Land & Water
Conserving Natural Resources in Illinois
University of Illinois Extension • College of Agricultural, Consumer and Environmental Sciences

Constructing Your Well

Three Types

The type of well and the method of well construction you choose will depend on the costs involved and the recommendations of your well contractor.The contractor's recommendations, in turn, will be based on your site's geologic and groundwater conditions.

The two most common types of wells constructed in Illinois are small-diameter drilled wells and large-diameter bored wells. A third type, a sand-point well, is also used but not as often.

Small-Diameter Drilled Wells

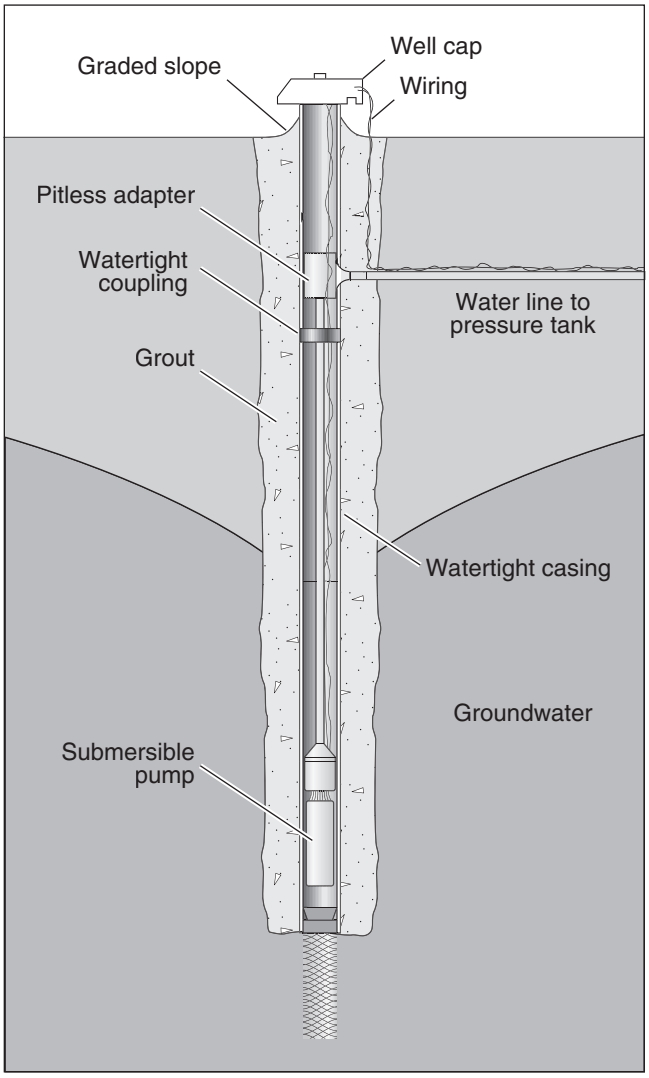
Small-diameter drilled wells for farms or domestic use average 4 to 6 inches in diameter. They are constructed where the aquifers are capable of supplying water to the well as quickly as it is pumped.

Drilled wells tap water-bearing sand and gravel formations, as well as bedrock formations of permeable sandstone and cracked and creviced limestone and dolomite. The depth to which these wells are drilled varies greatly, depending on your geologic conditions.

Drilled wells may be constructed by one of two methods. The faster of the two ways is the rotary method. This procedure uses a rotating shaft and drill bit to bore through compacted sand, gravel, clay, and glacial till. Drilled materials are then brought to the surface mixed with drilling fluid, referred to as "mud."

If the well is being drilled into a sand and gravel aquifer, a steel or plastic pipe is inserted

Figure 1. Drilled Well



into the bore hole and extends from the land surface into the aquifer. This process, known as "casing out" the bore hole, prevents the overlying materials from caving in and minimizes contamination of the water.

A length of commercially made well screen is placed immediately below the casing to hold back sand particles and permit water to flow freely into the well. The size of the well screen openings varies. Screen selection is based on the size of the sand and gravel particles in the aquifer.

If the well is being drilled into bedrock, the bore hole is cased out above the aquifer, with the casing set firmly into the bedrock. Below this, the bore hole is usually left open without casing or a well screen.

The other method for drilling wells uses a percussive cable tool. The well is advanced by raising and dropping a heavy drill bit repeatedly. This breaks the rock formations into fragments that are periodically flushed to the surface.

With this method, the casing is installed as the hole is being drilled, following the bit closely, to keep the bore hole open.

Large-Diameter Bored Wells

In contrast to drilled wells, large-diameter bored wells generally are 24 to 36 inches in diameter and are constructed in areas where water yields are low. Their wide diameter helps to overcome the disadvantages of the aquifer's flow rate. They can do this for two reasons: (1) large-diameter wells sometimes store several hundred gallons of water, which can be tapped during periods of peak demand; and (2) water can continuously seep into the wells and refill them during the times when they are not being pumped.

Unfortunately, large-diameter bored wells sometimes extend only several feet into the water table; consequently, they can go dry when the water table drops during periods of drought. Because of this drawback, a large-diameter bored well is usually constructed only when no better option is available.

Once the decision to build a large-diameter bored well has been made, construction usually proceeds as follows. The hole for the well is bored using a rotary bucket drill rig. A casing, usually made from concrete pipe, is then inserted in the hole. A layer of gravel, usually 4 inches thick, is placed around the casing from about 10 feet below the land surface to the bottom of the well.

Because the bore holes for these wells must remain open until the casing is installed, the construction of bored wells is most successful in fine-textured soils that contain silt and clay. Silt and clay will prevent the hole from caving in.

Sand-point Wells

Sand-point wells are shallow (typically less than 40 feet deep), and they are used in areas that have highly permeable sand and gravel aquifers. However, they are not as widespread in most areas of the Midwest as the other two types of wells.

Figure 2. Bored Well

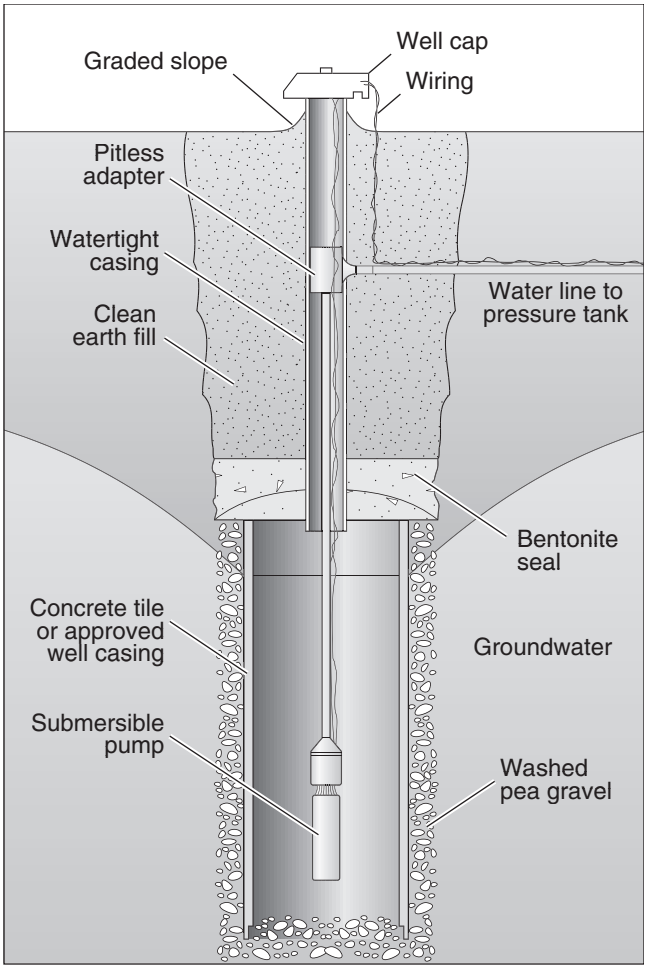
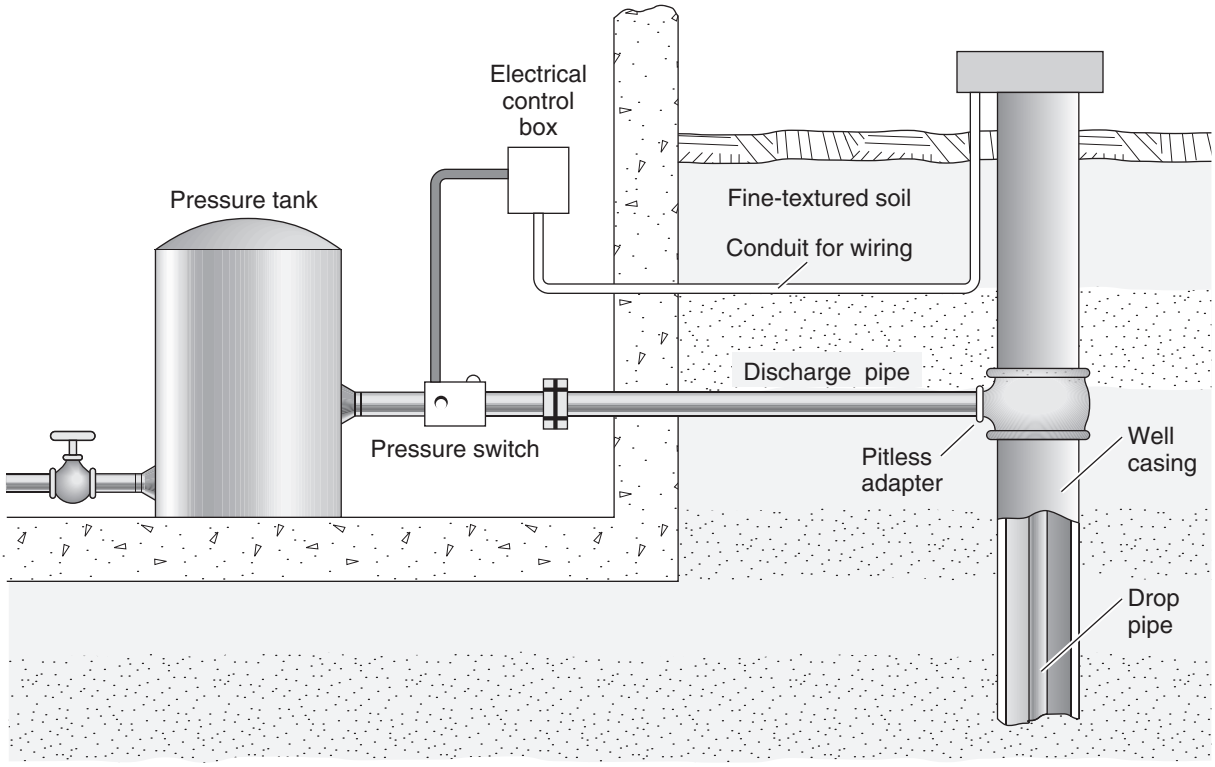


Figure 3. Domestic Well Installation



This is a typical domestic well installation with the discharge pipe extending into the home.

Developing Your Well

Once your well has been drilled, it must then be "developed." A well usually is developed by pumping it or by surging it with air. This process clears debris and sediment from the sides and bottom of the well, and it restores the natural hydraulics of the water-bearing formation to maximize its yield. If it is done properly, developing the well will result in clear, sediment-free water. Little development work is possible for large-diameter bored wells.

After development work is completed, the well is tested for its water-yielding capability. Testing will help determine the size of pump you need, the depth at which the pump should be set, and the size of the pressure tank.

To prevent any surface pollutants from contaminating the well, the top of the new well will extend at least 8 inches above ground; and if the area is subject to flooding, it will extend at least 24 inches above any maximum known floodwater elevation. To prevent contamination of the aquifer and the well itself, the space between the well casing and the drill hole is sealed with neat cement grout or bentonite grout. The discharge pipe exits the well casing through an approved pitless adapter.

Within 30 days from the completion or modification of your well, your contractor submits a construction report to the Department of Public Health. Then a representative from the health department inspects your well, collects a water sample, and submits it to a certified laboratory to have it tested for coliform bacteria and nitrate concentration.

Be certain to request a well log from your contractor describing the methods and materials used to construct your well. Keep this log in a safe place because you will need this information later to properly maintain and repair your well.

Disinfecting and Testing Your Well

Disinfection following construction is necessary to eliminate any bacterial contamination that may have occurred during the drilling process. Disinfection also is necessary after the pump is installed or any time the system is opened for repair.

The well contractor or pump installer is the one responsible for making sure this is done correctly. However, disinfection does not guarantee that your well is free from contamination. The only way to be sure is to have your well

water tested, either by the Department of Public Health or by a private laboratory. (See the Land & Water publication, “Testing Your Drinking Water.”)

Permits

Before construction begins, well contractors must obtain well permits from the Department of Public Health or (in most counties) from the local health department.

When the well contractor applies for a permit, he or she must also submit a plot plan that describes the location of the proposed well and indicates the locations of all sources or routes of contamination.

In Illinois, property owners may obtain a well permit and perform the actual well construction and pump installation if the well will be used for the owner’s private water supply. Otherwise, a licensed well contractor must perform the work. Well construction, whether by the owner or a contractor, must conform to the specifications established by the Illinois Water Well Construction Code.

Copies of the code are available online at: http://www.ilga.gov/commission/jcar/admincode/077/07700920sections.html

A Well Construction Checklist

When contracting to install a well, find answers to these questions:

Is it clear whether the well driller is responsible for guaranteeing a certain quantity or quality of water?

Do you, the property owner, and the contractor have a common understanding of...

- the water yield that will be sought?
- the minimum yield that will be accepted if difficulties are encountered?
- the maximum depth to drill if satisfactory amounts of water are not encountered?

Have you been provided with a written estimate that will cover...

- the drilling cost per foot?
- the cost per foot of well casing materials?
- surface sanitary sealing?
- sealing material (such as grout)?
- the well screen, if the well does not extend into bedrock?
- excavations for piping from well to house?
- the submersible pump, piping into house, and all other required equipment?
- the pressure tank inside the house, if such a tank is provided by the pump contractor?
- the cost of “dry” holes?
- the cost of the well drilling permit?

Do you know when the work will start and how long construction is likely to take?

Is there an agreement about the contractor’s right of access onto the site, any necessary disruption to existing land and vegetation, and disposal of debris from the drilling operation?

Is the contractor free of liability for injuries not due to the contractor’s negligence?

Does the contractor provide future maintenance services? If not, who will?

Will the contractor furnish a well log when the work is completed?
Such a log will include details of the well’s construction, which will be invaluable for future maintenance or repairs.

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Sources
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