## An Internet Book on Fluid Dynamics

## Solution to Problem 450C:



In the text we evaluated the total pressure drop, $\Delta p^{T}$, through a hydraulic jump for any streamtube:

$$
\begin{equation*}
\Delta p^{T}=\frac{\rho g\left(h_{2}-h_{1}\right)^{3}}{4 h_{1} h_{2}} \tag{1}
\end{equation*}
$$

where $h_{1}$ and $h_{2}$ are the water depths upstream and downstream of the jump. It follows that the rate of energy dissipation in the jump, $E$, is

$$
\begin{equation*}
E=Q b \frac{\rho g\left(h_{2}-h_{1}\right)^{3}}{4 h_{1} h_{2}} \tag{2}
\end{equation*}
$$

where $b$ is the breadth of the flow and $Q$ is the volume flow rate. In addition $Q$ is given by

$$
\begin{equation*}
Q=\sqrt{g h_{1} h_{2}\left(h_{1}+h_{2}\right) / 2}=12.13 \mathrm{~m}^{3} / \mathrm{s} \tag{3}
\end{equation*}
$$

Therefore the answer is

$$
\begin{equation*}
E=5700000 \mathrm{~kg} \mathrm{~m}^{2} / \mathrm{s}^{3}=7640 \mathrm{HP} \tag{4}
\end{equation*}
$$

