wellcare® information for you about

Sizing a Well Pump

Proper sizing and selection of the components in your water well system, most notably the well pump, are essential to meet your water needs today and in the future.

Role of the Well Pump

Well construction typically consists of three steps. First, your well will be drilled to meet all well construction standards in your area. Next, a trench is dug to connect the well to your house and other buildings. Finally, a well pump is selected that will raise water from the well and deliver it to a storage tank in the home, where it is held under pressure until needed.

Selecting or sizing the well pump is a critical step in this process, determined by the yield of the well and the needs of the household. The general rule is to never install a pump that has a greater capacity than your well.

The pump usually refers to both the pump itself and an electric motor, which together make up the pumping unit. The pump may be one of several types: shallow-well or deep-well, and jet, submersible or reciprocating. When the pump turns on, it fills the pressure tank used for water storage.

Determine Gallons Per Minute Required

A key to selecting the right size pump is to figure the gallons per minute of water required at peak periods. A pump should be selected to meet normal peak demand for the household, rather than average use. There are two common methods for sizing a residential pump system that give similar results:

- **Residential Capacity Based on Fixture Count**
  The capacity of the pump system in gallons per minute should equal the number of fixtures in the home. This must take into account all use for the kitchen, bath, appliances, outside irrigation, a pool and special fixtures, such as a hot tub.

  In this model, a modern home with two bathrooms (three outlets each), kitchen sink, dishwasher, washing machine, laundry tub and two outside hose outlets would require a capacity of 12 gallons per minute, based on the 12 fixtures or outlets.

- **Residential Capacity Based on Peak Demand**
  A second model, using the same fixtures and plumbing as the previous example, calculates capacity based on a seven-minute peak demand. The peak time for household water use is normally in the morning, when the family rises, or in the evening, when all are home. Seven minutes is the average high water use timeframe for a shower or automatic washer. (See Table 1, page 2.)

TABLE I. SEVEN-MINUTE PEAK DEMAND PERIOD USAGE

OUTLETS	FLOW RATE GPM	TOTAL USAGE GALLONS	BATHROOMS IN HOME 1	1 1/2	2 - 2 1/2	3 - 4
Shower or Bath Tub	5	35	35	35	53	70
Lavatory	4	2	2	4	6	8
Toilet	4	5	5	10	15	20
Kitchen Sink	5	3	3	3	3	3
Automatic Washer	5	35	–	18	18	18
Dishwasher	2	14	–	–	3	3
Normal seven-minute *peak demand (gallons)			45	70	98	122
Minimum sized pump required to meet peak demand without supplemental supply			7 GPM (420 GPH)	10 GPM (600 GPH)	14 GPM (840 GPH)	17 GPM (1020 GPH)

Note: Values given are average and do not include higher or lower extremes

*Peak demand can occur several times during morning and evening hours.

To determine peak demand, read down the column in Table 1 under the number of bathrooms to the normal seven-minute peak demand total. Note this figure, which in a two-bathroom house is 98 gallons. Then read down the same column to the minimum-sized pump required to meet peak demand, which in a two-bathroom house is 14 gallons per minute.

Address Low Well Capacity

In the best and most economical water system, the needs of the household are less than the rate at which water can be drawn from the well. If the peak demand exceeds the maximum rate of water available, the pump must be sized within the well capacity and the peak demand reached through added storage capacity.

Usually a large-size pressure tank can perform this function. In fact, a larger water storage tank can prolong the life of your pump, as it reduces the need for the pump to cycle as often. Most wear and tear on the well pump occurs when it stops and starts.

There are times, however, when the well capacity is so low that a two-pump system is needed. In a two-pump system, the well pump supplies water to an atmospheric storage tank. A second pump, a shallow well unit, takes water from the atmospheric tank and discharges it into the pressure tank or directly into the system. Its operation is controlled with a pressure switch.

Ensure Adequate Water Pressure

Water pressure is the final consideration in sizing the well pump. Pressure must be sufficient to force the water through the piping system to the highest outlet and to properly operate modern appliances, continuously and when other outlets are also in use.

Most appliances, such as dishwashers and washing machines, require a pressure of at least 10 pounds per square inch (psi) at their inlet for proper operation. Lawn sprinklers usually require a minimum of 20 psi and sometimes up to 40 psi. The installation of water condi-

tioning equipment, such as water softeners, results in a pressure drop in the system for different flow rates and must be considered in determining required pressure.

If the piping system is old and the inside diameters of the pipes are reduced due to deposits of rust or lime, the friction loss through the system will be great. Therefore, a higher-pressure setting will be required. If the pump is located a distance from the house, and particularly if it is at a lower elevation, higher pressure is required. Most modern water systems are set to operate between 30 psi to 50 psi or between 40 psi to 60 psi.

A conservative method of determining the best pressure setting is to have a pressure of 20 psi at the inlet side of the fixture that is the highest and farthest from the pump, as measured when water is flowing through the fixture.

Select the Right Pump

Each type of well pump has advantages and limitations. In working with your water well professional, review some of the following factors before making a final selection:

- Adequate capacity (gallons per minute) for present and future use.
- Adequate pressure for present and future use and for the possibility of a lower water level in the well.
- Cost of the pump.
- Cost of the labor to install the pump.
- Cost of materials to install the pump, such as piping, fittings, accessories, well pit, etc.
- Power supply.
- Area needed to install the pump. Is there enough space available?
- Reliability of the pump.
- Cost and ease of servicing the pump.
- Cost of operating the pump, including power and parts.

For more information on sizing a well pump

Water Systems Handbook and *Large Submersible Water Pump Manual,* both published by Water Systems Council, give extensive detail on how to determine water capacity needs and required equipment, such as pumps and storage tanks.

For more information on your drinking water

The following sites provide up-to-date information on efforts to protect public water supplies and steps you can take as a private well owner:

Home*A*Syst Program	**www.uwex.edu/homeasyst**
The Groundwater Foundation	**www.groundwater.org**
U.S. Environmental Protection Agency	**www.epa.gov/safewater**
American Groundwater Trust	**www.agwt.org**

For more information about wells and other wellcare® publications

wellcare® is a program of the **Water Systems Council (WSC). WSC** is a national nonprofit organization dedicated to promote the wider use of wells as modern and affordable safe drinking water systems and to protect ground water resources nationwide.

Contact us at 888-395-1033 or visit www.watersystemscouncil.org

This publication was developed in part under Assistance Agreement No. X-82849101-1 awarded by the U.S. Environmental Protection Agency. It has not been formally reviewed by EPA. The views expressed in this document are solely those of WSC. EPA does not endorse any products or commercial services mentioned in this publication.