

**567—115.23(455B) Monitoring well/soil boring construction standards.****115.23(1) General considerations.**

a. Contractors involved in construction of monitoring wells and piezometers and soil boring activities shall be registered with the department as required in 567—Chapter 82.

b. To the extent possible, all monitoring well construction materials must not absorb, desorb, react or otherwise alter the screened soil stratum or the quality of the groundwater being sampled. Galvanized metal, glues, welding solvents, pipe thread lubricants and other foreign substances must not be used.

c. All monitoring well construction materials must be protected from contamination prior to installation.

d. A typical cross section of a properly constructed monitoring well is shown in Figure 1 at the end of this chapter.

**115.23(2) Casings.**

a. As a minimum, the diameter of the inner casing (see Figure 1) of a monitoring well must be at least 2 inches.

b. Plastic cased wells must be constructed of materials with threaded, nonglued joints which do not allow water infiltration under natural subsurface pressure conditions or when the well is evacuated for sampling.

c. Well casings must provide structural stability to prevent casing collapse during installation as well as drill hole integrity when installed. Flush joint casing is required for small diameter wells installed through hollow stem augers.

d. Well casings must be constructed of inert materials such as polytetrafluorethylene, stainless steel or polyvinyl chloride. The department may approve other casing materials if the owner or operator can demonstrate that the material has a low potential for biasing the water quality parameters of samples. The department may approve the construction of composite well casings (casings with less inert materials in the unsaturated zone).

**115.23(3) Well screens.**

a. Slot size will be based on sieve analysis of the sand and gravel stratum or filter pack. The slot size must hold out 35 percent to 60 percent of the formation material and not less than 90 percent of the filter pack.

b. Slot configuration and open area must permit effective development of the well.

c. Screen length. Maximum screen length shall be 10 feet except for water table wells in which the screen must be of sufficient length to accommodate expected seasonal fluctuations of the water table. The screen shall be placed 5 feet above and below the observed water table, unless local conditions are known to produce greater fluctuations. Screen length for piezometers shall be 2 feet or less. Multiple screened single-cased wells are prohibited.

**115.23(4) Filter pack.**

a. To prevent other materials from coming in contact with the well screen, the filter pack shall extend 18 inches above and 12 inches below the well screen.

b. Size must be based on sieve analysis of sand and gravel stratum. The filter pack material must be 2.5 to 3 times larger than 50 percent grain size of the zone being monitored.

**115.23(5) Grouting.**

a. The annular space above the filter pack must be sealed with expanding cement or bentonite grout. The vertical dimension of this seal must be a minimum of 3 feet.

b. The annular space between the seal and to just below the frostline must be backfilled with an impervious material such as bentonite grout or expanding cement.

c. The remaining annular space must be sealed with bentonite grout to the ground surface.

d. Grouting materials must be installed from the top of the filter pack up in one continuous operation with a tremie tube.

**115.23(6) Well protection.**

a. Plastic cased wells. A protective metal casing must be installed around the well casing. The inside diameter of the protective metal casing shall be at least 2 inches larger than the outside diameter of the well casing. The protective metal casing shall extend from a minimum of 1 foot below the frostline

to slightly above the well casing top. The protective casing shall be shortened or omitted if it covers part of the well screen. The protective casing shall be sealed or immobilized with a concrete plug around the outside. The bottom of the concrete plug must extend at least 1 foot below the frostline. The concrete plug shall be shortened if it covers part of the well screen. The top of the plug shall extend approximately 3 to 6 inches above the ground surface and shall slope away from the well approximately 3 feet. Soil may be placed above the plug. The inside of the protective casing shall be sealed with a bentonite grout. A vented cap shall be placed on the well casing and a protective locking cap on the metal casing. The lockable cap must be kept locked when the well is not in use.

*b.* Metal cased wells. The concrete plug shall extend from at least 1 foot below the frostline to approximately 3 to 6 inches above the ground surface and shall slope away from the well approximately 3 feet. Soil may be placed on top of the concrete plug. A vented, locking cap shall be placed on the casing. The lockable cap must be kept locked when the well is not in use. See Figure 1.

*c.* To protect against accidental damage, a ring of brightly colored posts or other protective devices must be installed around all wells.

**115.23(7) Well drilling.**

*a.* The owner or operator must ensure that in all phases of drilling, well installation and completion, the methods and materials used do not introduce substances that may alter the results of water quality analyses.

*b.* Well drilling equipment coming into contact with contaminants in the borehole or aboveground must be thoroughly cleaned to avoid spreading contamination to other depths or locations. Contaminated materials or leachate from wells must not be discharged onto the ground surface or into ponds or streams so as to cause environmental harm in the processes of drilling or well development.

*c.* The owner or operator must ensure that, at a minimum, the following well design and construction log information be retained at the site and a copy of this information be sent to the department:

- (1) Date/time of construction;
- (2) Name and address of the driller;
- (3) Drilling method and drilling fluid used;
- (4) Soil sampling methods;
- (5) Surveyed location ( $\pm 0.5$  ft.);
- (6) Soil and rock classifications;
- (7) Field observations;
- (8) Well name/number;
- (9) Borehole diameter and well casing diameter;
- (10) Well depth ( $\pm 0.1$  ft.);
- (11) Water level measurements;
- (12) Drilling and lithologic logs;
- (13) Casing materials, inside diameter and weight or wall thickness;
- (14) Screen materials;
- (15) Casing and screen joint type;
- (16) Screen slot size/length;
- (17) Filter pack material/size (depths from \_\_\_ to \_\_\_);
- (18) Filter pack volume;
- (19) Filter pack replacement method;
- (20) Sealant materials (depths from \_\_\_ to \_\_\_);
- (21) Sealant volume;
- (22) Sealant placement method;
- (23) Grouting schedule and materials;
- (24) Surface seal design/construction (depths from \_\_\_ to \_\_\_);
- (25) Type of protection well cap;
- (26) Ground surface elevation ( $\pm 0.1$  ft.);
- (27) Well cap elevation ( $\pm 0.01$  ft.);

- (28) Top of casing elevation ( $\pm 0.01$  ft.); and
- (29) Detailed drawing of well (including dimensions).

**115.23(8) Well development.** Prior to use of the monitoring well for water quality monitoring purposes, well development is required to ensure the collection of representative groundwater samples. Procedures used in well development involve using a surge block, bailing or surging by pumping of compressed inert gas to produce a movement of water at alternately high and low velocities into and out of the well screen and gravel pack in order to loosen and remove fine materials. Development of low hydraulic conductivity wells may require the circulation of water down the well casing, out through the screen and gravel pack, and up the open borehole prior to the placement of grout or seal in the annulus. Any additional water used must be of a quality so as not to interfere with future groundwater quality determinations. Following surging, the well is pumped until the water does not contain significant quantities of suspended solids.