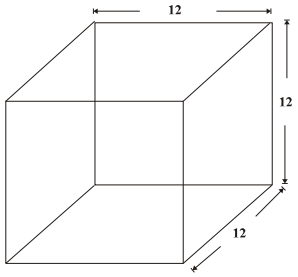
Irrigation Design Information

Water Pressure

Water pressure is the force which moves the water through the pipeline and pushes the water out through the sprinklers.

Water pressure equals the weight of water times the height of the column of water. Water weighs 62.4 pounds per cubic foot. In 1 cubic foot there are 1,728 cubic inches. One cubic inch of water weighs 0.0361 pounds.



1 Cubic Foot
1,728 Cubic Inches

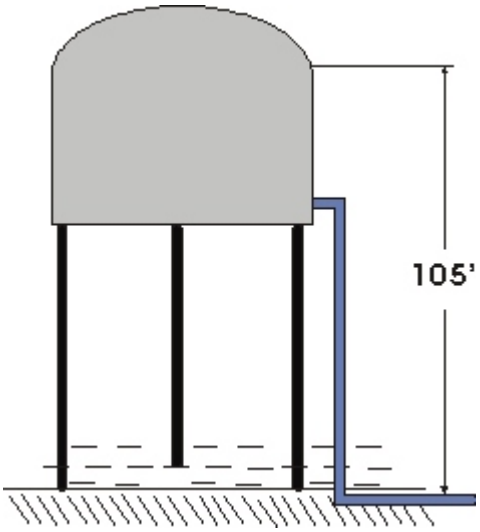
Water pressure in the irrigation industry is measured in pounds per square foot per one foot column. One foot of water equals 0.433 psi. It would take a column of water 2.31 feet to create one pound of pressure.

$$\frac{62.4}{1728}=0.0361 \qquad 0.361x12''=0.433 \qquad 2.31x0.433=1$$

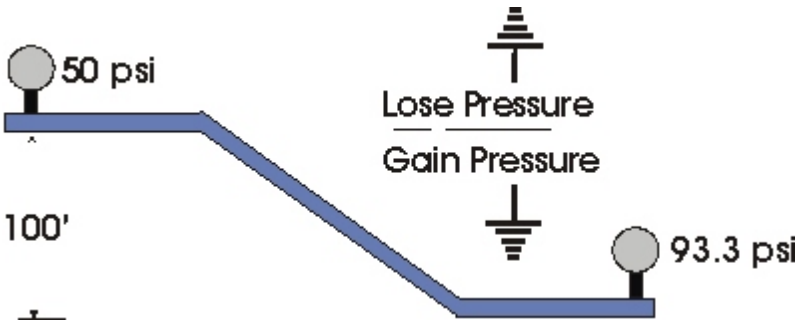
To create enough pressure to operate a standard spray head at it's optimal pressure of 30 psi you would have to have a water tower 69.3 feet tall. That just takes care of the pressure required to operate the spray head, you also have to overcome all the pressure losses in the system (water meter, valves, pipe friction losses, etc…) an additional 10 to 15 psi. So the tower would have to be approximately 105 feet tall.

There are two types of water pressure (1) Static and (2) Dynamic or Working Water Pressure.

Static pressure is pressure without any water flowing. This pressure will be the same throughout the system as long as there are no elevation changes. Static pressure will change 0.433 psi per foot of elevation change. If the change is uphill the pressure will decrease and if the change is downhill the pressure will increase.

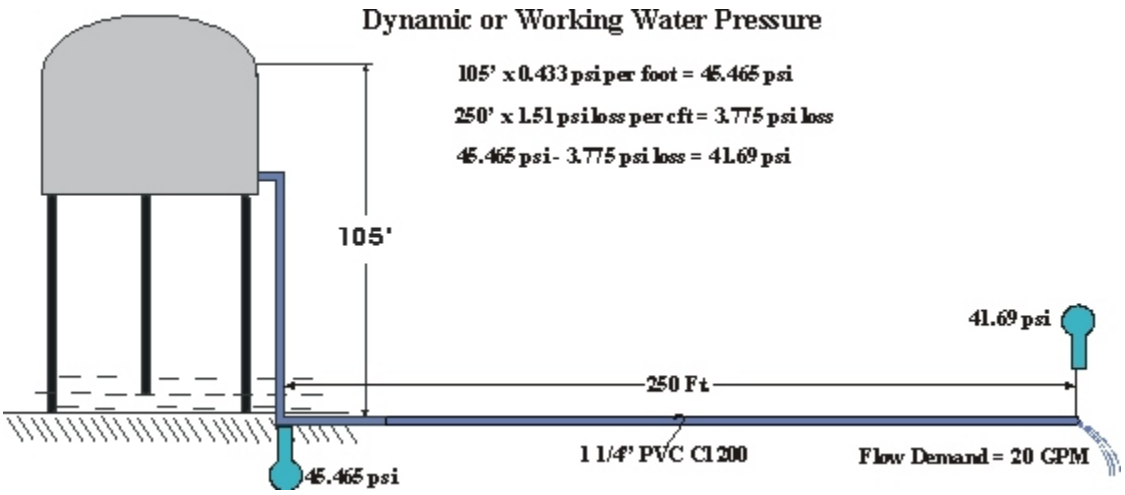


Water Tower with 105' water level



Up You Lose .433 psi /ft, Down You Gain .433 psi /ft

With Dynamic pressure you have water flowing through the pipe. Depending on the flow demand, the size and type of pipe, and the length of the pipe there will be a loss of pressure due to friction caused by the water flowing in the pipe. In the following example we start with a pressure of 45.465 psi at the base of the water tower, the flow demand is 20 gallons per minute through 250 feet of 1 ¼" PVC Class 200 pipe and we end up with 41.69 psi at the discharge point.



How is the friction loss determined?

Friction loss in pipe determined by using the basic Hazen Williams formula; it's a drawn out unwieldy formula that adds extra time to your design so we use friction loss charts that have the losses and velocities pre figured.

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