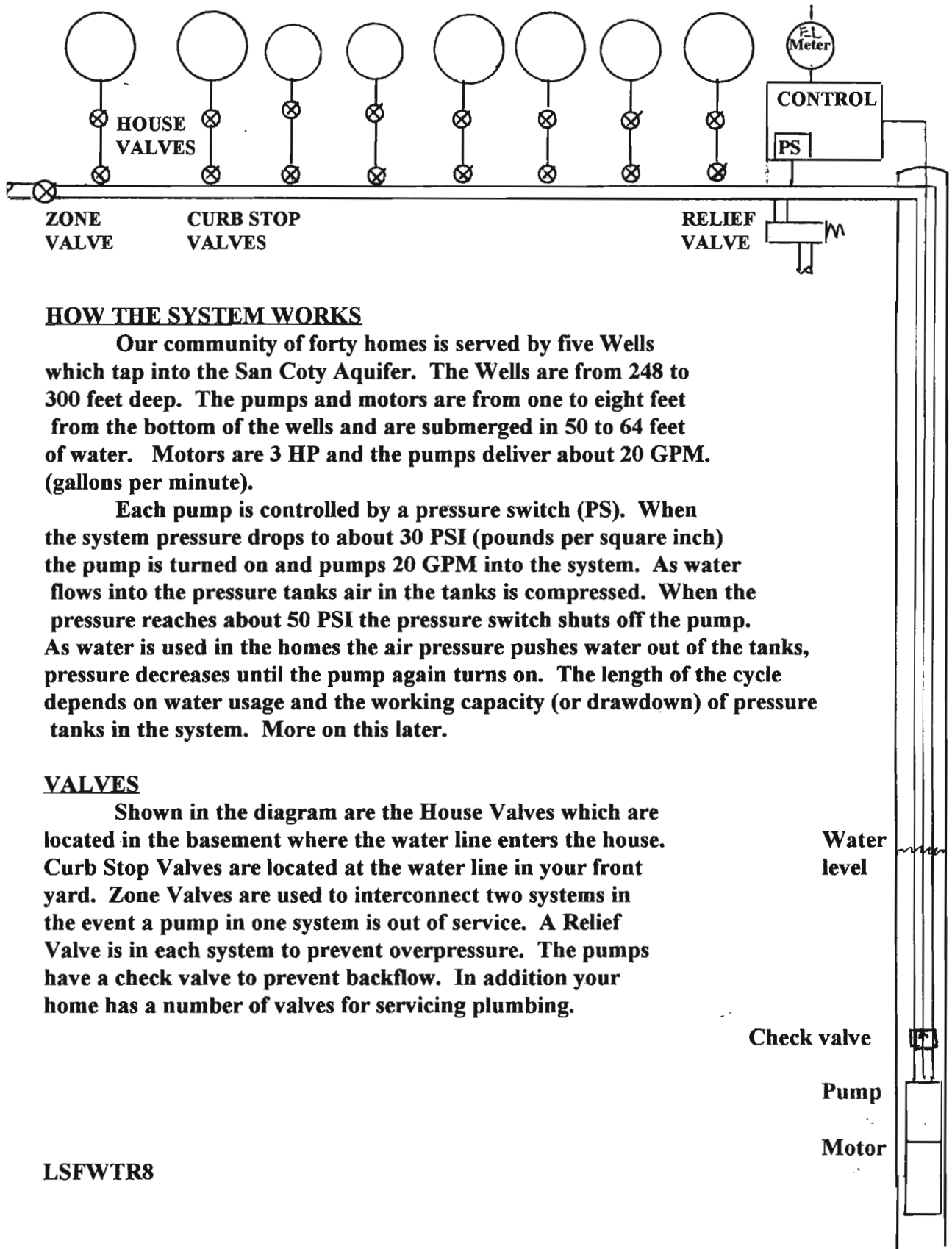


LSF WATER SYSTEMS
A PRESSURE TANK IN EACH HOME



HOW THE SYSTEM WORKS

Our community of forty homes is served by five Wells which tap into the San Coty Aquifer. The Wells are from 248 to 300 feet deep. The pumps and motors are from one to eight feet from the bottom of the wells and are submerged in 50 to 64 feet of water. Motors are 3 HP and the pumps deliver about 20 GPM. (gallons per minute).

Each pump is controlled by a pressure switch (PS). When the system pressure drops to about 30 PSI (pounds per square inch) the pump is turned on and pumps 20 GPM into the system. As water flows into the pressure tanks air in the tanks is compressed. When the pressure reaches about 50 PSI the pressure switch shuts off the pump. As water is used in the homes the air pressure pushes water out of the tanks, pressure decreases until the pump again turns on. The length of the cycle depends on water usage and the working capacity (or drawdown) of pressure tanks in the system. More on this later.

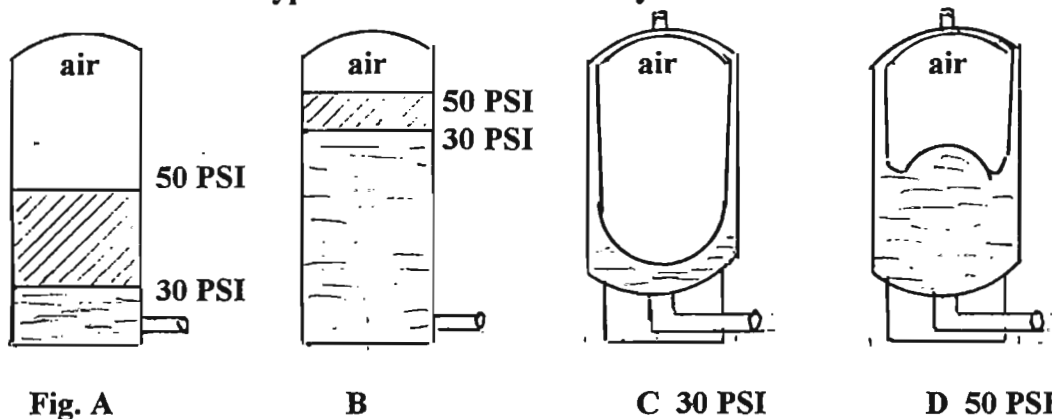
VALVES

Shown in the diagram are the House Valves which are located in the basement where the water line enters the house. Curb Stop Valves are located at the water line in your front yard. Zone Valves are used to interconnect two systems in the event a pump in one system is out of service. A Relief Valve is in each system to prevent overpressure. The pumps have a check valve to prevent backflow. In addition your home has a number of valves for servicing plumbing.

PRESSURE TANKS

There are two basic types of pressure tanks:

1. Standard (or empty) tank. Some of these have floats between the air and water. They are shown in Figures A & B.
2. Bladder, diaphragm, air cell are all names for tanks with a flexible separator between the air and water. They are shown in Figures C & D. This is the recommended type of tank for our water system.



HOW THE SYSTEM WORKS

Figure A shows a properly charged tank. Air nearly fills the tank at the pump turn-on pressure (30 PSI). Figure A shows the tank at the pump shut off pressure (50 PSI). The working capacity of water is shown as ////////////// . For an 85 gallon tank this working capacity is 25 gallons.

Figure B shows a tank that has lost its air charge either by air being absorbed into the water or when a pump is shut down (i.e.. power failure). The working capacity of water is now only about 6 gallons.

Figure C shows the bladder almost filling the inside of the tank at 30 PSI and Figure D shows the bladder contracted when the water pressure is at 50 PSI. This 85 gallon tank has a working capacity of 25 gallons. The big advantage is that it does not lose its air charge when system pressure is lost.

SOME MISCONCEPTIONS

1. My pressure tank is working because the gauge pressure goes up and down.
The pressure in the overall systems goes up and down as the pump goes through its cycle. If your (and other) pressure tanks are not properly charged the pump will cycle more often. This decreases pump/motor and control life.
2. My pressure tank is OK because I did not use water when the power was off.
Others on the system may have used water and unless you have a tank with a bladder the air charge in your tank will be lost.

3. I have a bladder type pressure tank so it never needs servicing.

There are some bladder tanks that are sealed and cannot be serviced. Most have an air valve on the top. First the bladder tanks must be properly charged at 2 PSI below pump turn on pressure at your house. Second, the bladder may have some air permeability and lose some of the air charge. Third the bladder may crack or develop a leak in which case it is not effective and the bladder should be replaced.

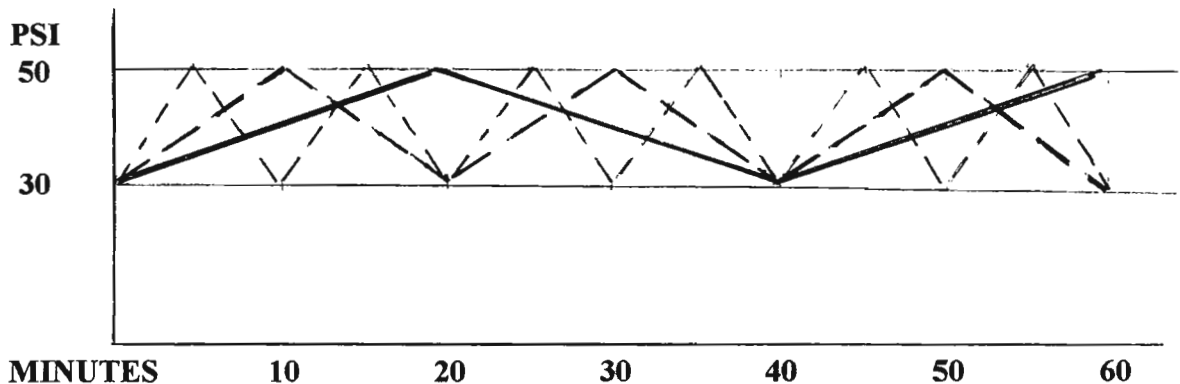
4. It says on my tank to use a bicycle pump to put in air.

To recharge a Standard or Float type tank it must be drained. This usually requires pumping in air with a compressor to push out all the water. Then it takes about 10 minutes with a 1 horsepower compressor to bring it up to 28 PSI.

PRESSURE CYCLES

The pump pressure cycles depend on the pump output (20 GPM), pressure tank working capacity, and the rate of water usage. For our example we will use a constant water usage rate of 10 GPM. (This usage rate causes the shortest cycle.) Of course actual water usage rate will vary greatly during the day. The graph shows the frequency of pump cycles when the total system working capacities are:

200 Gallons	—————	One and one half cycles per hour
100 Gallons	- - - - -	Three cycles per hour
50 Gallons	· · · · ·	Six cycles per hour



Our present water systems have sufficient pressure tank volume to provide a working capacity of 200 + gallons IF the pressure tanks are properly charged. This is our goal to minimize pump cycles and extend the life of the pumps, motors and controls.

In preparation for checking and recharging your pressure tank it is necessary for you to watch the gauge on your pressure tank to record the lowest pressure. From the example above you can see it may take twenty minutes, or longer if water usage is low, to go down to the pump turn on pressure.

HOMEOWNERS RESPONSIBILITY

It is your responsibility to keep your pressure tank, air and water valves, and gauge in working order. The air pressure must be checked and recharged when needed. While more detailed recharge procedures are attached the basic steps are:

1. Record the lowest pressure during a pump cycle.
2. Close the house valve.
3. Drain the tank.
4. Using a compressor pressurize to 2 PSI below lowest pressure recorded.
5. Slowly open house valve

FOR THOSE WHO LIKE NUMBERS

Average Flow Rate For Various Fixtures

Shower	4 to 6 GPM
Bathtub	4 to 8 GPM
Toilet	4 to 5 GPM
Lavatory	1 to 3 GPM
Kitchen Sink	2 to 3 GPM
1/2" hose and nozzle	200 GPH
3/4" hose and nozzle	300 GPH
Lawn sprinkler	120 GPH

Average Amount Of Water Required By Home and Yard Fixtures

Each shower bath	Up to 60 gal
To fill bathtub	30 gal
To flush toilet	Up to 6 gal
To fill lavatory	2 gal
To sprinkle 1/4" on 1000 square feet of lawn	120 gal
Dishwasher per load	3 gal
Automatic washer-per load	Up to 50 gal
Regeneration of domestic water softener	50-100 gal

From the above lists you can see how water usage can at times exceed the 20 GPM pump output. The pump will be running, but pressure drops below the 30 PSI. That's one of the reasons to limit the number of sprinklers operating.

Pounds Pressure - Feet Of Head

Each pound per square inch (PSI) of pressure is equal to 2.31 feet head of water. For example the water in Well # 1 is 216 feet below the surface so it takes $216/2.31 = 93$ PSI for the pump to raise water to ground level. Added to this are the 30 to 50 PSI to fill our pressure tanks.