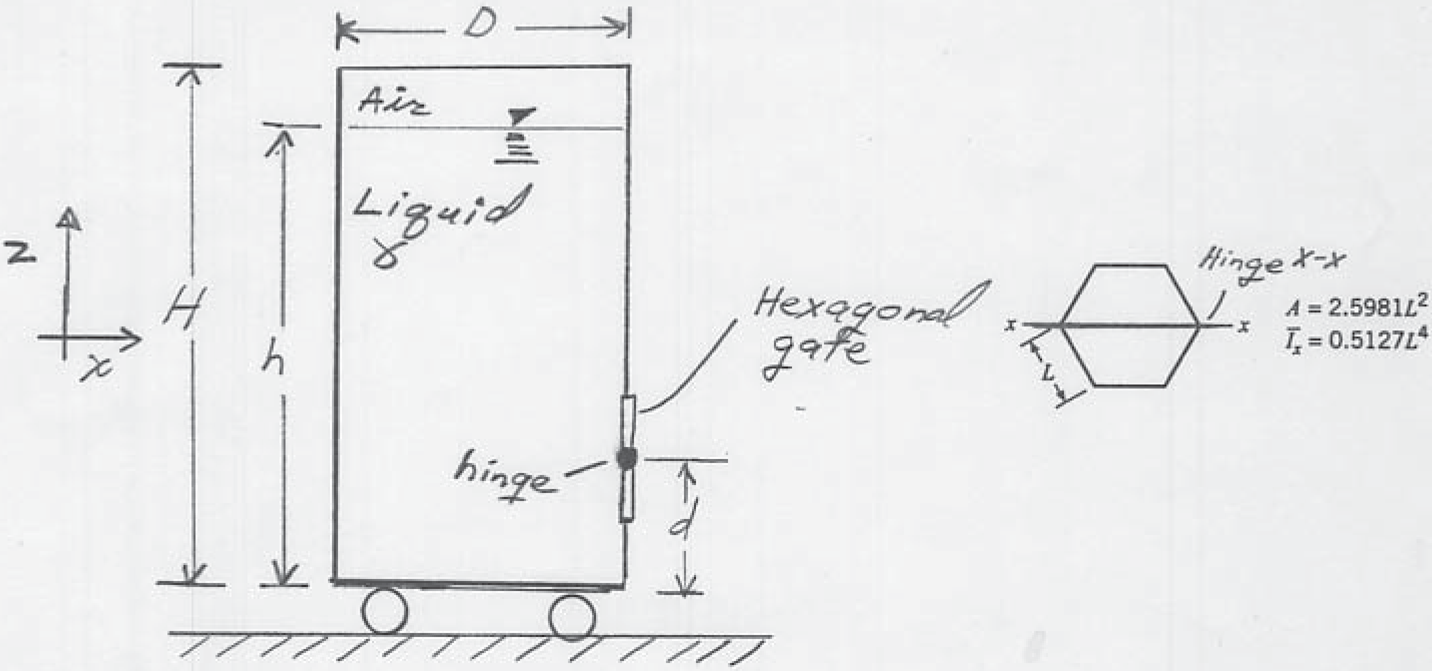
PROBLEM 1: THE COOLER



- diameter of the cooler is D = 1m
- total height H of the cooler is H = 2m.
- hexagonal gate has sides with L=5cm
- center of the hexagonal gate is located d=20cm from the bottom of the cooler.

Figure 1: Wheeled cooler of liquid

A wheeled cooler, filled with an unknown liquid, sits at rest on the the floor. A hexagonal gate, hinged through its center, prevents the liquid from leaving the cooler.

Problem 1a.

Initially, the air in the cooler is open to the atmosphere, and the height h of the fluid in the cooler is h=1.9m. If a torque T=0.03 *N-m* is applied to the hexagonal gate's hinge to keep it from opening, what value of specific weight (γ) will cause the gate to open?

Problem 1b.

At some later time, the air in the cooler is pressurized to p=150kPa absolute. If the gate is removed (more likely blown out!), what force (magnitude and direction) will initially accelerate the cooler due to the exiting liquid jet? Neglect viscous and exit losses, and assume a uniform velocity distribution for the jet. Take the fluid specific weight to be equal to γ = 10kN/m3.

Problem 1c.

For the same conditions described in Problem 1b, at what rate will the free surface in the cooler initially descend?

PROBLEM 2: THE FALLING PISTON

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Quiz 1

Open Book

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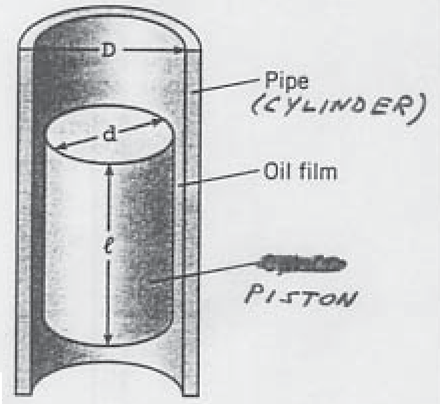
1. A smooth piston 12 in. long and 9.98 in. diameter, which weighs 5 lbs., slides under its own weight inside a 10.00 in diameter cylinder. A continuous film of oil ($\mu = 10^{-3}$ lb.sec/ft.^{2}, s = 0.9) is maintained between the piston and cylinders. Calculate the steady rate of fall.



Assume a linear velocity distribution in the oil between the piston and the cylinder.

PROBLEM 3: ACCELERATING TANK

The closed tank shown is full of liquid having γ = 10 kN/m3. The whole tank is accelerated downward at 2g/3 and accelerated to the right at g . If L = 2m and H = 3m, what is the difference in pressure between points C and A, Pc - Pa?