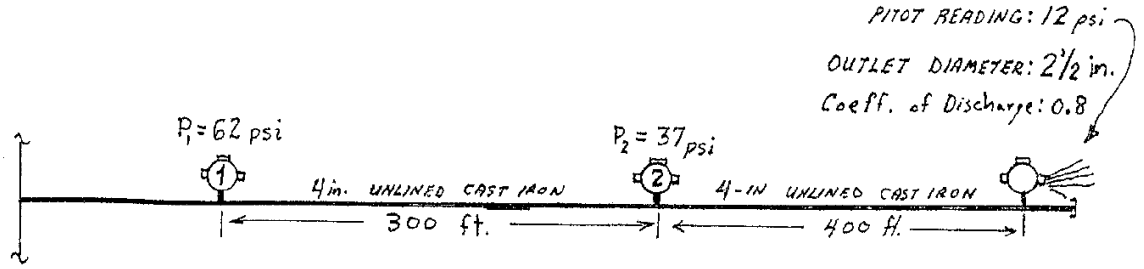
FPST 2483 Laboratory No 07 Name:_____

Part A

Respond as directed to the following questions and problems and submit at the end of lab:

1. In the situation shown below, determine the Hazen-Williams coefficient of roughness.



2. A straight piece of 2-inch Schedule 40 steel pipe, 50 feet long, with a C-factor of 100 loses 17 psi to friction at a flow of 200 gpm. If a tee fitting is installed in the pipe and friction loss increases to 22 psi at the same flow, calculate the equivalent pipe length of the tee fitting.

3. Respond to the following questions:

a. Is friction loss greater as water travels downhill or uphill?

b. How is the friction loss calculated in a static system where water velocity is 0 fps?

c. All other factors being equal, will you get more friction loss in pipes with large diameters or small diameters?

d. All other factors being equal, will you get more friction loss in pipes with large or small C-factors?

e. All other factors being equal, will you get more friction loss in long pipes or short pipes?

4. Use the Hazen-Williams formula to establish the pressure lost to friction in the following situations. Use actual internal diameters.

	Pipe Type	Nominal Diameter	C	Length (feet)	Flow (gpm)	Pf (psi)
a.	Schedule 40 Steel	4	120	200	500	
b.	Schedule 10 Steel	4	120	200	500	
c.	Ductile Iron, CL51	6	100	460	750	
d.	Cast Iron Cement Lined	6	140	460	750	
e.	Schedule 40 Steel	1	120	15	30	
f.	CPVC Plastic	1	150	15	30	
g.	Type L Copper	1	150	15	30	
h.	PVC CL150	12	150	1000	5100	
i.	PVC CL 200	12	150	1000	5100	
j.	Permastran	12	150	1000	5100	

5. If you want to end up with 40 psi at the end of an 8-inch water main 2100 ft. long, what pressure must you begin with if the flow is 2500 gpm and:

a. Piping is Permastran

b. Piping is enamel-lined cast iron

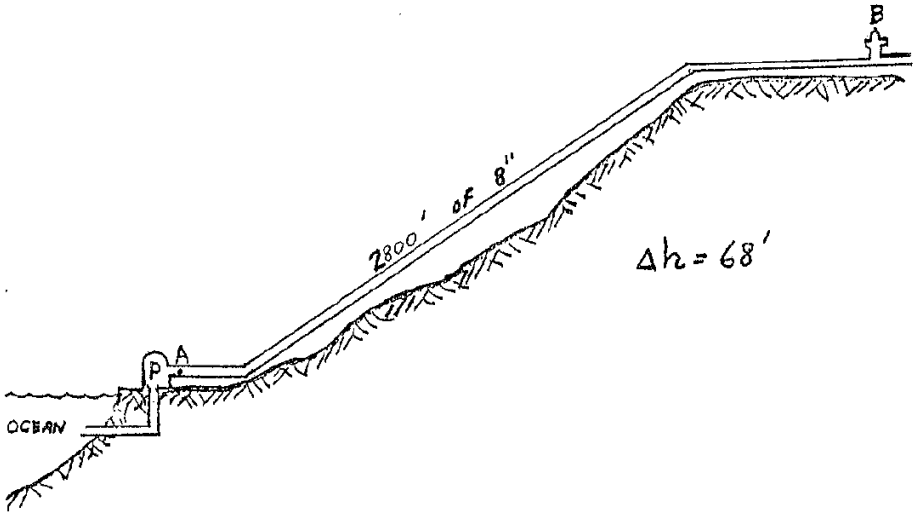
c. Piping is unlined ductile iron, CL 52

6. If 1000 gpm is to be delivered to an industrial facility at the top of a hill, what beginning pressure must exist to overcome an elevation change of 72 ft. and have 45 psi left over if the pipe is 8-inch, 2300 feet long and of unlined cast iron?

7. If the water supply comes from a mountain lake 850 ft. above a city that is 19,200 ft. away from the lake, what will be the pressure at the city with 1500 gpm being delivered if the pipe is 12-inch and is of Permastran construction?

8. If the beginning pressure is 65 psi, what size of cement lined ductile iron, class 52 would be required to deliver 1500 gpm 10,000 ft. away at a minimum residual pressure of 30 psi?

9. In the figure shown below, if the pump can deliver 1325 gpm at 115 psi to point A, what will be the existing pressure at the hydrant at point B with 1325 gallons per minute flowing. All pipes are 8-inch PVC, CL 200.



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Part B

OBJECTIVES

Use the Moody diagram and the Darcy-Weisbach technique to solve the following:

1. How much pressure will be lost to friction in delivering a medium fuel oil at a rate of 410 gpm through a 4-inch commercial steel pipe over a distance of 1630 feet? The fuel oil is to be heated to maintain an average temperature of 100°F (Use nominal diameters.)

2. How much pressure will be lost to friction in delivering 600 gpm of water at 70°F through 500 feet of 6-inch asbestos cement pipe? (Note that e is 0.000008 and use nominal diameter.)

3. Determine the minimum size of asphalt lined cast iron pipe that will deliver 2150 gpm a distance of 1750 feet and have a pressure loss not exceeding 25 psi. Consider the water to have an average temperature of 60°F.