

Surface Water Hydrology

Homework #4

Due on Wednesday, March 28, 2012

Problem 1. Water flows in a 2.0-m wide rectangular channel. The water depth is 1.0 m and the discharge is $1.0 \text{ m}^3/\text{s}$. The channel bottom drops smoothly by 0.2 m over a short distance (a step down in the bottom) with no head loss or change in the width of the channel.

- Calculate the specific discharge (m^2/s) and specific energy (m) at the upstream station.
- Calculate the specific discharge (m^2/s) and specific energy (m) at the downstream station.
- Calculate the upstream Froude number. Is the upstream flow a subcritical or supercritical flow? How about the downstream flow (subcritical or supercritical)?
- Using the try and error method to estimate the water depth (m) at the downstream station.

Problem 2. A discharge of $4.0 \text{ m}^3/\text{s}$ is carried in a canal with the cross section shown in Fig.1, where w is width, and h is flow depth. The relationship between the width and the flow depth is $h=0.4w$. The canal is 2000 m long and drops 0.3 m in elevation over that distance. Manning's n for the channel is estimated to be 0.03. What is the value of the width (w) in meters of this canal?

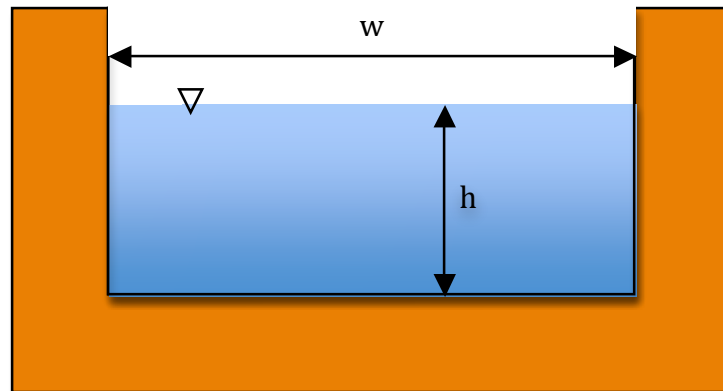


Fig.1 Canal cross section for Problem 2.