OHIO DEPARTMENT OF HEALTH
Bureau of Environmental Health

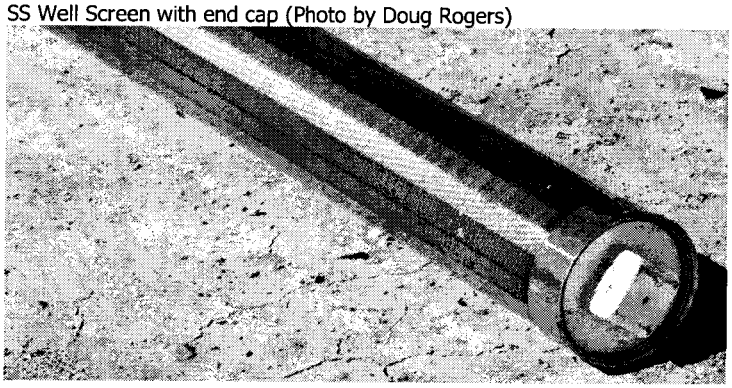
Private Water Systems BULLETIN

November 2012 – Special Well Drillers' Edition

PSW has received a variety of calls over the past several months concerning use of well screens, formation stabilizers, and bentonite grout, so we thought it best to assemble a bulletin for well drillers and local health department environmental health sanitarians on the topics. If you have a question not addressed here, please contact the office so we can answer it for you. We can be reached at (614) 466-1390 or BEH@odh.ohio.gov.

The Private Water Systems Staff

SS Well Screen with end cap (Photo by Doug Rogers)



WELL SCREENS:
FREQUENTLY ASKED QUESTIONS

The proper use and installation of well screens is often identified as a potential violation on many new well constructions for sand and gravel wells. Discussed below are common questions concerning well screens frequently asked by private water systems contractors contacting the Residential Water and Sewage Program.

When are well screens required to be installed?

OAC Rule 3701-28-10(K) states that well screens meeting specified construction standards shall be installed in all wells completed in unconsolidated or incompetent formations unless the geologic formation prevents their use. An unconsolidated geologic formation includes zones of sands, sand and gravels, gravels, or mixes of sand, gravel and clay not cemented together in the borehole. An incompetent geologic formation is a mixture of materials not cemented together or only weakly cemented together.

What are the material and construction requirements for well screens?

Material and construction requirements for well screens are specified in OAC rule 3701-28-09(K). This rule states that screens are to be factory manufactured of steel, PVC or fiberglass and must be fitted with bottom caps. Perforated or slotted well casing or liner pipe installed in consolidated formation (rock) prone to collapse are not well screens and therefore not regulated by the rules pertaining to well screens.

What if it is necessary to extend casing beneath a well screen?

Drillers finding it necessary to extend casing beneath a well screen must remember OAC rule 3701-28-10 (E), requiring that all well casing be grouted. In a situation where a piece of casing is required beneath a well screen, an end cap needs to be placed at its deepest end, and be grouted up to the well screen.

What geologic conditions might prevent use of a well screen and how should this be documented?

During prior rule development discussions private water systems contractors asserted that a well

screen installation was not always feasible in some types of geologic formations. This is true. There are three formation conditions generally acknowledged as being very difficult in which to set a screen:

1) very thin (less than 1-2 feet thick) unconsolidated formations,
2) the presence of "heaving" sand, or
3) the presence of very large cobbles (loose rocks 2.5 to 10.1 inches in diameter) or boulders (loose rocks having at least one lineal dimension greater than 10.1 inches).

Over the years, contractors experiencing these types of geologic formations have developed alternate construction practices to address such borehole conditions. Please remember that other rules require a well be properly developed and turbidity in the well minimized, requirements applicable to all wells and geologic formations. Hence, if sand and silt size particles are mixed in with large cobbles and boulders the formation will still need to be screened to prevent the entrance of sand and silt into the well.

How do I report that geologic formation conditions have prevented the use of a well screen?

If you encounter a geologic condition where installing a screen will be very difficult, then you must document the reasons why a screen could not be installed and the alternate construction methods used in the unconsolidated or incompetent formations. You should discuss the reasons for not installing a screen with the local health district sanitarian, if possible, and note the reasons on the Well Log. The noted information allows the local health department sanitarian reviewing the Well Log to understand the driller's reasoning for not installing a well screen, and help determine if construction of the well is in compliance with rule requirements.

What other types of information related to well screens must be reported?

Information on the screen material, its diameter, slot size, length and starting and finishing depth of screen placement in the well must be noted on the Well Log and Drilling Report. Private water systems contractors must note the depths and in which formations they encounter water, and if possible, an estimate of the yield. The static water level of the well must be recorded and noted on the Well Log, in addition to the sustainable yield of the well from pumping and the drawdown of the water level in the well during pumping. All this information is critical to ensure the well construction maximizes the well yield and is able to sustain the yield over time for the well owner.

How should multiple well screens be recorded on the well log?

The Water Mapping and Technical Services Section, Division of Soil and Water Resources, Ohio Department of Natural Resources (ODNR) has established a method for well drillers to record the placement of multiple well screens separated by solid casing in a well. The method also addresses how a driller is to record the use of screens with different slot sizes.

The following information should be recorded on the Well Log:

1. Screen length = the combined length of all the screens
2. Screen slot size = the most predominant size used or smallest size being used
3. Screen set from = the shallowest depth below the surface and
   Screen set to = the lowest (deepest) depth below the surface

Example

For a well with two screens, one 3 foot, 0.040 slot screen and one 3 foot, 0.050 slot screen placed at 40 feet and 60 feet respectively, the contractor should record:

1. Screen length = 6 feet (the two 3-foot sections)
2. Screen slot size = 0.040 (the smallest size screen)
3. Screen set from = 40 to 63 feet (shallowest depth and deepest depth)

In the Well Log's "Comments on water quality, quantity and well construction" box, which allows up to 500 characters, the contractor would explain that a 3 foot, 40 slot screen was installed from 40-43 feet and that a 3 foot, 50 slot screen was installed from 60-63 feet.

ODNR staff ask drillers using paper Well Logs, which do not have a "Comments" box, to simply write the depths and sizes of all screens in the "Screen" section under "Construction Details" of the Well Log form, separating each piece of information with a slash. The above example would be recorded as such: "6-feet/0.040/40-60 feet." The information could also be written at the bottom of the "Drilling Log*" section.

To summarize, any well finished in an unconsolidated or incompetent formation is to have a closed end well screen installed. Wells not in compliance with these requirements will need to be reconstructed to include a screen or be deepened so that the casing extends past the end of the unconsolidated formation. If a screen cannot be installed and deepening the well is not an option, the well will need to be sealed and a replacement well constructed no closer than ten feet from the sealed well.

PROPER USE OF FORMATION STABILIZER, FILTER PACK, GRAVEL PACK

Several additional rules associated with well screens should be kept in mind. OAC Rule 3701-28-01(MM) defines "formation stabilizer" (filter pack, gravel pack) as washed and disinfected siliceous sand or gravel placed between the borehole wall and a well screen to prevent formation material from entering the screen, and to stabilize the borehole. For the purposes of this discussion, and generally in the private water systems rules, the terms "formation stabilizer," "filter pack" and "gravel pack" are used interchangeably.

What are the perimeters for using formation stabilizers?

OAC 3701-28-10(J)(1) states that formation stabilizers, filter/gravel packs shall be installed adjacent to the well screen and may only extend:

1. a maximum of two (2) feet above the top of the screen for wells less than or equal to six (6) inches in diameter and,
2. a maximum of four (4) feet about the top of the screen for wells greater than six (6) inches in diameter.

In addition, the rule states that a formation stabilizer, filter/gravel pack shall not extend to less than ten (10) feet below the ground surface, and this is only permitted in situations where water is not available below a depth of twenty-five (25) feet beneath the surface. Please remember that OAC Rule 3701-28-10(K)(3) states that formation stabilizers, filter/gravel packs shall not be placed inside well casing or liner pipe.

When formations stabilizers extend greater distances above the well screen then the annular space is filled with formation stabilizer and there is no room for the placement of grout in the annular space. OAC Rule 3701-28-10(E)(1) states that all annular space is to be filled with grout from the bottom of the annular space or top of any formation stabilizer, filter/gravel pack to the ground surface. Large lengths of formation stabilizer in the borehole also allow water from different geologic zones to enter the well which can increase the drawdown in a well, or allow water of poor quality to enter the well.

How are formation stabilizers to be used when there are multiple well screens?

There are several things to be considered when using multiple screens in a well. In wells where more than one screen is installed, rule OAC 3701-28-10(E)(3) allows for the placement of formation stabilizer, filter/gravel pack in the annular space between the screens. In these cases the formation stabilizer, filter/gravel pack may extend more than two feet above the top of the deeper screen and still be in compliance. On the Well Logs of wells containing more than one well screen, the specifications and placement depth of each screen must be recorded. The ODNR Well Log form provides room for the

listing of only one screen, therefore a contractor constructing a well with more than one screen will need to note information regarding the additional screen or screens in the "Comments" section of the Well Log form.

Improper placement of well screens and formation stabilizers not complying with rule requirements is prohibited. Proper placement and use of screens protect sustainable well yields, promote better water quality from the well, and make well maintenance and cleaning more effective and easier to perform. Please contact the Ohio Department of Health, Private Water Systems Program at (614) 644-7558 if you have questions or concerns about implementing these requirements when constructing a well.

REMINDERS

Bentotite Grout

There are various types of bentonite and various grades, including ones for animal and human consumption. The bentonite used in the construction or sealing of wells must meet NSF standard 60 as specified in OAC 3701-28-09 (G)(1) and meet the definition of bentonite in OAC 3701-28-01 (G). Bentonite used for grouting and sealing water wells is composed of sodium montmorillonite, which swells effectively when exposed to water. Water well bentonite is also processed into particles and grades making it easier to mix as a slurry or use for dry pouring into a properly sized annular space or borehole. Food grade bentonite, on the other hand, is primarily calcium montmorillonite, which has significantly reduced swelling capacity, is more finely textured, and, most importantly, is not approved for use in water wells.

TDS and Grout

OAC Private Water Systems Rule 3701-28-09 (G) states that bentonite is not to be used where the total dissolved solid, **(TDS)** content of the water in a well is greater than 1500 milligrams per liter (mg/L). Milligrams per liter is also expressed as parts per million (ppm).

When encountering high TDS content water, cement based grouts are to be used in place of bentonite grouts. Cement based grouts may be "neat" cement or concrete that is mixed with sand as the aggregate. When grouting the annular space of a well or sealing a well having water in it, cement based grouts shall be placed only by pressure grouting methods. The one exception is that cement based grouts may be poured into a dry hole for the purpose of sealing.

Contractor Inspections

Ohio Administrative Code 3701-28-04(F) requires every well contractor to be inspected once every five (5) years by an Ohio Department of Health staff member during the drilling, construction and/or sealing process. This rule took effect on April 1, 2011, which means contractors must have at least one inspection done before December 31, 2015 in order to register for 2016. If an inspection by ODH staff has not been done prior to the 2016 registration, well contractors will not be able to register or drill wells before an inspection can be completed. There are over two hundred well drillers registered at this time and limited ODH staff available to do inspections. The chances of getting an inspection done quickly if a contractor waits until December of 2015 are not very good. Plan ahead. Schedule an inspection as soon as possible by calling the PWS Program at (614) 644-7558 when you have a well to drill or seal.

USEFUL RESOURCES

The Private Water Systems web site at http://www.odh.ohio.gov/odhprograms/eh/water/PrivateWaterSystems/main.aspx provides links to the following sites:

- Private Water Systems Rules
- PWS Power Point Training Presentations on the revised rules
- Registration application and bond forms
- List of actively Registered Private Water Systems Contractors
- List of OEPA Approved Laboratories performing colony count analysis
- Private Water System Permit Applications and Job Status Completion forms