Water Well Disinfections, Enhanced Disinfections, and Investigations

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Well Disinfection

- Who is required to disinfect?
- When are they required to disinfect?
  - OAC 3701-28-11 (E)(1) requires all pws contractors performing any work on the system to disinfect at the time of completion of their portion of the work.
  - OAC 3701-28-11(E)(2) requires the owner to provide access to the pws for the disinfection and to also be responsible for disinfecting the plumbing system prior to the pws being put into service

What is a disinfectant?

- OAC 3701-28-11 (D) specifies the materials used to disinfect a private water system.

- OAC 3702-28-11 (D)(1) Sodium hypochlorite at a strength of 5% or greater, not expired, not fragranced.
- Commonly known as bleach to the average pws owner.
- Most consumer available (OTC) bleach is now 8.25% sodium hypochlorite

- 3701-28-11(D)(2) Calcium hypochlorite designed for use as a well disinfectant. The product shall be prepared and placed in the well according to the manufacturer's requirements.
- Calcium hypochlorite should not be used to disinfect wells in limestone or dolomite aquifers, or where the dissolved calcium levels are high.

- OAC 3701-28-11(D)(4) Distilled white vinegar.
  - food
  - pH control

- 3701-28-11(D)(5) requires that if not sodium hypochlorite (OTC bleach) or distilled white vinegar, any product used to disinfect a private water system must be certified to ANSI/NSF 60 drinking water treatment chemicals – health effects AND be designated by the manufacturer for use as a drinking water well disinfectant and/or cleaning agent

Okay, that is what is used to disinfect, but how is a disinfection actually performed?

- 3701-28-11(F)(1) requires that for new (or replacement) well construction, the well shall be developed and all loose material shall be purged from the well and the distribution system

- 3701-28-11(F)(2) requires that with alterations, the pws contractor shall assess the need for physical or chemical cleaning of the well and distribution system, and shall do what is needed to ensure a proper disinfection of the system occurs.

- 3701-28-11(F)(3) requires that the total capacity of the pws to be disinfected be calculated to determine the total volume of disinfectant solution needed

- 3701-28-11(F)(4) requires that all authorized disinfectants be used in accordance with manufacturer's requirements.
- When Calcium or Sodium hypochlorite is used, the initial disinfectant solution should be between 100 and 500 mg/L with pH control.

- 3701-28-11(F)(5) requires that disinfectants shall be distributed throughout the borehole, including the portion of the casing and borehole above the static water line. It should also displace into the aquifer to ensure a complete disinfection.

- 3701-28-11(F)(6) requires that disinfectants remain in the system an adequate amount of time to ensure a proper disinfection.
- Typically at least eight hours. Longer is always better.
- 3701-28-11(F)(7) Once the contact time is completed the pws and distribution system shall be purged of disinfectant. Avoid the STS

What triggers an investigation?

- Well under active permit
  - Two consecutive TC failures
  - E.coli present
  - Other ‘weird’ sample results
- Water sampling for other reasons that returns unsatisfactory results
  - Systems required to sample annually
  - Point of sale sampling

- Talk to the contractors involved, ask them questions about the information they reported on the completion forms and well log about the construction process or maintenance history

- First sample failure
  - Contractor must re-disinfect the system
- Second consecutive sample failure
  - Contractor must perform an enhanced disinfection (should be the corrective action required by the LHD, and documented in the file)

Enhanced Disinfection

- *Not* a “super chlorination”
- Effective April 1, 2011 OAC 3701-28-11(H) specified the procedure for enhanced disinfection.
- More than just a stronger disinfectant solution
- Worth an up front conversation with the PWS contractor

Enhanced Disinfection Factsheet

Types of Private Water Systems

Ensuring the safety of drinking water from a private water system, whether it is a water well, spring, pond or rainwater cistern, is important. The Ohio Department of Health establishes construction standards for different sources of water and types of systems, and requires that contractor who work on these systems are registered and bonded to protect public health.

Private Water Systems Contractor Registration

Below is a list of the different types of private water systems. These links provide access to the standards for each type of private water system. These links will also provide additional information (such as FAQs, PowerPoint Presentations, and additional links to other websites) to private water systems owners, contractors, and local health districts to better understand the construction standards and terminology. This information should be helpful with the process of planning and constructing a new water system or altering or sealing an existing private water system.

- Wells
- Ponds
- Springs
- Cisterns and Hauled Water Storage Tanks

If you are unable to locate the information needed about the private water systems types, contact:

- Private Water Systems Contractors: Lists for those located in Ohio and Out of State
- Local Health Districts - this link will allow you to Search for the address and phone number of your Local County or City Health Department
- Ohio Department of Health Private Water Systems Program

Laboratories certified to conduct water testing for private water systems

The private water system rules (Ohio Administrative Code Chapter 3701-28) require water samples collected from private water systems to be analyzed by laboratory certified by either the Ohio Department of Health (ODH) or the Ohio Environmental Protection Agency (OEPA) for system approval after new construction, alteration or repair. The department recommends that all water samples collected from private water systems for real estate transactions, or

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Well Safety and Maintenance Guides and Fact Sheets

- Guides for Cleaning and Disinfecting
  - Disinfection Fact Sheet for Drinking Water Wells - Simple Procedures for Homeowners **(Now Includes a Disinfection Solution Volume Calculator!)**
  - Contractor Procedures for Cleaning and Disinfecting Private Water Wells
  - Disinfecting Wells after Flooding Events
- Droughts - Private Water Systems and Droughts fact sheet
- Power Outages - Private Water Systems and Power Outages fact sheet
- Oil and Gas Drilling - Recommendations for Water Well Sampling Before Oil and Gas Drilling
  - Go to the Water Quality webpage for additional information on contaminants
- Steps to Construct, Alter, and Seal a Private Water System
- Microbiological Standards for Private Water Systems in Ohio

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Ohio Department of Health
Bureau of Environmental Health
Private Water Systems

"To protect and improve the health of all Ohioans"

Contractor procedures for cleaning and disinfecting private water wells

Revised September 2012

Research and down-hole camera investigations show that all wells will have some degree of bacterial growth, sediment build-up, encrustation, scaling and deterioration. While disinfection of wells is required as part of the construction and alteration process, the following cleaning and disinfecting procedures are to be performed when there is a problem with continual positive or high bacterial colony counts, when a well that has not been in use for an extended period is being brought back into service, or when the integrity of the well has been compromised by flooding or physical damage to the well casing. The following procedure is intended to supplement and act as an instructive guide to performing the enhanced disinfectant process cited in rule 3701-28-11(H) of the Private Water Systems Rules, Chapter 3701-28 of the Ohio Administrative Code.

The following private water well cleaning and disinfection procedures must be performed by a registered private water system contractor due to the equipment required and the chemicals used.

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Procedure for enhanced disinfection

- The system shall be evaluated by the registered private water systems contractor to determine any necessary corrections or repairs to the system. Necessary corrections or repairs should be made to the system prior to additional enhanced disinfection steps being performed;

- The casing and borehole walls shall be physically or chemically cleaned

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- All debris, loose materials and biological slimes shall be removed from the well

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- The well shall be disinfected by the registered private water systems contractor using an approved disinfectant solution, in accordance with rule

- The introduction of a volume of the chlorine disinfectant solution, as described in paragraph (E) of OAC 3701-28-11, that is two or three times the total volume of water stored in the casing into the well to displace chlorinated water into the aquifer; or, other methods approved by the director.

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As the pump and drop pipe is put back into the well it should be wiped off to prevent the introduction of ‘extra’ organic material (any grass etc. that may have been stuck to it from resting on the ground and any remaining ‘loose’ iron/bacteria deposits)

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- The private water systems contractor or contractors shall document all corrective work or disinfection procedures implemented and (in current proposed revised draft rule language) submit a summary to the board of health describing any corrections or repairs made to the system and the specific enhanced disinfection procedures utilized.

- Resample of the system still fails...

What now?

Dye test

Dye test, what do you need?

- Time!!!
- Shovel
- Garden hose(s) that will reach from spigot to the well
- Water turned on at the spigot
- Rhodamine dye (Red)
- Clear sample bottles
- Log sheet, additional sheet of white paper

Dye Test, procedure

- Dig a “moat” around the well casing at least 6” deep
- Run water from the hose into the moat to saturate the ground
- Goal is to get it to the point where the moat contains water, but not overflowing
- Fill and label a “control” sample bottle from a convenient fixture (often the kitchen sink)

- Add the Rhodamine dye into the “moat” (~100 mL)
- Continue running water through the hose into the “moat”
  - Monitor to make sure it doesn’t overflow, nor does it run dry, adjust flow rate as needed
- Periodically collect samples, label with time and compare to control sample for colour changes

- If possible, have samples refrigerated after collection in case later examination under a black light in necessary to verify that lack of visible colour change is in fact indicative of no dye present

- Dye test positive -> likely construction issue with direct connection to the surface.
- Dye test inconclusive -> further investigation needed

Now can I request a DHC?!?

- If the dye test is positive, orders should be issued to the contractor to eliminate the direct connection to the surface

Now can I request a DHC?!?

- If the investigation thus far has proved inconclusive as to the reason for the repeat microbiological failures… this is when a down hole camera investigation is requested. However, the expectation is that the contractor has been ‘interviewed’ about the construction process and that the full step through of the enhanced disinfection process has occurred first.

- If, during the interview, it is revealed that the contractor's enhanced disinfection did not in fact meet the requirements of rule, the contractor should be issued a NOV citing the requirements of OAC 3701-28-11(H) with the corrective action to perform an enhanced disinfection following the procedure outlined in rule. As always, copied to applicant, owner, and ODH

Confounding factors

- Forms which document incomplete information to determine compliance with the construction requirements of rule.
- Replacement systems often tie into existing portions of the PWS rather than replace everything.
- Lack of understanding of what an enhanced disinfection actually entails.

- System owner self sabotage
  - Adding or changing filters in the distribution system
  - Doing other work that opens the distribution system after the disinfection but before you get there to sample

Results of DHC inspections

- Often not that glamorous, but occasionally can be exciting in a geeky way.
  - Karst features
  - Fracture flow at the elevation of a nearby stream
  - Worms
  - Holes in casing at the joints
  - Pitless adaptor installation issues

Ohio Department of Health

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