TALLER NO. 1A

Energia Espeficica, Fuerza Especifica, Transiciones y Resalto Hidraulico

2.4. The flow depth and the flow velocity upstream of a 0.2-m sudden step rise in the bottom of a 5-m wide rectangular channel are 5 m and 4 m/s respectively. Assuming there are no losses in the transition, determine:

i. The flow depth downstream of the step and the change in the water level;
ii. The flow depth and the water level downstream of the step if the channel bottom has a 0.2-m drop instead of the rise, as in (i).

2.7. A 8-m wide rectangular channel carries a flow of 96 m^3/s at a flow depth of 4 m. The channel width is constricted to 6 m in a length of 5 m. Assuming the channel transition has straight and vertical sides, and there are no losses, plot the water-surface profile in the transition.

2.16. The channel bottom at the junction of two channels is raised by 0.1 m. The upstream channel is 10 m wide and the downstream channel is 8 m wide. If the channel discharge is 10 m^3/s and the depth in the upstream channel is 1.5 m, determine the flow depth downstream of the junction assuming the losses at the junction to be $0.2V_2^2/(2g)$, where V_2 =flow velocity in the downstream channel.

2.21. The flow depth and velocity in a 6-ft wide rectangular channel are 5 ft and 3 ft/sec respectively. The channel width is reduced to 5 ft in a distance of 15 ft.

i. Compute and plot the flow depth in the contraction assuming the bottom is horizontal and the head losses are negligible.
ii. In order to keep the water surface in the contraction as horizontal, determine the variation of the bottom elevation.

2.8. A hydraulic jump is formed in a 4-m wide outlet just downstream of the control gate, which is located at the upstream end of the outlet. The flow depth upstream of the gate is 20 m. If the outlet discharge is 100 m^3/s, determine

i. Flow depth downstream of the jump;
ii. Thrust on the gate; and
iii. Energy losses in the jump.

2.15. A 8-m wide rectangular channel is carrying a flow of 54 m^3/s at a flow depth of 0.6 m. A sluice gate located at the downstream end of the channel controls the flow depth y_2. Determine y_2 so that a hydraulic jump is formed upstream of the gate.

2.24. A hydraulic jump is formed just downstream of a sluice gate located at the entrance of a channel. There is a constant-level lake upstream of the sluice gate. The flow depth and velocity in the channel downstream of the jump are 5.2 ft and 4.3 ft/sec, respectively. Determine the water level in the lake. Assume the losses for flow through the gate are negligible.

Example 3-2. Derive the discharge per unit width of a broad-crested weir across a rectangular channel.

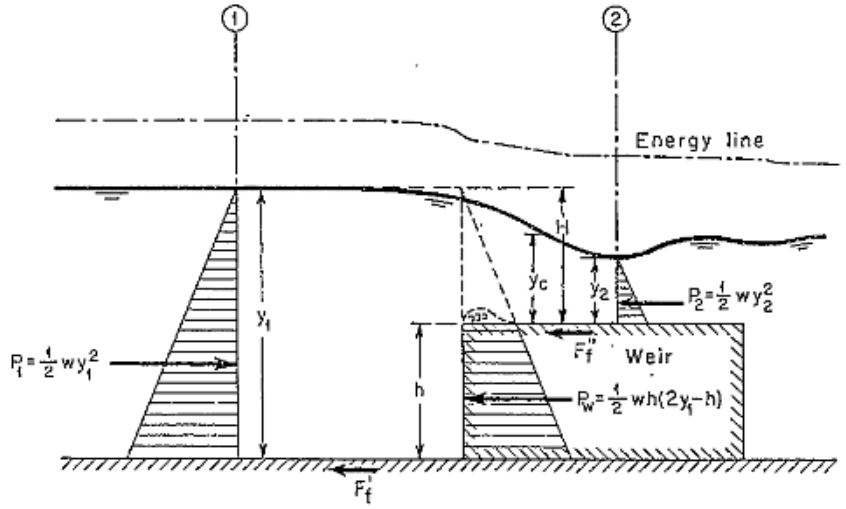

FIG. 3-8. Momentum principle applied to flow over a broad-crested weir.

EXAMPLE 3.2

A flow of 100 m^3/s (3530 ft^3/s) occurs in a trapezoidal channel with side slopes of 2:1 and a base width of 5 m (16 ft). If the upstream depth of flow is 1.0 m (3.3 ft), determine the downstream depth of flow which will cause a hydraulic jump.