

Well Construction

There are five different well construction types or categories listed on the *official* drinking water form (lab 10G):

1. Drilled
2. Driven
3. Spring
4. Bored
5. Dug

A **drilled well** is constructed by using a type of percussion tool or a drill (rotary) bit. During the drilling process, casing (steel or plastic) is installed to prevent the collapse of the borehole. The depth of the casing in the well will depend on the depth of the well and the different types of formations encountered during the drilling process. The space between the casing and the sidewalls are filled with either a cement or bentonite grout to prevent contamination of the well by water moving vertically along the casing. This construction method is commonly used when drilling through bedrock and/or reaching several hundred feet.

A **driven well** is constructed by driving a screened well point attached to small diameter segmented pipe into **sand** or **gravel** bearing formations. This type of well may be driven or jetted until a water-bearing stratum is reached. They are typically very shallow (25 feet or less) and easily contaminated (see Figure 1).

Springs are formed when groundwater surfaces above ground naturally. A spring is developed by using a watertight box usually constructed of concrete, and a tight fitting lid with a lip that will hang over the box to prevent the entrance of any contaminants. The spring box is set in the line of flow at least 3 feet into the ground. Depending on the type of spring, tile or pipe may be required to collect the water and transfer it to the spring box. In some instances (low area springs), the spring box may serve as the collection point. The spring box will have an outlet pipe, a screened overflow pipe, and a drain to clean the box when needed. Springs are not a recommended source for drinking water because they are easily and often contaminated (see Figure 2).

A **bored well** is constructed by using a rotating auger or bucket to bore into unconsolidated material such as sand, clay or silt. Their diameter ranges from two to four feet and they are typically no more than 50 feet deep. Bored wells are usually lined with a concrete casing, which is lowered down the hole in segments. This type of well is shallow and easily contaminated if not sealed properly (see Figure 3).

Dug wells are constructed by using a shovel or a backhoe. The hole is dug into the groundwater table until the flow of water is greater than the bailing rate. Watertight casing is installed to prevent the well from collapsing and from becoming contaminated. The diameter of the well can be anywhere from 3 to 6 feet and the depth usually ranges from 10 to 30 feet. The risk of contamination is very high because these types of wells are extremely shallow (see Figure 3).

Above Ground Well Construction (See Figure 4.)

Newly drilled wells in Missouri are required to extend the casing at least 12 inches above ground and seal with a sanitary well cap to prevent surface contamination. The ground surface should be sloped away from the well to keep water from pooling around the well casing and the vent should be screened to keep rodents and insects out. If the well is subject to flooding, it is then required to extend the casing 24 inches above ground to prevent floodwater contamination. Existing wells with the casing below grade are required to extend the casing above grade unless a variance has been granted.

An above ground well inspection should be done on a yearly basis, usually during any routine inspection of a regulated establishment and at anytime water samples collected are positive for coliform and/or e-coli.

Guidelines for above ground inspection of wells:

1. Check well cap and casing for any visible signs of damage, cracking or tampering, etc., older wells may show signs of corrosion and deterioration. The well cap should be firmly attached to the casing.
2. Ground surface should be graded to drain water away from wellhead. Look for any evidence that water has been pooling around well. Check the space between the well hole and the well casing, this is known as the annular seal, if sealant has shrunk, this could provide a pathway for surface waters to flow downward.
3. Vent pipe should be elbowed downward and opening covered with a mesh screen.
4. Unprotected openings should be sealed. In above ground connections, the electric wire hole, the drop pipe hole and the vent pipe hole may not be adequately sealed, therefore, silicon caulking may be used to caulk around holes.
5. Maintenance of separation distances from common sources of contamination.