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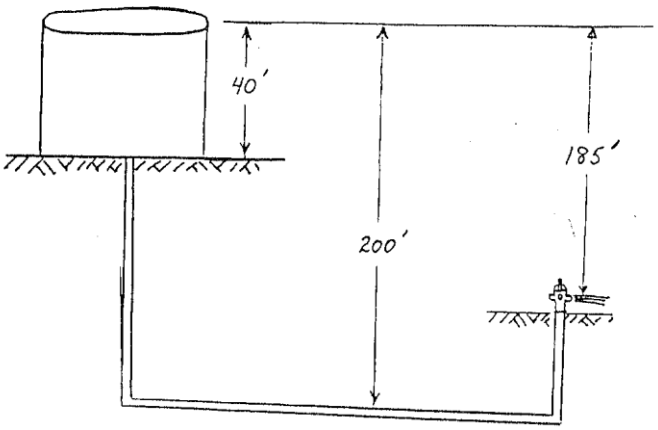
Read each problem carefully and respond as directed. Show all of your work where possible.

1. The cylindrical water storage tank is 40 feet high and has a diameter of 60 feet.

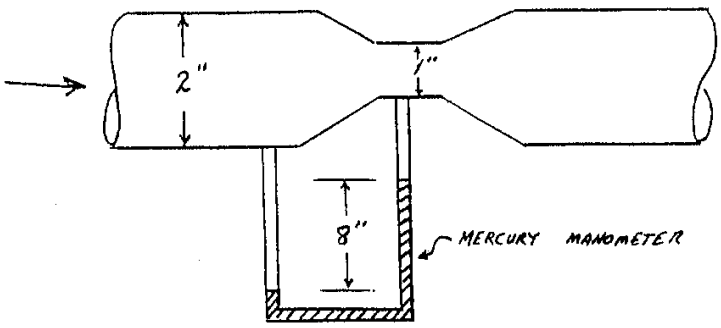


a. How many gallons will it hold?

b. If the tank is full, what pressure (in psi) would exist at the bottom of the tank and at the hydrant discharge outlet?

c. Assuming a full tank, what would the instantaneous velocity of the hydrant stream be?

2. In the following situation determine how many gpm are flowing.



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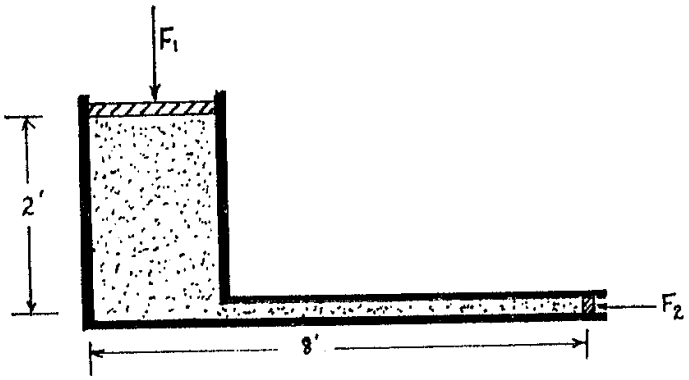
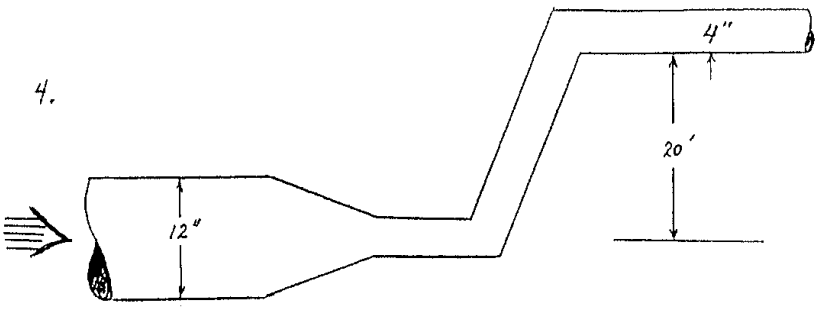
3. F_1 is created by some object that weighs 2000 lbs. and the top piston has a circular cross section with a 1 ft. diameter. What force, F_2, will be needed to equalize the effect of F_1 if the diameter of the small piston is 2 inches and the hydraulic fluid has a specific gravity of 0.92?



4. If the velocity of water in the 12 inch pipe is 6 ft/sec:



a. What is the velocity of the water in the 4 Inch pipe?

b. How many GPM are flowing?

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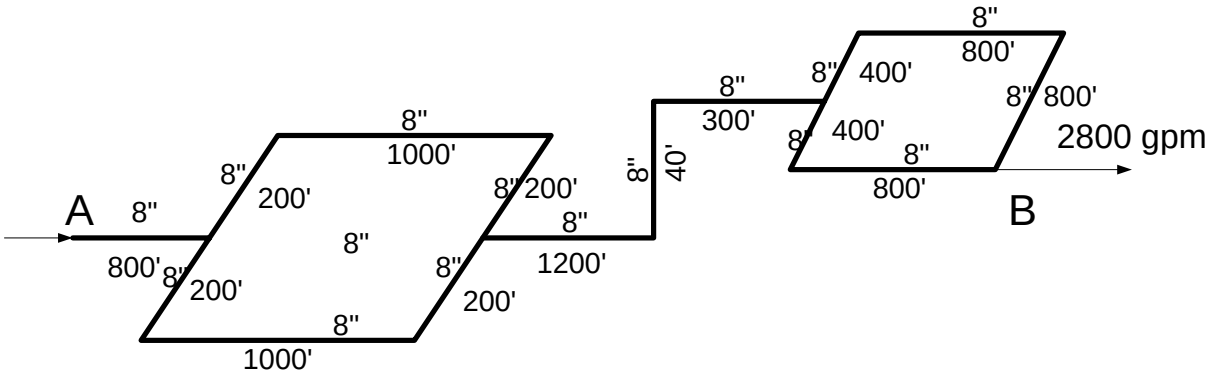
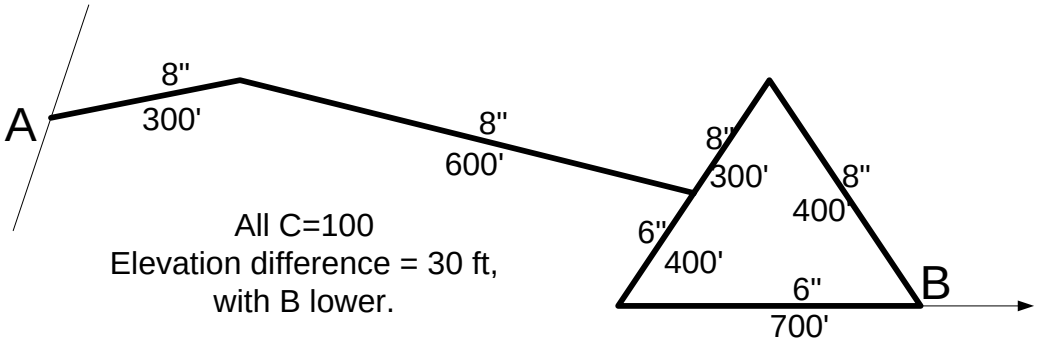
5. Determine the total pressure lost to ***friction*** between points A and B in the situation shown below. All C=100, use nominal diameter in HW equation.



6. Plot the water supply available at point B if test results at point A are as follows:
Static=72 psi; Residual=54 psi; Flow=1000 gpm.



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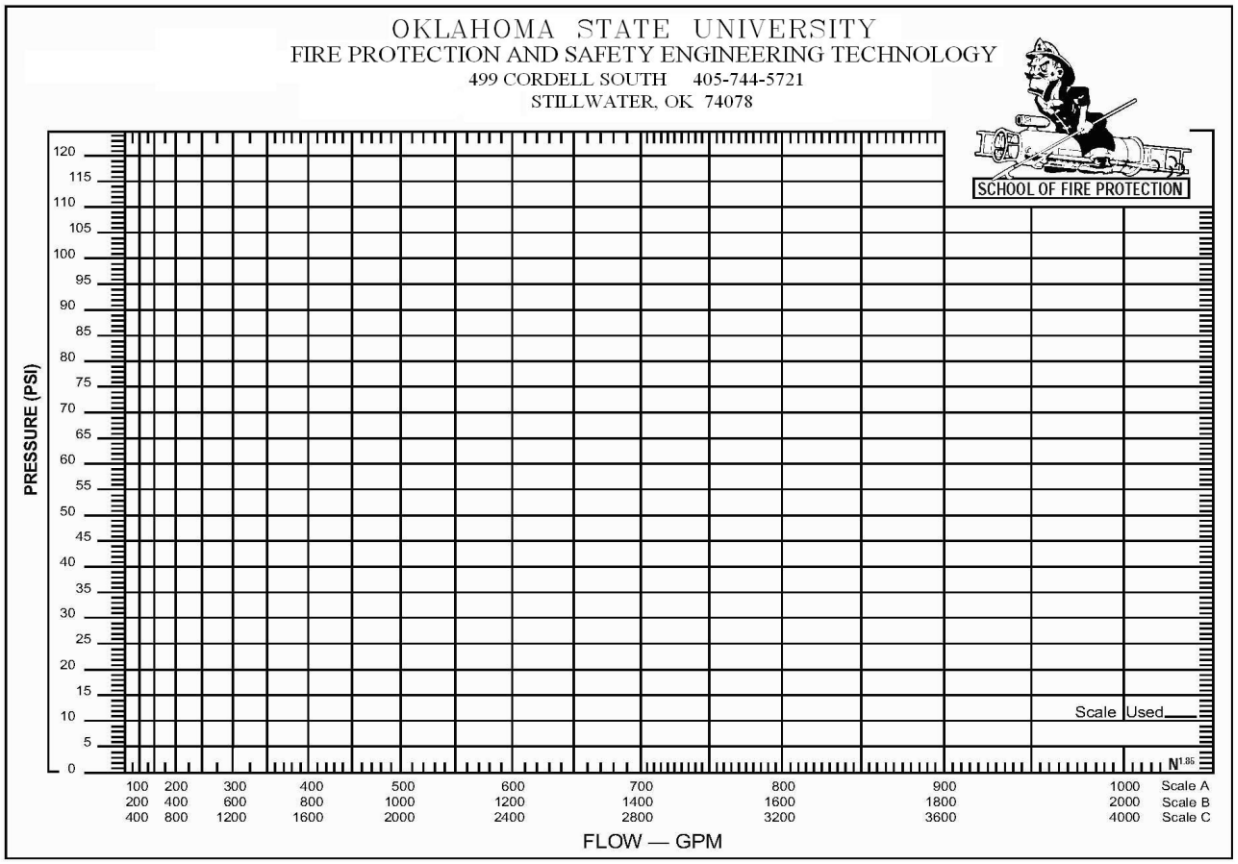
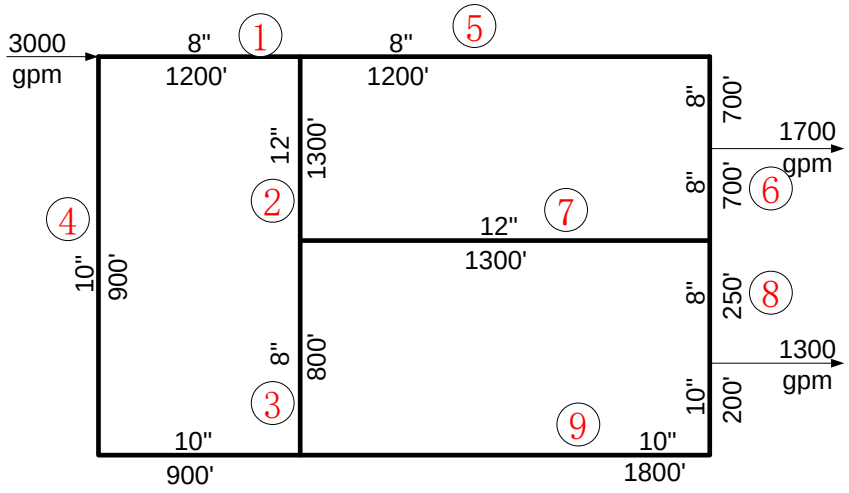


7. For the following complex looped systems, complete the attached Hardy Cross working sheet through the first corrections (fill in all empty boxes). The magnitude of the first flow assumptions have been made for you. However, you must provide the sign notations.



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Loop No.	Line No.	Size	C-Factor	Length	Q (gpm)	P_f (psi)	$\frac{1.85P_f}{Q}$	Correction	Q (gpm)
I	1				1600				
	2				1000				
	3				200				
	4				1400				
II	2	X	X	X	X			X	X
	5				600				
	6				1100				
	7				1200				
III	3	X	X	X	X			X	X
	7	X	X	X	X			X	X
	8				100				
	9				1200				
IV	1	X	X	X	X			X	X
	5	X	X	X	X			X	X
	6	X	X	X	X			X	X
	8	X	X	X	X			X	X
	9	X	X	X	X			X	X
	4	X	X	X	X			X	X

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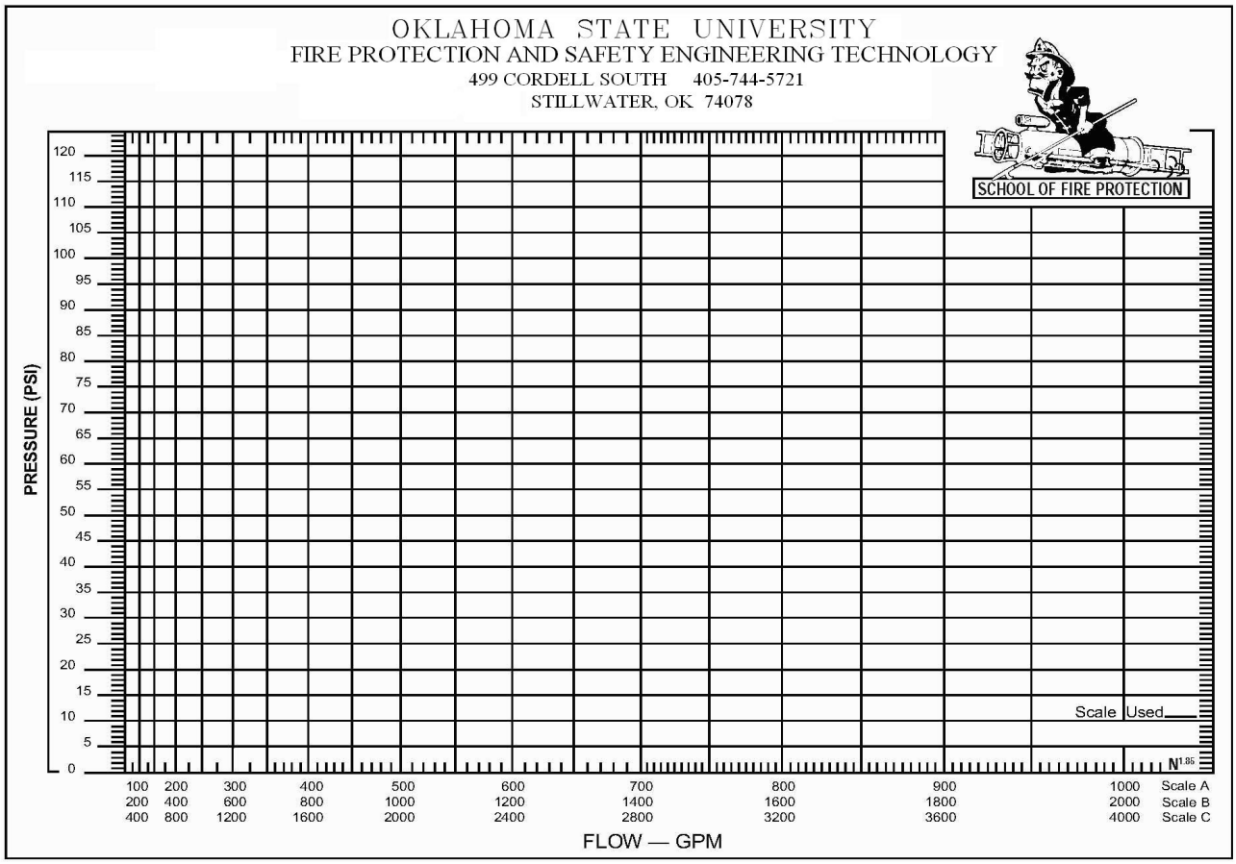
8. Plot the supply curve, the approximate pump performance curve, and the combined water supply from the following information:

Water supply: static =42 psi; residual =8 psi; measured flow: 900 gpm

Pump data: horizontal split-case, gpm rating = 500 gpm; psi rating=40 psi.



9. A horizontal shaft pump rated at 1500 gpm and 100 psi is to be tested. The pump is rated at 1760 rpm and is diesel driven. The pump takes suction from a 1-million gallon tank which delivers a constant pressure of 23 psi to the suction of the pump for the duration of the test.

a. If the discharge pressure at churn is 131 psi, what is the net pressure at churn?

b. If it is desired to flow exactly 150% of the rated capacity by using six hose lines each equipped with a U.L. playpipe with 1 ¾ - inch tip, what pitot reading should be achieved at each tip if all six are to be the same?

c. If the diesel engine is improperly tuned and is only turning at 1580 rpm, what test point (psi and gpm) should be plotted if the following data point is actually measured:
Discharge Pressure : 86 psi
Measured Plow : 1385 gpm

10. If a vertical shaft pump rated at 150 psi and 1000 gpm takes suction from a well with maximum distance of 115 feet down to the water level, plot the expected water supply provided by this pump at a building located 1480 feet away. The pump delivers water to the building through an 8-inch pipe with C of 140. There is no change in elevation between the pump discharge and the building.