Water Distribution Network Construction and Testing Worksheet

Now that you understand something about how water tower height, pipe diameter, pipe length, and connectors affect the flow rate of water, it is time to design a water distribution network. The network you will design will simulate the way in which culinary water is provided to residences and businesses in a community.

Construction

Your network must supply 4 "houses" that simulate water users on the ground floor, second floor, and second floor with a riser (e.g. a shower) and one house at a long distance from the supply line. The houses are to be configured as follows:

1) 2 ports on ground level.
2) 1 port on ground level, 1 port at 6".
3) 1 port on ground level, 1 port at 12".
4) 1 port on ground level, at least 36" long.

Each house should have only one connection to the supply line. Use tees, couplers and elbows as necessary to provide the specified ports. Each line should have a valve at or near the end of the line.

Place ports on your board hanging over two adjacent sides such that so that water may be collected easily. You may secure water lines in place using the staples and wire clips. Do NOT pound the nails in all the way – they will damage the table below your board.

If your design includes looped network, use the ½" T connector to create the loop. If your design is a branched network, kink and duct tape one end of the ½" tubing to create the end of the supply line.

Once you have built your town and connected the supply from the water tower, it is time to test the flow rates in each of the lines.

Measurements and Notebook questions:

1. Draw a diagram of your town as built. Number and label each port. Include tubing lengths.

2. Determine the flow rate from each of the ports separately (all ports but the port you are testing will be closed). Determine the flow rate from each of the ports with all of the ports open. Use a graduated cylinder to catch the water. Let the water flow for 10 seconds (use your finger to start and stop the flow). Record the flow rate in units of cm^3/sec. Return your water to the tank each time. Adjust the test time if the flow rate is too high or too low to make a good measurement.

3. Again record the flow rate for each port, but this time with all ports open. This will take teamwork and cooperation.

Port No.	Flow Rate (Individual)	Flow Rate (All Open)
1		
2		
3		
4		
5		
6		
7		

4. Which of the ports had the lowest flow rate for the individual measurement? Why?

5. Which of the ports had the lowest flow rate for the "all open" measurement? Why?

6. Was there a difference between these two ports? Why or why not?

7. What could be done to increase the flow rate at the "worst" two ports?