Jason,

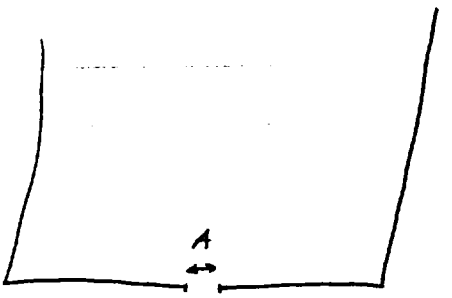
A quick look and it seems ok. However, you assume that there is no loss at the break (hole). This loss could be significant. This only makes your results a little conservative so I don't see a big problem.

Chris

12/6/99

3/4/99

$$-\frac{d\ \text{volume}}{dt} = \text{flow area} \cdot V$$



$$-\frac{d\ \text{volume}}{dt} = A \cdot V$$

$$-\frac{d\ L \cdot W \cdot H}{dt} = AV$$

$$-LW\frac{dH}{dt} = AV$$

$$\rho g H = \tfrac{1}{2}\rho V^2$$

$$V^2 = 2gH$$

$$V = \sqrt{2gH}$$

$$-LW\frac{dH}{dt} = A\sqrt{2g}\sqrt{H}$$

$$-\frac{dH}{dt} = \frac{A\sqrt{2g}}{LW} H^{1/2}$$

$$-H^{-1/2}\frac{dH}{dt} = \frac{A\sqrt{2g}}{LW}$$

$$H^{-1/2}\,dH = -\frac{A\sqrt{2g}}{LW}\,dt$$

$$\int_0^t H^{-1/2}\,dH = -\frac{A\sqrt{2g}}{LW}\int_0^t dt$$

$$\frac{H^{1/2}}{1/2}\Bigg|_0^t = -\frac{A\sqrt{2g}}{LW}\,t$$

$$2\left(\sqrt{H}\right)\Big|_0^t = -\frac{A\sqrt{2g}}{LW}\,t$$

$$2\left(\sqrt{H(t)} - \sqrt{H(0)}\right) = -\frac{A\sqrt{2g}}{LW}\,t$$

$$-\frac{A\sqrt{2g}}{LW}\,t = 2\left(\sqrt{H(t)} - \sqrt{H(0)}\right)$$

$$-t = \frac{2LW}{A\sqrt{2g}}\left(\sqrt{H(t)} - \sqrt{H(0)}\right)$$

$$t = \frac{2LW}{A\sqrt{2g}}\left(\sqrt{H(0)} - \sqrt{H(t)}\right)$$

$L = 30\ ft$

$W = 35\ ft$

$H(0) = 40\ ft$

$H(t) = 13\ ft$

2" diameter hole $\Rightarrow$ $A = \frac{\pi}{4} D^2 = \frac{\pi}{4}\left(\frac{2}{12}\ ft\right)^2 = .0218\ ft^2$

8" diameter hole $\Rightarrow$ $\frac{\pi}{4}\left(\frac{8}{12}\ ft\right)^2 = .349\ ft^2$

2"

$$t = \frac{2(30\ ft)(35\ ft)}{(.0218\ ft^2)\sqrt{2(32.2\ \frac{ft}{sec^2})}}\left(\sqrt{40\ ft} - \sqrt{13\ ft}\right)$$

$$t = \frac{262}{.0218}(2.72)\ sec = \frac{712.4}{.0218}\ sec$$

$$t = 32{,}678\ sec \times \frac{1\ hr}{3600\ sec} = 9\ hr$$

8"

$$t = \frac{262\ (2.72)}{.349}\left(\frac{1}{3600}\right)_{sec} = .567\ hr$$