Surface Water Hydrology
Homework #3
Due on Wednesday, April 3, 2013

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 m^3/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.

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

Problem 2. A discharge of 4.0 m^3/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?

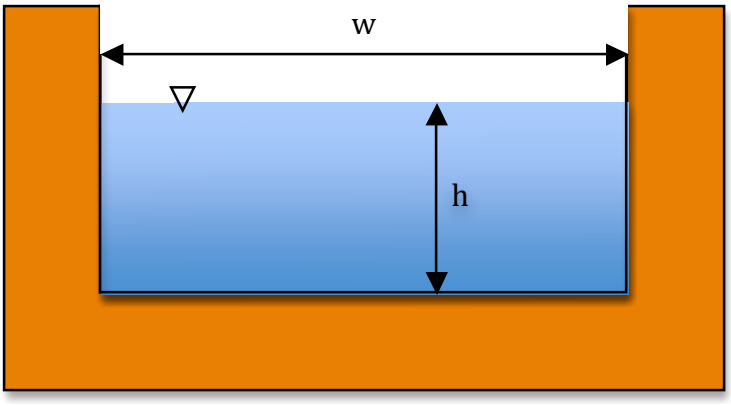

Fig.1 Canal cross section for Problem 2.