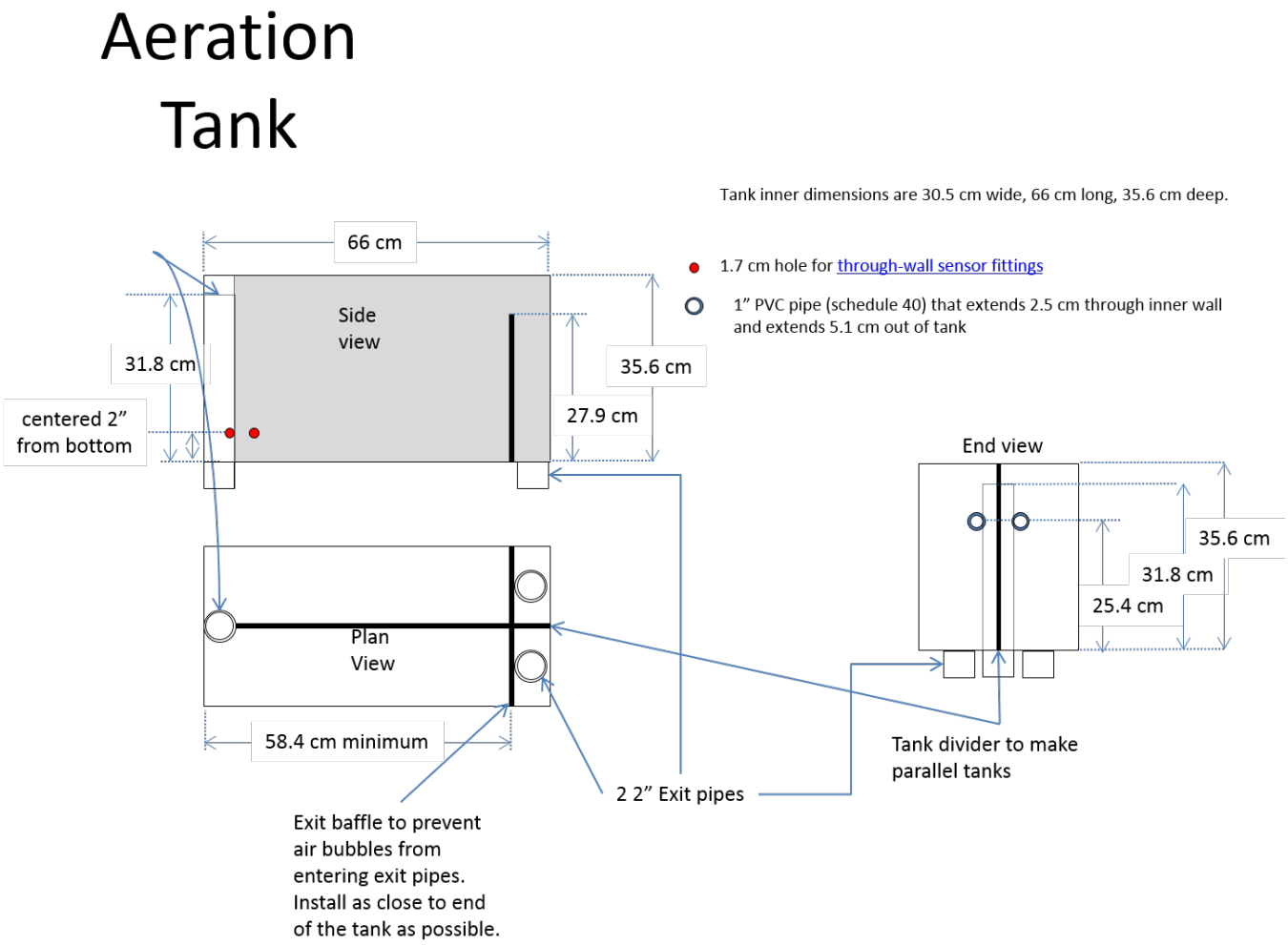
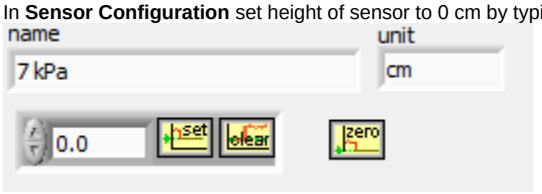
Setting Up the Water Supply System



Setting Pressure Sensors (Water Level)

1. MAKE SURE NO ONE IS USING THE SYSTEM BEFORE YOU BEGIN.
2. In **Sensor Configuration** set height of sensor to 0 cm by typing in "0" in the box and selecting **Set** (see image).



3. Run system in Run Activated Carbon and Tap Water ("Run AC and Tap") until water goes into the overflow pipe (the only PVC pipe that runs down from the tank). You can hear water in the overflow by putting your ear to the pipe.
4. Turn to "OFF" state
5. Switch to the **Graphs** tab and wait for the water level to reach a steady height.
6. Return to **Sensor Configuration** and set sensor height to 31.8 cm by typing "31.8" in the box and selecting **Set**.
7. Exit **Sensor Configuration** and run system.
8. Repeat for other pressure sensor if needed.

Current Parameters (and how to calculate them)

Needle Valves

These are currently fully open. In this configuration, the valves can supply about **0.5 L/s**. It is preferable to leave these as they are so that the maximum flow rate is available.

Hot/Cold Control

The hot and cold valves are controlled by a function found under feedback control called "**PID water height and temperature.vi**". This function keeps the water level above a minimum level, while also using a PID controller to control the balance of hot and cold water and maintain a temperature close to the target temperature. The target temperature is usually set to **22°C** in order to be close to average room temperature. When setting the control of the solenoid valves to be "PID water height and temperature.vi", the cold valve is controlled by the function with "cold/hot output (0/1)" set to 0, and the hot valve is controlled by the same function with the set point set to 1. While hot and cold valves for the same side of the system can use the same function, be sure to make a copy of the function and use either the copy or the original for the Tap or AC side and use the other version of the function for the other side of the system. This is important, because the temperature and level data are different for each side, and each function only has memory for one data set. If data from both sides of the system are going to the same function, the control of the system will be erratic.

Valve On Time

This is the total duration over which the valves are open during a fill time, and it is currently set to **2 s**. PID control determines what fraction of this total time is allotted to each valve. For example, if the mix of the temperatures is close to the target, each valve will be on for about 1 s. If the current temperature in the system is very cold, the hot valve will be on for close to 2 s, and the cold valve will be on for a small fraction of a second. The current value of 2 s was chosen to allow a maximum of 1 cm rise in water level on one side of the system (plan view area of 66 cm by 15.2 cm).

Data Average Interval

This is currently set at **0.67 s** in order to be 1/3 of the Valve On Time.

Heights

The minimum height was chosen to be **27 cm**, which is approximately 1 cm below the exit weir (see diagram above). The abort height was chosen to be **31 cm**, which is 3 cm above the exit weir, and is a little below the overflow weir. There is no sense in wasting water, so the abort height (which triggers a shutoff of the valves before their Valve On Time is completed when it is exceeded) is set below the overflow weir.

P, I, and D

These were set to **P = 10**, **I = 0.36 min**, and **D = 0** based on a Ziegler-Nichols tuning of the system under a similar control scheme to the current one.