

**Objective:**

The objective of this laboratory session is to reinforce the hydrostatic principals presented in Chapter 2 of the text and the study of hydrokinetics presented in Chapter 3 of the text.

**Procedure:**

Respond as directed to the following questions. Show your work. Circle or enclose your answers in a box. Nominal pipe sizes may be used.

1. Determine what flow rate in gpm will create a water velocity of 20 fps with the following pipe sizes (Note: use the equation  $Q=AV$  with proper unit conversion):

A. 1-inch

B. 2-inch

C. 3-inch

2. Find the following flow rates in GPM.

A. 2-inch pipe with water velocity of 15 fps.

B. 4-inch pipe with water velocity of 15 fps.

C. 2-inch pipe with water velocity of 30 fps.

3. Find the water velocity in FPS in the given situations.

A. 250 gpm through 6-inch pipe.

B. 1000 gpm through 8-inch pipe

C. 150 gpm through 3-inch pipe

4. Find the pipe diameter.

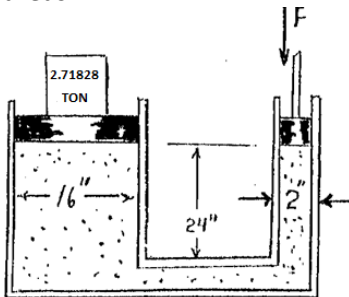
A.  $V=49$  fps,  $Q=120$  GPM

B.  $V=8.2$  FPS,  $Q=725$  GPM

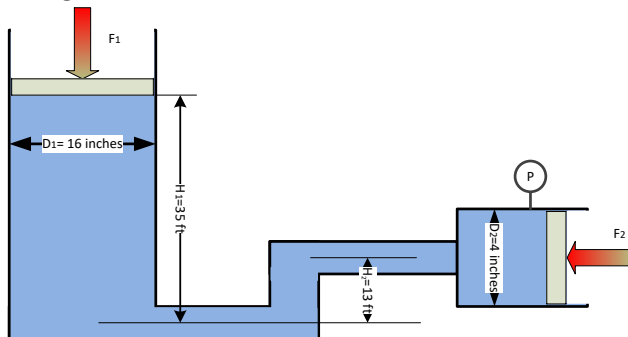
C.  $V=13.7$  FPS,  $Q=4900$  GPM

5. A quantity of steel weighs 12,000 pounds. If a boat is to be constructed of this steel, what is the minimum displacement volume (in  $\text{ft}^3$ ) that must be obtained for the boat to float?

6. In the situation shown below, what force must be exerted to lift the 2.71828 ton block? The hydraulic fluid within the power system is an oil with a specific gravity of 0.93. Assume negligible piston weights and circular areas.



7. In the following diagram, the liquid contained in the system is oil ( $sg=0.8$ ). What would be the pressure reading @ P if the  $F_2=2500$  lbs? If a force  $F_1$  is needed to balance the pressure, how much is the amplitude of  $F_1$ ?



8. In the situation shown below, how much air pressure must be available to equalize the force created by 65 psi of water pressure?



9. A rectangular solid piece of wood is floating in the ocean and is 12 inches by 12 inches by 24 inches. If the wood has a specific gravity of .83 and the 12-inch dimension is perpendicular to the surface of the ocean, how many inches will extend above the surface? (For salt water,  $S_g = 1.028$ )

10. If a fire pump turns on and delivers 100 psi to points 1 and 2 in the closed system shown below, what will be the pressure in psi at the two points and what will be the potential energy in feet at each point?

