Ohio Department of Natural Resources
Division of Water Fact Sheet

Fact Sheet 92–14

Well Construction Materials and Techniques

Approximately 42 percent of the residents of Ohio depend on ground water from both municipal and private water wells with about 720,000 rural households depending primarily on ground water for their daily water needs. Proper well construction materials and techniques are essential to providing both a long term and safe supply of ground water for household use. This fact sheet briefly discusses the following well construction components: casing types and sizes, pitless adapters and well screens.

Types of Casing

Steel and thermoplastic or PVC casing are the standard choices for casing residential wells drilled in Ohio. Each has it's advantages and disadvantages as shown below.

PVC Casing

Advantages	Disadvantages
Corrosion resistance	Lower relative strength
Light weight	Lower heat resistance
Ease of installation	Lower compressive strength
Resistant to acid clean-outs	Flexible (must be centered in the borehole)

Steel Casing

Advantages	Disadvantages
High relative strength	Higher corrosion potential
Higher heat resistance	Heavier in weight
Higher compressive strength	Relatively higher cost
Rigid pipe	Scale build-up

Whichever casing type you and your driller choose, the inside diameter of the casing should be 5 to 6 inches, or at least one and preferably two sizes larger than the bowl size of the pump to be installed. A common misconception is that doubling the casing size will double the well's yield. While it is true that doubling the casing diameter will increase the yield, the increase is only about 15-20% and may not be cost effective. Doubling the casing diameter will however substantially increase the storage of water in the well by approximately 400%. Therefore, in areas of relatively low yielding wells a larger casing can act as a reservoir and is an advantage over wells with smaller casing diameters.

Casing Length

Unless you are granted a variance by your local health department, the law requires a minimum of 25 feet of casing to be installed in a new well. When properly grouted, the casing seals out potential contaminants from entering your well.

Different geologic formations require different amounts of casings. Generally speaking, casing should be installed completely through any unconsolidated materials such as clay, sand or gravel. When drilling a well into a bedrock aquifer, the casing should be installed through any unconsolidated material and set at least a few feet into solid rock. If there is less than 25 feet of unconsolidated material, the casing must still be set far enough into the rock to meet the 25–foot minimum casing requirement. Longer lengths of casing can be installed through formations producing undesirable water. The casing isolates poor water zones and allows the development of higher quality ground water in deeper formations. Slotted casing can be run through water-bearing bedrock formations that are prone to sloughing such as thinly interbedded sandstone and shale sequences. The slots in the casing allow the water to enter the well while the casing prevents the borehole from collapsing.

Pitless Adapters and Well Seals

Pitless adapters provide your well a frost-proof and sanitary seal between the well casing and the water line running to your house. Pitless adapters are installed by first determining the frost line for your area. A hole is then cut into the casing below the frost line and the discharge line is installed into the adapter using a sanitary seal such as a gasket or by welding. A drop

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pipe connects to the adapter inside of the casing which in turn connects to the pump. Water is produced through the drop pipe to the adapter while still below the frost line and then into the discharge line for distribution into the house. Pitless units are also constructed with a release device that allows the tubing and pump to be pulled without having to dig up and disconnect the distribution line from the casing.

The well casing should extend at least eight inches above ground level, or above the flood level if located near a stream or river to prevent surface water from entering the casing and contaminating the aquifer. An approved well cap should fit snugly on top of the casing to keep out debris and insects.

Well Screens

A well screen is a filtering device that attaches to the bottom length of casing and allows water to move into the well while keeping the majority of sand and gravel out of the well.

The most common types of screens used in residential wells are continuous slot, slotted pipe and perforated pipe. The continuous slot screens are constructed from triangular wire or plastic wrapped around a series of vertical rods. When properly sized, these screens are very efficient. Slotted pipe screens are constructed by making machine cut slots into either steel or plastic casing at prescribed distances. This type of screen has less open area than a continuous slot screen. They are moderately efficient. Perforated pipe is a length of casing that has holes or slots drilled or cut into the pipe. This type of screen is generally not very efficient and is not recommended for sand and gravel aquifers although it may be useful in semi-consolidated aquifers. Open hole completions are never recommended in unconsolidated aquifers.

The proper screen slot size is determined by examining the well cuttings while drilling through the water bearing zone. Select a size that holds back the sand, yet allows water to freely enter the well. If the slot size chosen is too large, sand as well as water will pass through the screen creating excess wear on the pump. Choosing a slot size too small will hold back the sand but will also restrict the movement of water into the well lessening efficiency and increasing the stress on the pump.

All wells completed in an unconsolidated aquifer should have a well screen. Screened wells produce water more efficiently, last longer than unscreened wells, have fewer problems, and are easier to clean out than wells without screens.

Knowledge of well construction materials and techniques allows you to make better decisions when drilling a new well or servicing an existing well. For additional information on wells and ground water resources contact:

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Basic elements of well construction