

3.124

3.124 Draw the energy line and hydraulic grade line for the flow shown in Problem 3.71.

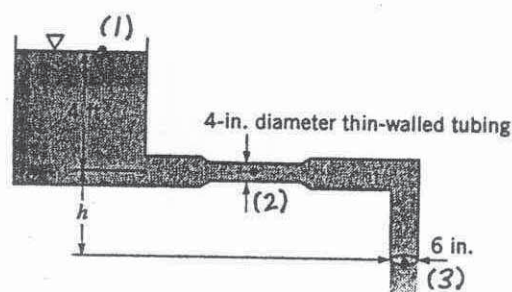


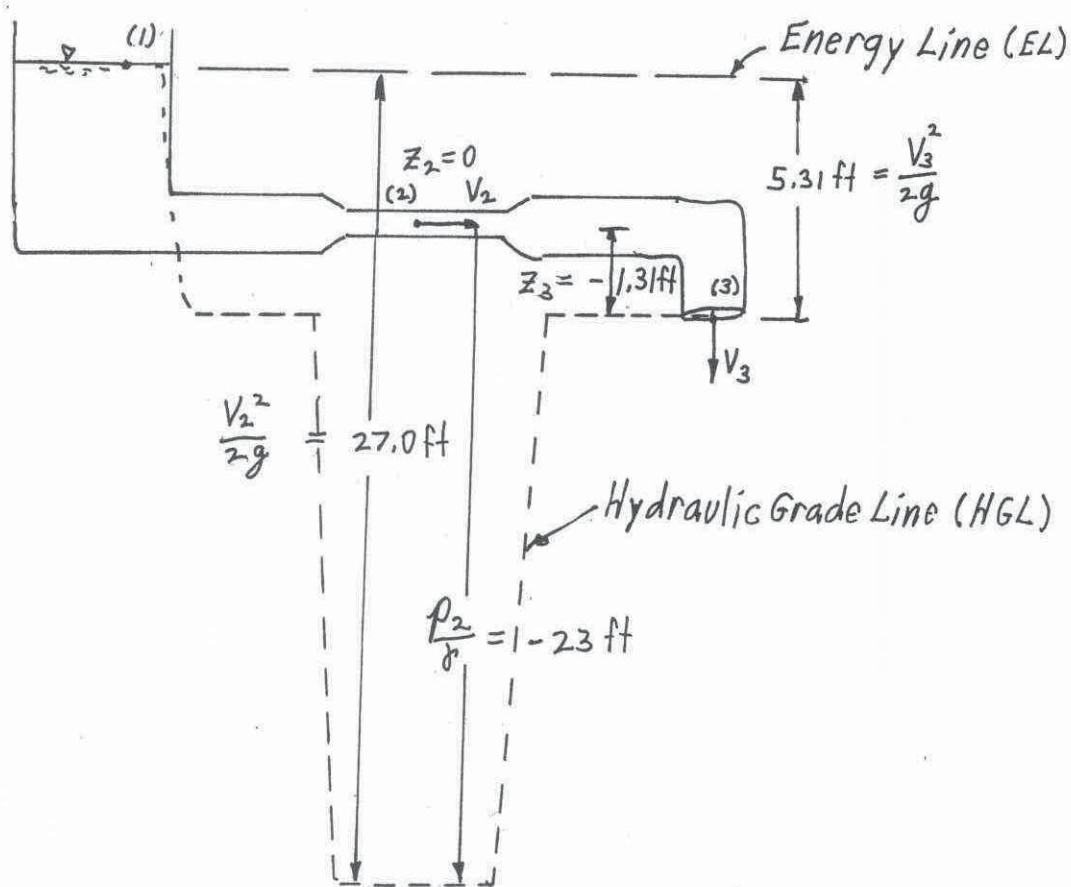
FIGURE P3.71

For steady, inviscid flow with no pumps or turbines the energy line is horizontal, a distance of $h + 4\text{ ft} = 1.31\text{ ft} + 4\text{ ft} = 5.31\text{ ft}$ above the outlet. (See solution to problem 3.71 for values of h , p_2 , V_2 , and p_3 , V_3 .) The hydraulic grade line is one velocity head, $V^2/2g$, below the energy line.

Thus, with $V_1^2/2g = 0$, $V_2^2/2g = (41.7 \frac{\text{ft}}{\text{s}})^2 / (2(32.2 \frac{\text{ft}}{\text{s}^2})) = 27.0\text{ ft}$,

and $V_3^2/2g = (18.5 \frac{\text{ft}}{\text{s}})^2 / (2(32.2 \frac{\text{ft}}{\text{s}^2})) = 5.31\text{ ft}$

the following EL and HGL are obtained:



Note: $\frac{p_2}{\gamma} = -144 \frac{\text{lb}}{\text{ft}^2} / (62.4 \frac{\text{lb}}{\text{ft}^3}) = 23\text{ ft}$