

MET 330

PRE-TEST REFLECTION (1st TEST):

AL McCLENNEY

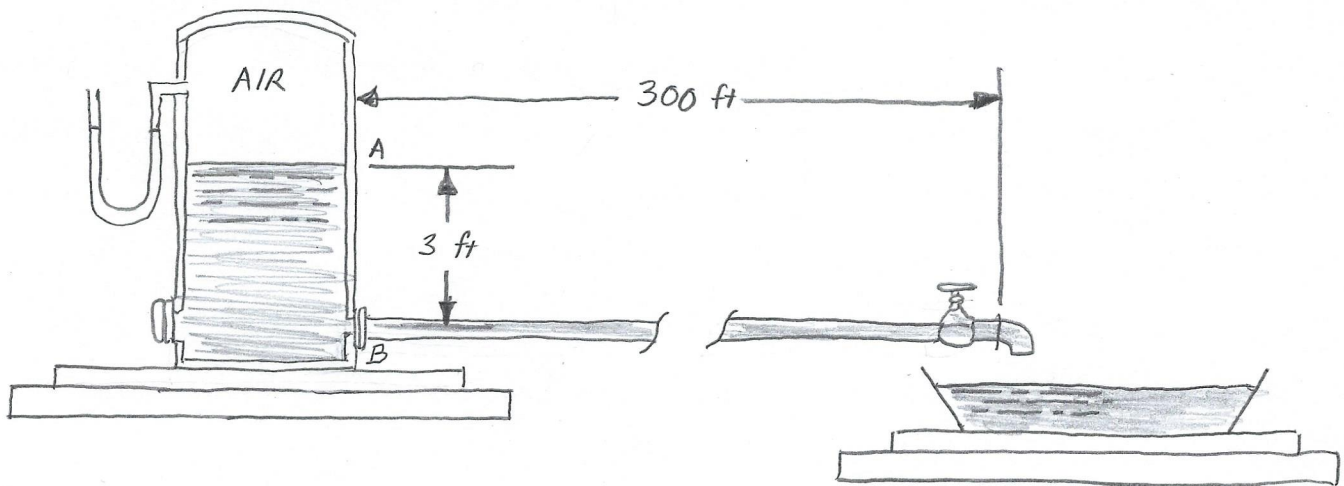
MARCH 7, 2019

PURPOSE

- a) FOR THE SYSTEM SHOWN IN THE DRAWINGS, 60° WATER IS DELIVERED AT A RATE OF 75 gpm FROM A PRESSURIZED STORAGE TANK TO A TRAPEZOIDAL OPEN CHANNEL. IF THE PIPE CARRYING THE WATER IS $1\frac{1}{2}$ in SCHEDULE 40 STEEL PIPE RUNNING A DISTANCE OF 300 ft, DETERMINE THE AIR PRESSURE REQUIRED ABOVE THE TANK FOR THIS TO OCCUR. NEGLECT MINOR LOSSES DUE TO THE VALVE OR ELBOW, BUT CONSIDER ENERGY LOSSES DUE TO THE STRAIGHT PIPE.
- b) CALCULATE THE WATER DEPTH (Y) IN THE OPEN CHANNEL WITH LATERAL WALLS ANGLED AT 60° AND A WIDTH AT THE TOP OF THE WATER (T) AS $T = 2.309Y$.
- c) WHAT WOULD THE RELEVANT TOTAL HORIZONTAL AND VERTICAL FORCES BE IN THE WHOLE SYSTEM PIPE-ELBOW FOR THE SUPPORT DESIGN?
- d) FOR THE BLIND FLANGE AT THE LEFT-HAND-SIDE OF THE TANK, COMPUTE THE ACTING FORCE AND ITS LOCATION ON THE FLANGE.
- e) IF A SQUARE HICKORY LOG WERE TO BE CARRIED BY THE OPEN CHANNEL, WHAT IS THE LARGEST WOOD LOG THE CHANNEL COULD CARRY? KNOWING THE DENSITY OF HICKORY WOOD IS 830 kg/m^3 , WOULD THE LOG BE STABLE?
- f) IF USING A MERCURY U-TUBE MANOMETER TO MONITOR AIR PRESSURE, WHAT SHOULD BE THE MINIMUM DIMENSION OF THE U-TUBE AS IT IS MEASURED FROM THE CONNECTION AT THE TANK TO THE LOWEST POINT OF THE U-TUBE.
- g) IF A FLOW NOZZLE IS USED FOR MEASURING FLOW, AND HAS A RATIO OF 0.5 TO THE PIPE DIAMETER, WHAT WOULD BE THE PRESSURE DROP ACROSS THE NOZZLE?

- h) WHAT WOULD BE THE PRESSURE INCREMENT IF THE VALVE IN THE PIPE WERE CLOSED SUDDENLY? IF THE MODULUS OF ELASTICITY OF STEEL IS 200 GPa, WOULD THERE BE ANY CHANGE OF CAVITATION IN THE SYSTEM?
- i) IF A LOG HALF THE SIZE OF THE LARGEST LOG WERE CARRIED BY THE CHANNEL, CALCULATE THE LARGEST DRAG FORCE IT WOULD EXPERIENCE IF IT WERE STUCK IN THE CHANNEL,

DRAWINGS & DIAGRAMS



SOURCES