Answer on Question #77808, Physics Mechanics Relativity

The fresh water behind a reservoir dam has depth D15 m. A horizontal pipe 4.0 cm in diameter passes through
the dam at depth d6.0 m. A plug secures the pipe opening.
(a) Find the magnitude of the frictional force between plug and pipe wall.
(b) The plug is removed.What water volume exits the pipe in 3.0 h?

Solution.

$$P = \rho \cdot g \cdot h = 1000 \cdot 9.8 \cdot 6 = 58800 \, \frac{N}{m^2}$$

$$S_{plug} = \pi \cdot R^2 = 3.14 \cdot (0.04)^2 = 5.024 \cdot 10^{-3} \, m^2$$

The magnitude of the frictional force between plug and pipe wall:

$$F = S \cdot P = 5.024 \cdot 10^{-3} \cdot 58800 = 295.41 \, N$$

What water volume exits the pipe in 3.0 h:

$$v = \sqrt{2 \cdot g \cdot h} = \sqrt{2 \cdot 9.8 \cdot 3} = 7.67 \, \frac{m}{s}$$

Answer: $F = 295.41 \, N; \quad v = 7.67 \frac{m}{s}$