industry.

3.49. Pressure Tank -- A closed water and air storage device that modulates the water supply system pressure and sometimes allows for expansion during temperature fluctuations in the water system.

3.50. Public Water System -- Any water supply or system that regularly supplies or offers to supply water for human consumption through pipes or other constructed conveyances, if serving at least an average of twenty-five individuals per day for at least sixty (60) days per year, or which has at least fifteen (15) service connections, and shall include: (1) Any collection, treatment, storage, and distribution facilities under the control of the owner or operator of the system and used primarily in connection with the system; and (2) Any collection or pretreatment storage facilities not under such control which are

used primarily in connection with the system. A public water system does not include a system which meets all of the following conditions: (1) Which consists only of distribution and storage facilities (and does not have any collection and treatment facilities); (2) Which obtains all of its water from, but is not owned or operated by a public water system that otherwise meets the definition; (3) Which does not sell water to any person; and (4) Which is not a carrier conveying passengers in interstate commerce.

3.51. Pump -- Any mechanical equipment or device used to transfer water from a well.

3.52. Pumping Equipment -- Equipment or related materials that are used or intended to assist withdrawing groundwater from a well, includes seals and other safeguards to protect the water from contamination; associated fittings; intake and discharge piping; controls to provide sanitary water storage facilities and deliver water to a distribution piping system.

3.53. Rapid Joint Assembly -- A device intended to join two pieces of pipe without threads or glue and approved by the ASTM or NSF.

3.54. Standard Dimension Ratio (SDR) -- The quotient obtained when the outside diameter of thermoplastic well casing is divided by the wall thickness.

3.55. Standing Column Open-Loop Well -- A vertical well filled with water, in which water is removed from and returned to the same well for heat exchange.

3.56. Temporary Casing -- A durable pipe placed or driven into a borehole to maintain an open annular space around the permanent casing during construction of a well.

3.57. Test Wells (Exploratory/ Observation) -- A well that is used to obtain information on groundwater quantity; quality; aquifer characteristics; and availability of production water supply for manufacturing, commercial, and industrial facilities.

3.58. Tremie Pipe -- A small diameter pipe, hose, or tubing used in the down hole placement of well construction grouting material.

3.59. Unconsolidated Formation. -- A sediment that is loosely arranged whose particles are not cemented together, occurring either at the surface or at depth.

3.60. Under-reaming -- A process of drilling just below casing to allow casing to be set while drilling, especially in unconsolidated or unstable formations.

3.61. Under-reamer -- A drill bit used for under-reaming.

3.62. Unweathered Bedrock -- Bedrock that is competent, firmly consolidated, and unaltered by erosion or surficial weathering.

3.63. Unconfined Aquifer -- An aquifer not bounded above by a bed of distinctly lower permeability than that of the aquifer itself and which contains groundwater under pressure approximately equal to that of the atmosphere. The term is synonymous with the term "water table aquifer".

3.64. Vertical Closed Loop Heat Pump Well -- A borehole essentially perpendicular to the horizon into which a closed-loop pipe is placed for heat transfer.

3.65. Water system -- Includes any well and equipment for distribution, extending from and including the source of the water to the point of discharge from any pressure tank or other storage vessel to the point of

discharge from the water pump where no pressure tank or other storage vessel is present.

3.66. Water Return Well -- A well constructed for returning water that has passed through the heat pump system to the subsurface.

3.67. Water Well -- Any excavation or penetration in the ground, whether drilled, bored, cored, driven, washed, jetted, hand dug or otherwise constructed that enters or passes through an aquifer for purposes that may include, but are not limited to, a potable water supply, exploration for water, industrial, irrigation, commercial, dewatering, or geothermal heat pump wells, and water return wells. This definition shall not include ground water monitoring activities, and all activities for the exploration, development, production, storage and recovery of coal, oil and gas and other mineral resources regulated under Chapters 22, 22a, or 22b of the WV Code.

3.68. Well Cap -- A watertight casing seal approved by the Commissioner that covers and encloses the upper termination of the well casing above the pitless well adapter or unit.

3.69. Watertight -- A condition that does not allow the entrance, passage or flow of water under normal operating conditions.

3.70. Well Liner -- A casing placed inside the well, which may be required due to conditions encountered during and after drilling. A liner does not include casing that, once installed, requires the placement of grout to comply with construction standards of these Rules.

3.71. WSC -- Water System Council. WSC is the only national, non-profit organization solely focused on household wells and small, water well systems.

§64-46-4. Location.

4.1. The water well shall be located at least ten (10) feet from a property line to allow access without encroaching on property owned by others.

4.2. The water well shall be located as far as possible from any existing or potential sources of contamination in accordance with the following.

4.2.a. The required minimum horizontal distance between a water well, other than a well serving a public water system, and a source or potential source of pollution or contamination is shown in Table 64-46 A.

4.3. The top of the well casing shall not extend or terminate in the basement of any building or in a pit, room, or other space below ground surface.

4.4. All water wells shall be located to be accessible for cleaning, treatment, repair, testing, abandonment, and other such maintenance.

4.5. A well located in an area subject to seasonal flooding or surface water contamination, shall be constructed in such a manner that seasonal floodwater cannot enter the well.

§64-46-5. Materials.

5.1. Well casing shall be sized to allow for installation of equipment for producing water that is adequate for the intended use and to allow for the installation and maintenance of the well, pumps and related pumping equipment. In casing selection, consideration should be given to forces imposed during installation and other forces that can be expected after installation and the corrosiveness of the water with which it comes in contact.

5.1.a. Steel casing must be new, meeting AWWA Standard A-100, ASTM, or API specifications for water well construction, with a minimum wall thickness of 0.188 inches if the nominal pipe size is up to ten (10) inches and have a minimum wall thickness of .375 inches if the nominal pipe size is greater than ten (10) through twenty (20) inches:

5.1.a.1. Steel casing is joined by welds, threads, threaded couplings, or any combination thereof. Welding is accomplished in accordance with the standards of the American Welding Society or the most recent revision of the American Society of Mechanical Engineers Boiler Construction Code;

5.1.a.2. When steel well casing is driven, a standard drive shoe is welded or threaded on the lower end of the casing. The drive shoe shall have a beveled and tempered cutting edge of metal forged, cast or fabricated for this purpose.

5.1.b. Well liners and temporary steel casing used for construction shall be capable of withstanding the structural load imposed during its installation and removal. Well liners and temporary steel casing shall be approved by the ANSI/NSF, AWWA, ASTM, or equivalent for potable water use.

5.1.c. Plastic well casings, liners, rapid joint assembly couplings, and solvents must be approved by the ANSI/NSF Standard 14 and 61 and meet ASTM Standard F480.

5.1.c.1. Temporary casing shall meet ANSI/NSF Standard 61.

5.1.c.2. Plastic well casing shall not be driven during installation.

5.1.c.3. Plastic well casing shall be installed in accordance with the manufacturer's specifications and shall have an outside diameter and minimum wall thickness as specified in Table 64-46 B of this rule.

5.1.c.4. All plastic casing and liners shall have a wall thickness that shall be of adequate thickness to prevent collapse due to hydrostatic pressure or temperature effects.

5.1.c.5. Each section of casing and liner shall display the NSF seal.

5.2. Nonferrous casing material proposed as a well casing, shall be resistant to the corrosiveness of water and to the stresses to which it shall be subjected to during installation and grouting. Casing material shall comply with ANSI/NSF Standard 61, Water System Components - Health Effects.

5.3. Well screens shall be constructed of materials resistant to damage by chemical action of groundwater or cleaning operations, have size of openings based on sieve analysis of formation or gravel pack materials; have sufficient length and diameter to provide adequate specific capacity; and low aperture entrance velocity.

5.3.a. Well screens other than those commercially manufactured shall be constructed by creating slots, or openings in approved casing material.

5.3.b. Plastic well screens shall comply with the ANSI/NSF Standard 61 - Water System Components - Health Effects.

5.3.c. Well screens shall not interconnect aquifers or zones which have suspected or documented differences in water quality that could result in contamination of any aquifer or zone; or interconnect aquifers or zones with different

static water levels that would result in depletion of water from any aquifer or zone, or significant loss of head in any aquifer or zone.

5.4. Filter packs are silica based sand or gravel. The sand or gravel used for filter packs shall be hard and durable and shall have an average specific gravity of not less than 2.50. The sand and gravel are visibly free of clay, dust, and micaceous and organic matter. Not more than 5% of the sand or gravel is soluble in a 10% hydrochloric acid solution. Uniformity coefficients for filter pack material shall range from 1 to 3. All filter pack material should be purchased from a supplier who has properly cleaned and bagged the material.

5.5. Grout shall be neat cement, bentonite with cement mixtures, or bentonite. Other materials require the written approval of the Commissioner. The neat cement, bentonite with cement mixtures, and bentonite shall be mixed according to the manufacturer's specifications. No drilling muds shall be used for grouting. Cement grouts must be allowed to cure according to the manufacturer's specifications before well drilling, construction, or testing may be resumed.

5.6. Water used during the initial construction of a water well shall be obtained from a public water system, water well or protected spring box. If additional water is required to complete the construction of the well, the driller shall use water from the best available potable source near the drill site. In the event that water from a public water system, water well or protected spring box is not available, the driller may obtain water directly from a surface supply other than a farm pond, open ditch or waste lagoon. The best source, in order of preference, are: a public water system, an existing water supply or protected spring box; a surface source other than a farm pond, open ditch, or waste lagoon.

5.6.a. All water from a public water system, well or spring box shall also be treated with enough liquid bleach or hypochlorite granules to retain a free chlorine residual of at least two parts per million (2 ppm).

5.6.b. All water from a surface source is dosed with a fifty parts per million (50 ppm) of chorine, i.e., two (2) gallons of sodium hypochlorite (laundry bleach, approximately five percent (5%) available chlorine) per one thousand (1,000) gallons of drilling water.

5.6.c. Surface water sources must be free of mud, algae and other visible contaminants.

5.7. Packers, when shall be of material that shall not impart taste, odor, toxic substance, or bacterial contamination to the well water. They are usually made of rubber or neoprene collar (boot). Lead packers shall not be used.

5.8. Any additive used in the drilling, development, or grouting of a water supply designed for that purpose must meet ANSI/NSF Standard 61.

§64-46-6. Construction; general.

6.1. The minimum protected depths of drilled wells shall provide watertight construction to the depth required by the Commissioner to: exclude contamination; seal off formations that are, or may be, contaminated or yield undesirable water; and provide a minimum casing length as follows:

6.1.a. Twenty (20) feet of casing in unconsolidated water bearing formations below ground level;

6.1.b. a minimum of twenty (20) feet of casing in bedrock wells with a minimum of five (5) feet of casing installed into unweathered bedrock below ground level or;

6.1.c. other minimum depths of casing may be required by the Commissioner in special circumstances.

6.2. The minimum borehole diameter, at the top of the water well, shall be four (4) inches.

6.3. The full length of the well casing shall be fully grouted from the lower terminus up to the ground surface, except as noted in paragraphs 6.3.a through 6.3.c of this section.

6.3.a. When drilling through caves, mines, or other cavities, the lower portion of the casing is grouted in accordance with the method described in section 6.4.d and a packer or similar bridging device shall be used to permit grouting above the cavity.

6.3.b. In unconsolidated aquifers (i.e., sand and gravel) above bedrock, the permanent casing is grouted.

6.3.c. In cases where a pitless adaptor is to be installed, upward grouting may terminate at the pitless adaptor level to allow for the installation of a pitless adapter.

6.4. All water wells shall have an annular space seal between the casing and borehole that forms a seal to prevent the entrance of water from sources other than the aquifers selected. The borehole diameter must be sufficient to allow placement of the material to fully enclose and entirely seal the pipe.

6.4.a. When grouting below the water level, grout material is installed by a positive placement method, such as pumping or forced injection by air or hydraulic pressure, placed from the bottom up. The annular space shall be a minimum of 1.5 inches completely around the casing for grout. Grout is injected in the annular space between the inner casing and either the outer casing or the borehole. In wells where the outer casing is left in place, a dry bentonite is used while driving the casing.

6.4.b. When grouting above the water level, grout material installed by a positive placement method, such as pumping or forced injection by air or hydraulic pressure, placed from the bottom up, is the preferred method for grouting. The annular space shall be a minimum of 1.5 inches completely around the casing. A gravity emplacement method can be used for grouting above the water level, not exceeding thirty (30) feet in depth.

6.4.c. When under-reaming is used to set permanent casing in unconsolidated materials, either a dry or wet bentonite grout is used at the ground surface while the casing is being installed. Upon termination of casing in unweathered bedrock and removal of the under-reamer, bentonite or neat cement is placed in the bottom of the casing by a positive displacement or gravity placement method before casing is set in bedrock.

6.4.d. If rapid loss of grout material occurs during emplacement, coarse fill material (e.g., sand, gravel, crushed stone or dry cement) may be used in the zones in which the loss is occurring. The remainder of the annular space shall be grouted as provided in this section.

6.4.e. When driving casing with

a cable tool rig through unconsolidated alluvial formations, a cone shaped depression or temporary outer casing filled with bentonite grout shall be maintained around the outside of the casing. The bottom of the driven casing shall be equipped with a drive shoe.

6.4.f. If the annular space cannot be grouted in accordance with this section, alternative methods shall require the written approval of the Commissioner.

6.4.g. The annular space shall be grouted as soon as possible, but not later than seven (7) calendar days after the well drilling has been completed and the drill rig is removed from the drill site location of a well.

6.5. Every well shall be developed to remove the native silts and clays, drilling mud, or finer fraction of the gravel pack resulting from drilling operations.

6.6. During the progress of work, water wells shall be provided protection to prevent tampering with the well or entrance of foreign materials. Once well drilling is complete and prior to departure of the drilling equipment from the well site, a WSC approved vector proof cap must be securely installed. The well cap must provide for ventilation. Vents are part of the well cap or may be attached to the well cap and terminate a minimum of one (1) foot above the finished ground level; be turned down and screened to prevent entry of vermin. Toxic or flammable gasses shall be vented from a well to the outside above roof level or a point where they shall not produce a hazard. Wells installed in flood prone areas shall be watertight to prevent intrusion of floodwaters.

6.7. Permanent casing for all groundwater sources shall project a minimum of twelve (12) inches above the ground surface upon completion.

6.8. Pitless units designed to replace a section of well casing shall meet the standards of the WSC and shall be factory fabricated from point of connection with the well casing to the unit cap or cover. The materials used shall be durable and approved by the WSC. The pitless unit shall:

6.8.a. form an unbroken extension of the well casing from the point of discharge to a point above ground level as specified for upper well terminals; and

6.8.b. be installed by a threaded connection or welded to the cutoff casing. Compression flange gasket is not allowed. The threaded or welded connection to the cutoff casing shall be watertight.

6.9. Commercially manufactured pitless adapters shall be connected to the well casing with clamps, compression nuts, or by welding and must form a watertight seal. To assure a watertight seal between the pitless adapter and the well casing, care shall be used in cutting the hole in the well casing with a hole-cutting saw or other Commissioner approved methods. All burs from the cutting process shall be removed. Both the outside and the inside surfaces of well casing surrounding the hole shall be smoothed. Pitless adapters shall be installed according to manufacturer's specifications and shall meet the standards of WSC.

6.9.a. Pitless adapters are constructed and installed to prevent the entrance of contaminants into the well or water supply through openings in the well casing.

6.9.b. The pitless adapter shall provide adequate clearance within the well to allow insertion and withdrawal of the pump and system components through the upper terminal of the well casing.

6.9.c. If a pitless adapter is to be used with PVC casing, it should be designed for use with PVC casing, and the driller or pump installer should ensure that the weight of the pump and column do not exceed the strength of the PVC well casing.

6.10. Pump installation contractors shall not cut off or penetrate well casing below ground level except to install a pitless adapter or a pitless unit.

6.11. Well houses, if constructed, shall not be built directly over a water well.

§64-46-7. Pump Installation.

7.1. At all times during the pump installation, the certified pump installer or well driller or both shall provide protection to prevent tampering with the well or entrance of foreign materials. The approved well cap shall be re-installed immediately upon completion of the pump installation and prior to departure of the certified pump installer.

7.2. The pumping capacity of the pump installed in a well must be consistent with the intended use of the ground water and with the yield characteristics of the well.

7.3. Submersible pumps shall have a minimum of two (2) check valves installed. A properly sized (based on discharge pipe diameter) check valve for the pump, plus one (1) on the outer casing on top of the well unless it interferes with the function of the system.

7.4. Jet pumps shall have a check valve installed on the discharge side of the pressure tank and all clamps used shall be stainless steel.

7.5. Turbine pump installation shall be:

7.5.a. steel column pipe for turbine pump irrigation wells using standard weight flanged or threaded steel pipe, or

7.5.b. plastic column pipe may be used for turbine pump installation provided the pipe is designed and manufactured for that purpose.

7.6. Torque arresters and cable guards are used as required by the manufacturer's specification.

7.7. Electrical wiring and equipment used in connection with the installation of a water pump shall meet and be installed in accordance with any national, state, or local codes and ordinances.

7.7.a. All splices in electrical wiring must be watertight.

7.7.b. Electrical wiring from the wellhead to the house must be in a conduit or be an approved underground cable.

7.8. Pump controls for water wells are installed in accordance with manufacturer's recommendations and shall include a pressure relief valve. All conduits, valves, piping, other plumbing fixtures and fittings should be NSF approved and suitable for potable water used to convey water from a water well to any building or other outlet.

7.9. Water service pipe from the well to point of entrance to a building shall comply with all applicable standards and carry the seal of the NSF-Potable Water (PW).

7.9.a. The materials from which water supply system pipe fittings are made shall be compatible with the type of piping materials used in the water supply system.

7.9.b. All materials used for water piping are suitable for use with the maximum temperature, pressure, and velocity that may be encountered in the

installation, including temporary increases and surges.

7.9.c. Water service piping is installed below the anticipated frost line, with a minimum depth of two (2) feet.

7.10. All components of a pumping system shall be in compliance with NSF standard 61.

7.11. Pressure tanks and switches are located above ground. A pressure tank may be buried, provided the tank is designed for installation below ground and approved by the Commissioner.

7.12. Water filters and water treatment units that are installed to accommodate water quality problems, as determined by physical, chemical, or bacteriological evaluation or field-testing shall achieve the results specified by the manufacturer. During installation or repair of the treatment units the sanitation of the water supply shall be protected.

§64-46-8. Disinfection.

8.1. New potable water wells and existing potable water wells being placed into service or that have been disrupted for service or repair, such as new pump installation or reinstallation of an existing pump shall be disinfected.

8.1.a. The following standard disinfection procedure shall be used.

8.1.a.1 Material which may be used for disinfection are; calcium hypochlorite, sodium hypochlorite, or other materials approved by the Commissioner.

8.1.a.2. Disinfectant is placed in the well in quantities that shall produce a concentration of at least 100 mg/l or parts per million (ppm). The amount required to obtain this concentration shall depend on the casing diameter and the amount of water standing in the well. See Table 64-46 C to determine the proper dosage.

8.2. When working with disinfectants, be in ventilated place. The powder or strong liquid should not come in contact with skin or clothing. Solutions are best handled in wood, plastic or crockery containers because metals are corroded by strong disinfectant solutions.

§64-46-9. Repair of Water Wells.

9.1. All materials used in the replacement, alteration or repair of any water well shall meet or exceed the requirements for a new installation.

9.2. Repairs or retrofits or both to wells, with the top of the well casing terminating below ground shall include extending the well casing above land surface with like material.

§64-46-10. Heat Pump Construction.

10.1. Design Methods and Compliance

10.1.a. The manufacturer's design procedure must follow a recognized methodology as presented in the most recent editions of IGSHPA and ASHRAE.

10.1.b. The ground heat exchanger design must be clearly documented in order to determine compliance with the heat pump manufacturer's or utility's specifications or both.

10.2. Location of Heat Pump Wells Criteria

10.2.a. Heat pump closed-loop wells shall be located at least twenty-five

(25) feet from sewage absorption systems and known sources of contamination.

10.3. Casing Material

10.3.a If permanent casing is needed in a heat pump well, it shall be new steel casing.

10.4. Heat Pump Loop Material

10.4.a. All pipe and heat-fused materials shall be manufactured from a virgin polyethylene extrusion compound material in accordance with ASTM Standard D-2513, Sections 4.1 and 4.2. Pipe shall be manufactured to outside diameters and wall thickness as specified in ASTM Standard D-3035 or D-2447. Fittings shall be manufactured to diameters, wall thicknesses, and respective tolerances as specified in ASTM Standard D-2683 for socket fittings and ASTM Standard F-1055 for electrofusion fittings.

10.4.a.1. The material shall maintain a 1600 psi (110.316 bar) Hydrostatic Design Basis at 73.4°F (23.5°C) per ASTM Standard D-2837, and listed in PPI TR4 as a PE3408 piping formulation. The material shall be a high density extrusion compound having a cell classification of PE345434, PE355434, or PE3455534 with a UV stabilizer of C, D, or E as specified in ASTM Standard D-3350 with the following exception: this material shall exhibit zero failures (F0) when tested for a minimum of 192 hours under ASTM Standard D-1693, condition C, as required in ASTM Standard D-3350.

10.4.a.2. Dimensions

10.4.a.2.A. Pipe with a diameter of less than 1¼" (3.175cm) (nominal) is manufactured in accordance with ASTM D-3035 with a minimum (based on pressure rating) dimension ratio of 11.

10.4.a.2.B. Pipe manufactured with a diameter from 1¼"(3.175cm) (nominal) up to three (3) inches in diameter, shall be manufactured in accordance with ASTM D-3035 with a minimum (based on pressure rating) dimension ratio of 11.

10.4.a.2.C. Pipe 3" (7.62cm) (nominal) and larger shall be manufactured in accordance with ASTM D-3035, (with a minimum [based on pressure rating] dimension ratio of 17) or D-2447 (Schedule 40). Table 64-46 C indicates the Water Pressure Ratings at 73.4°F (23.5°C) for DR-PR PE 3408 Plastic Pipe.

10.4.a.3. Markings, defined by the appropriate ASTM pipe standard shall be permanently marked on the length of the pipe as required information.

10.4.a.4. Manufacturer shall supply a notarized document confirming compliance with these standards, called a Certification of Materials.

10.4.b All pipe joints and fittings installed and buried are socket or butt thermally fused according to the pipe manufacturer's specifications. Glued or clamped joints shall not be used below ground. Joints shall not leak after assembly. Pressure testing of the closed-loop heat pump system network is conducted prior to putting the system into operation.

10.4.b.1. Acceptable methods for joining buried pipe systems are;

10.4.b.1.a. a heat fusion process;

10.4.b.1.b. stab-type fittings, quality controlled to provide a leak-free union between pipe ends that are stronger than the pipe itself or;

10.4.b.1.c. polyethylene pipe heat fused by butt, socket, sidewall, or electrofusion in accordance with the pipe manufacturer's procedures. The individual performing fusion shall possess a fusion technician certification from IGSHPA or the pipe manufacturer. The instructor must be IGSHPA approved to conduct pipe fusion classes.

10.4.b.1.d. Fusion transition fittings shall have threads used to adapt to copper, or fusion transition fittings will have threads or barbs used to adapt to high strength hose. Barbed fittings are not permitted to be connected directly to polyethylene pipe, with the exception of stab-type fittings as described above. All mechanical connections shall be accessible.

10.5. Heat transfer liquids are only IGSHPA approved fluids.

10.6. The diameter of a heat pump well shall be sufficient to allow placement of grout. The minimum diameter shall be four (4) inches.

10.7. Heat Pump Vertical Closed-Loop Wells

10.7.a. Approved Grout Materials

10.7.a.1. Approved sealing and filling materials shall include high solids bentonite grout—20-30% solids by weight, bentonite pellets or chips, or approved high efficiency, thermally enhanced grouts designed for heat transfer in geothermal applications.

10.7.a.2. All materials placed in the borehole must be uncontaminated. All sand and gravel placed in the borehole shall be silica based and inert, unless a material other than silica is used in an IGSHPA approved, commercially available product that meets all other requirements.

10.7.a.3. Drill cuttings shall not be placed in the borehole as fill material.

10.7.b. Grouting

10.7.b.1. Grout the entire length from bottom to top with bentonite or thermally enhanced grout specifically designed to facilitate heat transfer and provide low permeability.

10.7.b.2. Boreholes with temporary casing may be grouted during or before removal of casing depending on borehole stability.

10.7.b.3. Grouting shall be completed immediately after installing the geothermal loop when reasonable to do so.

10.7.b.4. Boreholes with permanent casing shall be grouted before the top of the casing is terminated below ground level.

10.7.b.5. Boreholes with no casing shall be looped and grouted immediately after drilling.

10.7.b.6. Boreholes drilled with a mud system in unconsolidated formations shall be looped and grouted immediately after drilling.

10.7.b.7. Slurry mixtures shall be installed by pumping through a tremie pipe using a positive placement technique.

10.7.b.8. When voids are encountered (i.e. mined coal seams or caves), the borehole is cased from below the void to the surface.

10.7.c. Flushing, Purging, Pressure, and Flow Testing

10.7.c.1. Loops shall be pressure tested before installation.

10.7.c.2. Loops shall be pressure tested after installation and grouting.

10.7.c.3. All horizontal components of the ground heat exchanger shall be flushed, pressure tested, and flow tested prior to backfilling.

10.7.c.4. Heat exchangers shall be tested hydrostatically at 150% of the pipe design rating or 300% of the system operating pressure if this value is the smaller of the two.

10.7.c.5. No visible leaks shall occur within a thirty (30) minute period.

10.7.c.6 Soil thermal conductivity testing overseen by an IGSHPA certified designer or comparable certification, shall be required for all systems with 50 or more tons capacity. The thermal conductivity test shall be conducted for a minimum of 48 hours.

10.8 Heat Pump Open-Loop Requirements

10.8.a. Open loop wells shall be constructed in the same manner and conform to the water well construction standards set out in this rule. This shall apply to return wells, standing column wells and supply wells. DEP generally requires permits for injecting or returning water to the subsurface and for surface discharges. It is the homeowner's responsibility to obtain any required permits.

10.8.b. Pump tests shall be required for all open loop wells. The pump test shall demonstrate ability to produce 150 percent of the anticipated demand by sustaining this level of volume for twenty-four (24) continuous hours of stabilized flow; recovering to pre-pump test levels within twelve hours.

10.9. Direct Exchange Wells:

10.9.a. Shall be constructed in the same manner and conform to the construction standards set out in this rule.

10.9.b. The direct exchange loop shall be constructed of copper tubing or other material approved by the Commissioner. All joints in the direct exchange loop shall be soldered and not brazed. The solder used must withstand stresses associated with the direct exchange process.

10.9.c. The thermal fluid or refrigerant used in the direct exchange well tubing shall be biodegradable and non-toxic.

10.9.d. All loops shall be at least ten (10) feet from underground utilities due to the potential for freezing as heat is removed from the ground for heating.

§64-46-11. Dewatering and Dug Wells Construction.

11.1. Dewatering wells generally withdraw shallow ground water for construction purposes; grouting of the annular space can be minimized. Each dewatering well is unique. Plans shall be submitted to the Commissioner for approval. Dewatering wells shall be immediately sealed using methods described in Section 12 of this rule after dewatering has ceased.

11.2. Every dug well shall have a continuous watertight lining of steel casing, concrete pipe, or other approved casing

material, extending from above ground surface to a depth of at least ten (10) feet below the ground surface. When more than one formation bearing suitable water exists, the lower formation should be used. The lining in the producing zone shall readily admit water and shall be structurally sound to withstand external pressures. Each dug well is unique. Plans shall be developed and submitted to the Commissioner for approval.

11.2.a. The open space between the excavation and the installed lining shall be sealed with grout. If the first ten (10) feet of the casing is jointed, such as concrete, and would allow surface water to seep into cracks of casing, the grout will continue from the ten (10) foot seal to ground level.

§64-46-12. Well Abandonment.

12.1. When a water well is abandoned, the work shall be performed by a West Virginia Certified Water Well Driller.

12.2. All wells shall be completely filled with grout to prevent contamination from entering the subsurface water bearing formations and ground water mixing with one aquifer to another. Bentonite or cement grout shall be used for grouting material. If the well is so large that, the use of these materials is not practical, the Commissioner shall determine a proper plugging process. Methods and materials shall be selected only after careful consideration of casing material, casing condition, the diameter of the casing, quality and quantity of the original grout seal, the depth of the well, well plumbness, hydrogeologic setting, level of contamination, and the zones where contamination occurs. All abandonment procedures shall prevent groundwater contamination.

12.3. Screens, casings, and liner pipes shall be pulled whenever possible to assure placement of an effective seal. The borehole shall be completely sealed in such a manner that the vertical movement of water within the annular space is effectively and permanently prevented. When the casing is removed and the borehole is unstable, grout is simultaneously emplaced as the casing is "removed" to prevent collapse of the borehole; however, if the casing is left in place, the borehole is completely grouted from the bottom to the top with approved grouting material to reduce the possibility of annular channeling.

12.4. All pumps, wiring, pipes, valves, accessories, and hardware that may interfere with abandonment operations shall be removed prior to abandonment.

12.5. Water wells in consolidated formations shall be completely filled with grout to prevent contaminating materials from entering the subsurface water bearing formations and ground water from one aquifer mixing with that of another aquifer.

12.6. Water wells in unconsolidated formations shall be sealed with bentonite, cement, or bentonite-cement mixture from bottom to top.

12.7. Abandoned wells that penetrate limestone or other creviced or channelized rock formations that show a loss of grout while filling may use stone, pea gravel, or other approved bridging agents to seal these zones.

12.8. Abandoning dug or bucket drilled water wells exceeding twenty-four (24) inches in diameter shall be abandoned by the same method and grouting materials as used in unconsolidated formations.

12.9. Flowing artesian wells shall be abandoned with grout from the bottom of the well to the ground surface, using a

tremie pipe and pump. The added slurry weight of the cement-based or bentonite materials is necessary to overcome the naturally occurring pressuring characteristic of artesian flowing wells. For a large artesian flowing well (pressure head), it may be necessary to control the head or flow while placing the sealing material with the use of an inflatable packer to stop or restrict the flow of water.

12.10. Boreholes drilled for any geothermal uses or for a potential system but are unused in the final system shall be abandoned in accordance with this section.

§64-46-13. Additional Requirements.

13.1. All installations and operations shall meet or exceed relevant requirements of national, state, or local codes, whichever has jurisdiction.

13.2. The Commissioner shall specify construction requirements more stringent than those specified in this rule within specific areas of concern to protect the public health or prevent contamination of groundwater. The specific areas of concern recommendations shall be based on the assessment of the hydrologic condition and contaminant characteristics that may require more stringent design standards. Prior to requiring more stringent standards within a specific area of concern the Commissioner shall submit a report to the advisory board for review and recommendations.

13.3. When the strict application of any provision of this rule presents practical difficulties or unusual hardship, the Commissioner may grant a variance for that specific instance. Variance requests shall be made in writing to the Commissioner on forms prescribed by the Commissioner. The request shall include a thorough description of the site (lot size, the location of sewers, septic tanks, buildings, seepage fields, and other sources of contamination on the property and adjacent property with distances shown to the proposed well) and a brief summary of the provisions for which a variance is requested, and a complete justification as to why the variance is needed. Include how the alternate standard protects the quality of groundwater and protects public health and safety. The request shall provide a description of site-specific geologic and soil conditions. The Commissioner shall not grant any variance unless the applicant demonstrates that there will be unusual and unnecessary hardship in complying with the rules; contamination of the water well will not occur as a result of construction and operation of the system; the health of persons using water from the private water system will not be endangered thereby; and no other technically feasible and economically reasonable means of obtaining water from the proposed type of water source exists. The Commissioner shall notify the applicant in writing within thirty (30) calendar days of its decision to either grant or deny the variance. In all cases, variances shall be approved in advance of performance of the actual work.

13.3.a. After any variance is issued regarding the location of a well with respect to various contamination sources in Table 46-46 A of this rule, the Commissioner shall take two (2) water samples from the well and have them analyzed for *Total coliform and E coli* at an approved laboratory. The Commissioner may require analysis for other water quality parameters that may exist in conjunction with the source of potential pollution as necessary to protect the health or safety of potential users. At the time the variance is approved, the Commissioner shall notify the owner as to what these parameters are. One (1) sample shall be taken within thirty (30) days and the second sample shall be taken within sixty (60) days, after completion of

the well. After receiving the water analysis, the Commissioner shall determine if a water treatment unit shall be installed to accommodate any water quality problems as determined by the chemical and bacteriological testing.

13.3.b. Examples of location problems which could preclude compliance with this rule would include the proposed location of a well too close to septic tanks, buildings, sewer lines, or barnyards as indicated in Table 64-46 A of this rule.

13.3.c. Examples of public health and engineering principles that may be considered in issuing a variance are ground surface conditions, depth of the water table, the location of sources of pollutants, the vulnerability of the aquifer to bacteria and other pollutants, and the geologic conditions at the site.

TABLE 64-46 A

Minimum Horizontal Distance Between a Groundwater Well and a Potential Contamination Source

SOURCE	MINIMUM DISTANCE
Septic Tanks	50 feet (100 feet)*
Sewage Treatment Facilities	200 feet
Sewers and Drains (Watertight)	10 feet
Drains (Non-watertight)	50 feet (100 feet)
Sewage Holding Tanks and Privies (Vault)	50 feet (100 feet)
Barnyard/Feeding and Watering Areas	100 feet
Streams, Rivers, and Impoundments	25 feet
Sewage Absorption Fields	100 feet
Existing Building or Foundation	10 feet
Storage or Preparation Area for Fertilizers and Pesticides	150 feet
Buried Oil, Gasoline, Chemical Storage Tanks	>1100 gallons 150 feet <1100 gallons 50 feet
Cemetery	50 feet (100 feet)

*Note: The distance noted in parenthesis is required when a water well is lower in elevation than the source of pollution or contamination referenced.

TABLE 64-46 B

Diameter and Wall Thickness of Plastic Well Casing and Liners

Nominal Size	O.D.*	Class	Minimum Wall Thickness
2"	2.375	SDR 17 SDR 21	.133 .140
3"	3.500	SDR17 SDR21	.167 .206
4"	4.500	SDR 21 SDR17	.214 .265
5"	5.563	SDR 21 SDR 17	.265 .327
6"	6.625	SDR 21 SDR 17	.316 .390
6 ¼"		SDR 21	.329
8"	8.625	SDR 21	.410
10"	10.750	SDR 21	.511
12"	12.750	SDR 21	.606
14"	14.000	SDR21	.667
16"	16.000	SDR21	.762

Note: Dimensions are in inches.
* O. D. = outer (or outside) diameter
Liner Pipe Only for the 2", 3" and 4" nominal pipe size.
All dimensions and weights are subject to normal manufacturing tolerances.

TABLE 64-46 C

Determine the chorine dosage determination:

Reference - *AWWA A100-6, Standard for Deep Wells*

AMOUNT OF CHLORINE NECESSARY PER 10 FEET OF WATER IN WELL		
Inside diameter of well casing	**5.25% Sodium Hypochlorite (Bleach)**	**65% Calcium Hypochlorite**
	100 ppm*	**100 ppm***
1¼ inches	1/8 fl oz	- -
2 inches	1/2 fl oz	- -
3 inches	1fl oz	- -
4 inches	1½ fl oz	- -
6 inches	4 fl oz	1/4 oz
8 inches	7 fl oz	1/2 oz
10 inches	10 fl oz	3/4 oz
12 inches	2 cups	1 oz
18 inches	4½ cups	2½ oz
24 inches	7½ cups	4½ oz
36 inches	17½ cups	10 oz

*ppm = parts per million

1 heaping tablespoon of 65% chlorine powder = 1/2 oz. 8 fluid ounces = 1 cup

TABLE 64-46 D

Geothermal Water Pressure Ratings at 73.4°F (23.5°C) for DR-PR PE 3408 Plastic Pipe for Closed Loop Ground Heat Exchangers

Dimension Ration of Pipe	Pressure Rating (psi)
7	267
9	200
9.3	193
11	160
13.5	128
15.5	110
17	100