Example of Grade Lines in a Fluid Flow
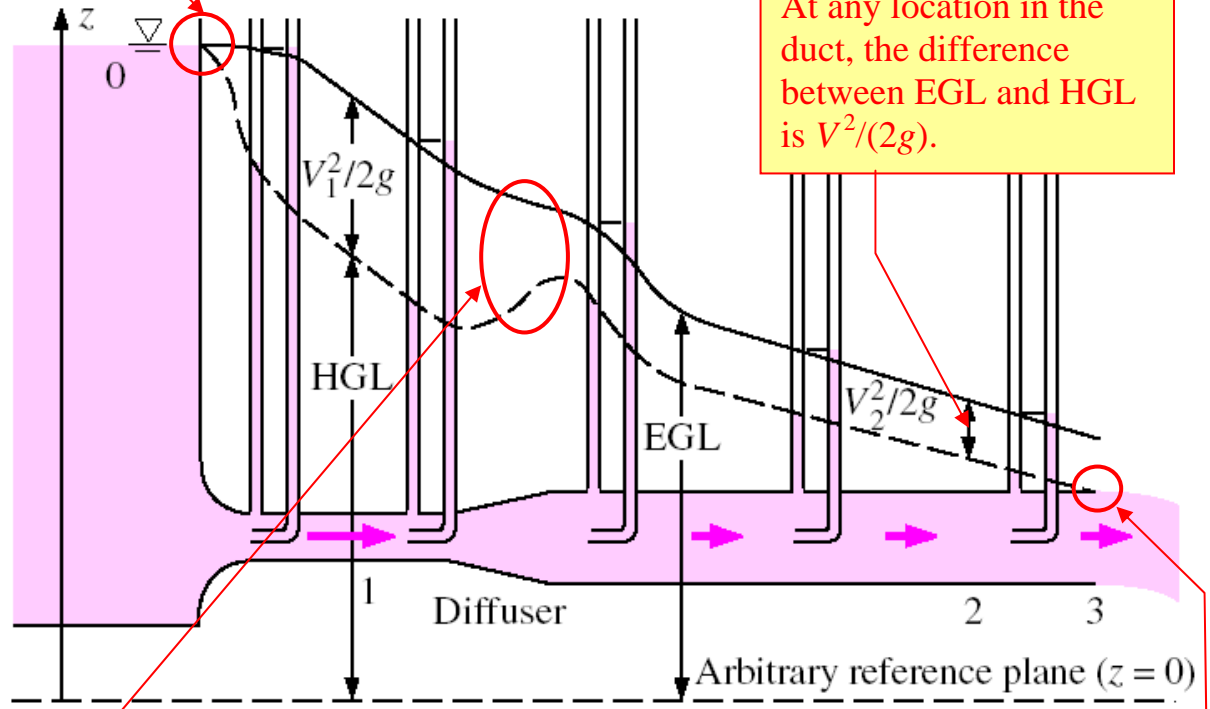
At point 0, HGL = EGL inside the tank, since the fluid is at rest ($V = 0$). Neither EGL or HGL can rise above this value unless work is added to the flow (e.g., with a pump).

FIGURE 5-35

The *hydraulic grade line* (HGL) and the *energy grade line* (EGL) for free discharge from a reservoir through a horizontal pipe with a diffuser.

At any location in the duct, the difference between EGL and HGL is $V^2/(2g)$.

EGL continually falls due to irreversible losses, but HGL can rise or fall. Overall, however, HGL also must fall. In fact, HGL can *never* rise above EGL.

Since the jet exits at atmospheric pressure at the outlet of the pipe, $P_3 = P_{atm}$, and HGL is equal to the height of the free surface of the liquid.