

Applied Hydraulics – Week 1 – Uniform Flow

Reading Assignment: Chin, Ch. 3, Secs. 3.1, 3.2, pp. 97 – 126.

Homework Problems: 3.4, 3.6, 3.8, 3.10, 3.12, 3.16

Hands-on Assignment

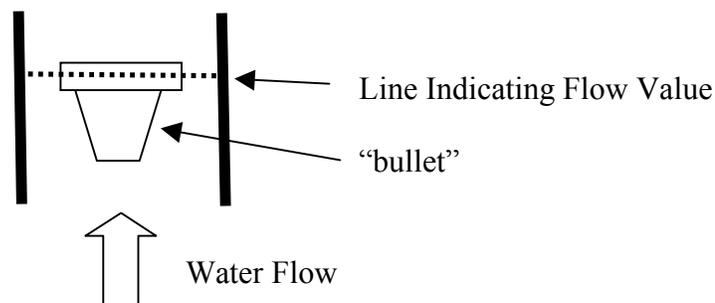
1. Using the 5-m teaching flume, measure the uniform flow depth at the bed slopes and discharges given below. In your measurement, be sure to confirm that your water depth is uniform (i.e., it isn't changing longitudinally). Use the pointer gauges to measure the water depth to the nearest tenth of a millimeter. Be sure to record where you measured your flow depth. Ideally, you should make more than one depth measurement along the channel to verify that the depth is uniform. Note also in which regions of the flume the flow appears to be non-uniform, and note how the depth is changing in these regions.

Bed Slopes: 1%, 2%, 3%

Discharges: 0.7 L/s, 1.5 L/s, 2.0 L/s

Notes:

Both the flow and slope measurement devices have been verified to be reasonably accurate. In measuring the slope, place your eye about 6" from the gauge, then move your head vertically until your eye is level with the bottom of the vertical indicator rod, then read the corresponding slope off the gauge. The flow should be adjusted with the gate valve so that the upper part of the indicator "bullet" lines up with the flow mark (see diagram below). You should be able to observe uniform flow for the center portion of the channel for these slopes and discharges.



2. Now confirm your slope measurements by measuring the difference in water depths at two locations within the flume (at the 1-m and 4-m locations). To do this, set the slope as before (choose 1, 2, or 3%). Turn off the flume and let the water drain. Place a sharp crested weir near the downstream end of the channel to dam the water, and place some clay at the front bottom edge to block leakage under the weir. Turn on the flume to fill the channel, then turn

it off and close completely the flow to prevent it from draining back through the pump into the reservoir. Carefully measure the water depth at two locations simultaneously. Wait until after the water surface elevation stops varying because of wave motion. Record your depths.

3. Now set the flow and slope to 0.7 L/s and 1%. Measure elevations again. This flow/slope combination may not produce uniform flow, or it may appear that there are two uniform flow sections. Record depths at various locations along the channel so that you describe later the flow conditions at various points along the channel.

To be done later

1. Create a table that gives the water depth, water velocity, and Froude number for each flow/slope combination.
2. Use one of the uniform flow equations to estimate the channel roughness. Give the roughness in units appropriate to the equation you used
3. Estimate the Froude number for the 0.7 L/s, 1% flow/slope case for several points along the channel. Explain the behavior of the water depth in this case.