**SOUTH DAKOTA SCHOOL OF MINES AND TECHNOLOGY**

# Department of Materials and Metallurgical Engineering

Met 422 Chapter 04 – Take Home SQ Due 11:00 pm Oct 14

Submit to the Dropbox Named Homework 04A

1. A tank of water shown below is to be supplied with the equivalent of 10 meters of water depth in the 2-m diameter tank every 20 minutes, but the water level in the tank remains constant at 20 meters depth owing to the overflow at its top. Ambient pressure prevails at the tank’s water surface and the pumping source.

L = total length of straight 4-cm diameter pipe = 20.0 m

f = friction factor of the pipe may be assumed constant at 0.0042.

1. What HP Pump would be required?
2. If a pump of the above calculated size were to be used, at what pressure would the pump need to operate?
3. If a 25 HP pump were selected, what capacity (volume flow rate) of water would be delivered and at what pressure would it need to operate at its exit when running at its maximum rating of 25 HP?
4. Assuming the originally-specified flow rate, what diameter pipe would need to be used if only half the energy to overcome the potential energy term were to be allocated to frictional losses?

Pump

Open Globe Valve

Standard Elbow

29 m

Plane 1: V1=0

Plane 2: V2=0

2 m Dia.

4 cm Dia.

Note: Q=VtankAtank=VpipeApipe

MathCad uses “hp” for HP unit and “W” for Watts. 746 Watts/1 HP.

2. Next week Adam, Pat, June, and you must retrofit a water tank with cathodic corrosion protection. The 20-ft diameter tank sits on a 5-ft platform with a 1 foot extension under the tank such that the 2-in globe valve drain is 1 ft above the platform. The water level in the tank is 12 ft above the drain valve. A 20-ft long piece of very rough 2-inch ID hose (f = 0.04) is hooked to the valve and laid out on the platform above a nearby storm drain as shown.

a) Adam says they should just open the value, and ‘let’r drain’.

b) Pat says it would drain faster without the hose.

c) June says they should lower the hose to the drain 6 ft below the bottom of the drain valve.

Calculate how long each method will take to drain.



20 ft



12 ft

2-in Globe Valve

20-ft hose



1 ft



5 ft

6 ft



Storm Drain

3. Problem 4.16 in the textbook

