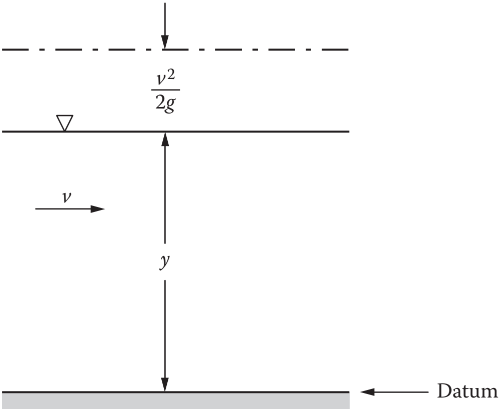

Figure 2.1 A typical open channel flowing at depth, y, with velocity, v. The channel bottom shows the datum of the system.

002x001.eps

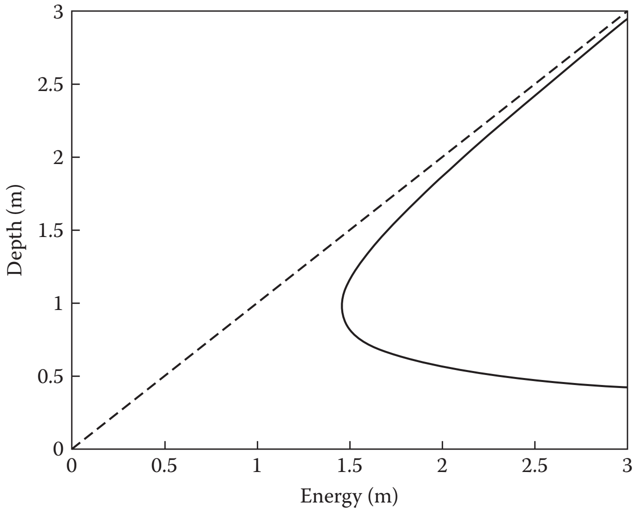

Figure 2.2 E-y diagram for $q = 3\ m^2/s$. The dashed line shows the $E = y$ asymptote.

002x002.eps

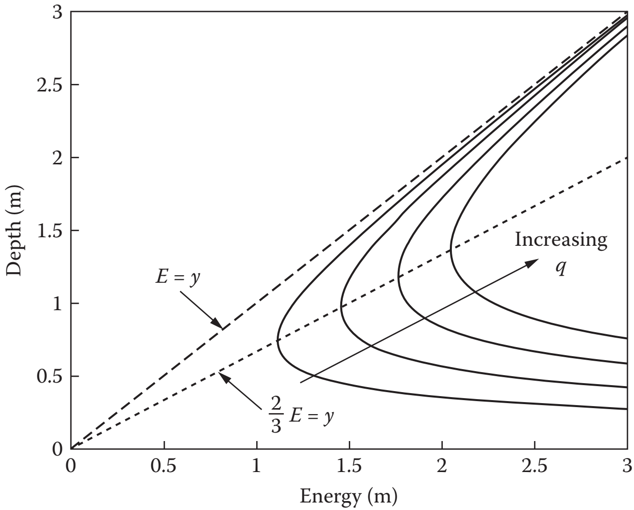

Figure 2.3 A family of E-y curves for q = {2, 3, 4, 5} m^2/s. Note that the dashed line for 2/3E = y crosses each curve at its mimimum energy value.

002x003.eps

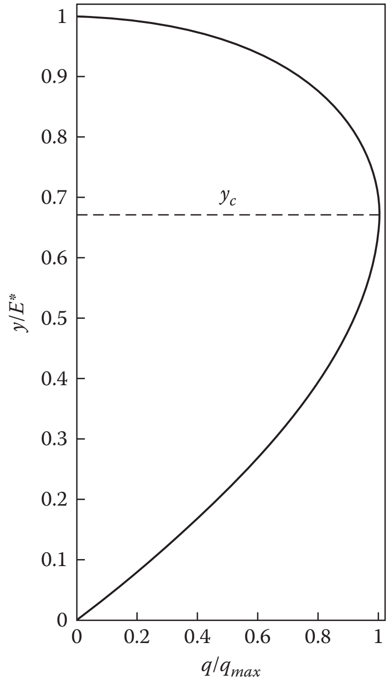

Figure 2.4 Specific discharge (q) normalized by the maximum specific discharge (q_{max}) as it varies with depth (y) normalized by a fixed specific energy, E^*.

002x004.eps

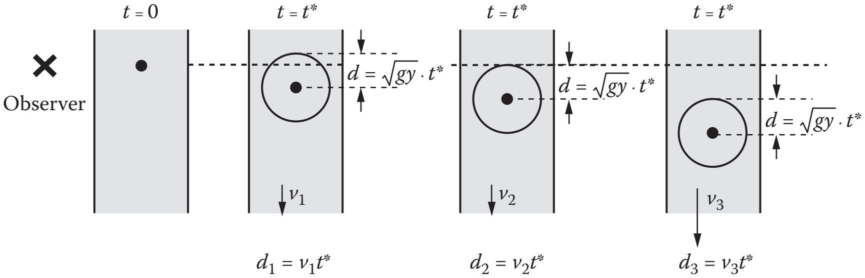

Figure 2.5 Propagation of shallow waves (ripples) from an object thrown into subcritical, critical, and supercritical flows. At v_1 (subcritical), some ripples propagate upstream. At $v_2 = v_c$ (critical) the upstream edge of the ripple forms a standing wave at the location of observer. At v_3 (supercritical) all ripples are washed downstream.

002x005.eps

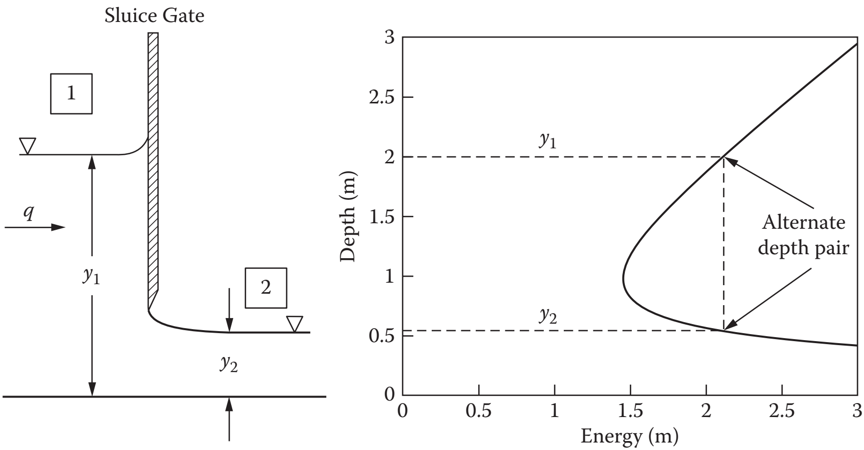

Figure 2.6 A sluice gate introduced to a flow imposes subcritical flow upstream of the gate and supercritical flow downstream of the gate. Depths y_1 and y_2 make up an alternate depth pair.

002x006.eps

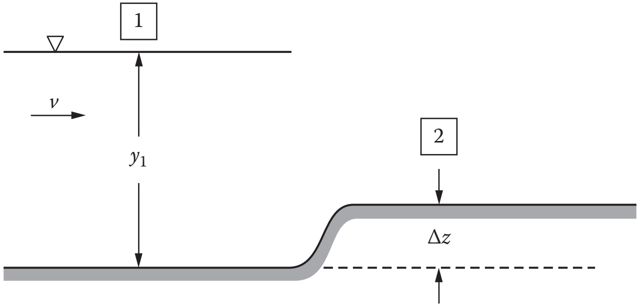

Figure 2.7 Definition sketch for flow encountering an upward step of height, Δz.

002x007.eps

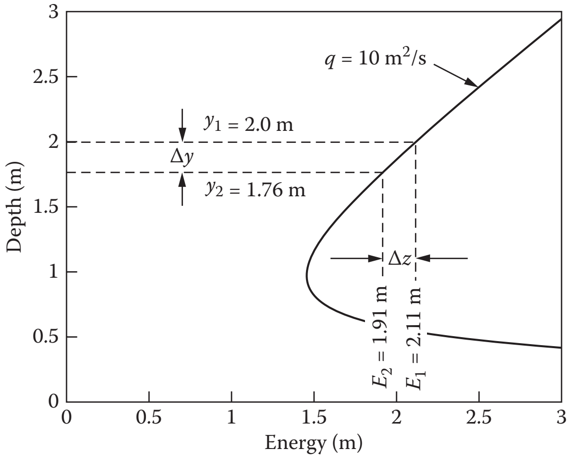

Figure 2.8 *E-y* diagram showing solutions to Example 2.2.

002x008.eps

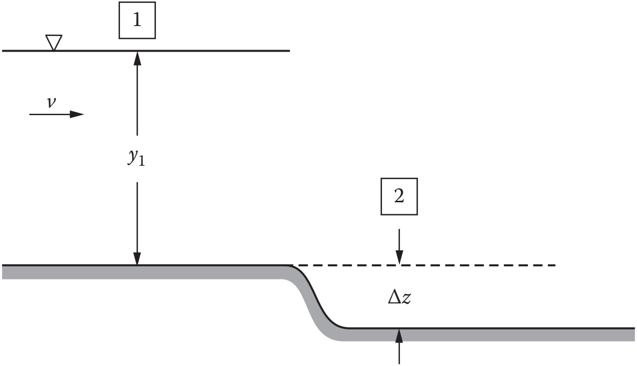

Figure 2.9 Definition sketch for flow encountering a downward step of height, Δz.

002x009.eps

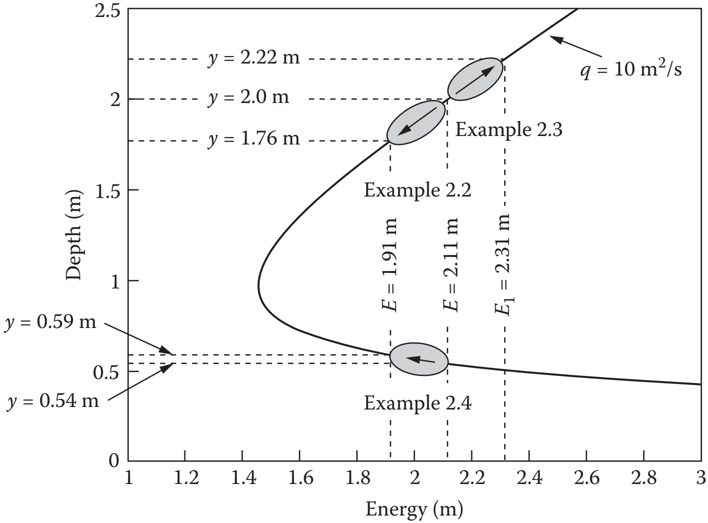

Figure 2.10 Summary of energy shifts on E-y diagram for Examples 2.2, 2.3, and 2.4.

002x010.eps

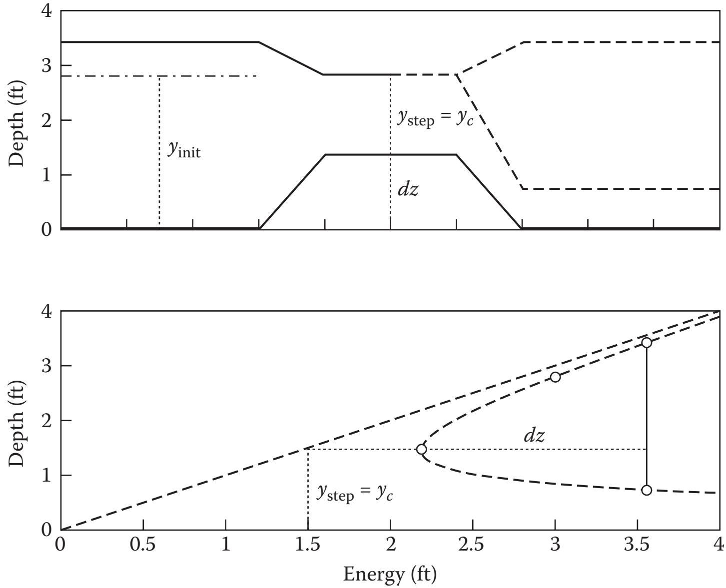

Figure 2.11 Screen capture from step.avi animation. Capture shows a step height dz that is large enough to act as a choke. Upper subplot shows physical system. Lower subplot shows E-y diagram.

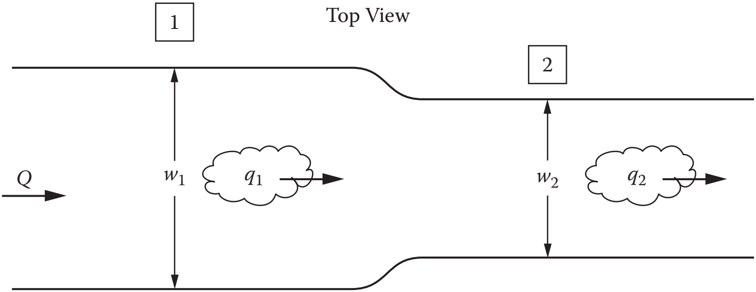

Figure 2.12 Definition sketch for flow encountering a constriction in flow width.

002x012.eps

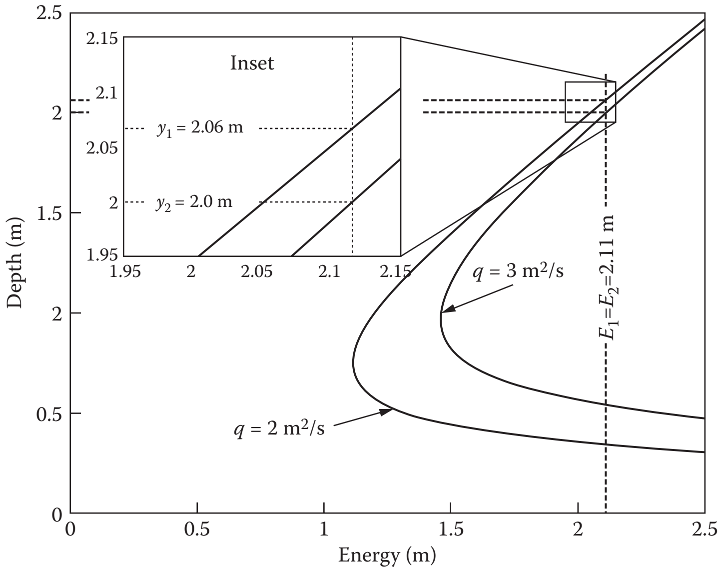

Figure 2.13 *E-y* diagram showing solutions to Example 2.5.

002x013.eps

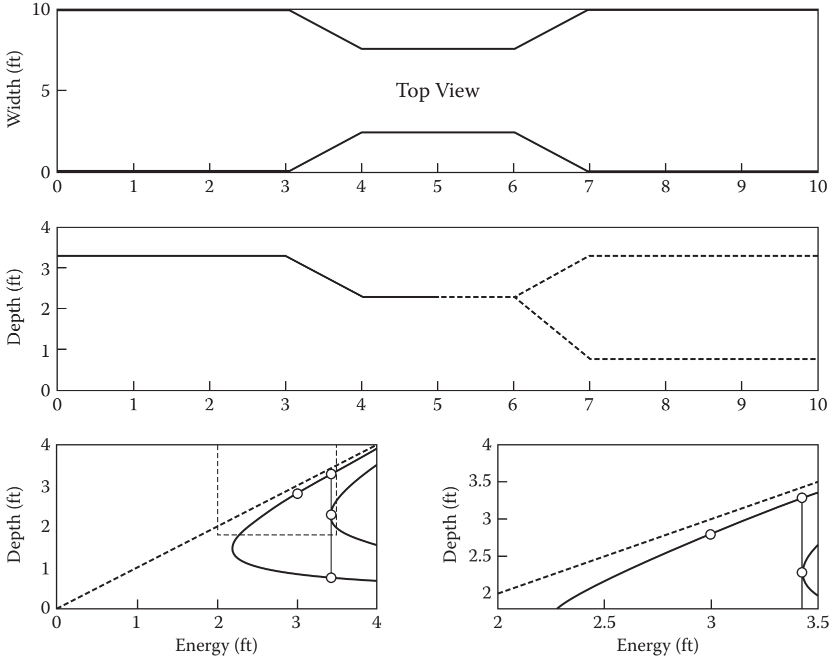

Figure 2.14 Screen capture from constriction.avi animation. Capture shows a constriction in width (top subplot) that is severe enough to act as a choke. Middle subplot shows flow depth upstream of, within, and downstream of the constriction. Lower left subplot shows overall *E-y* diagram, while lower right subplot shows enlargement of a portion of the *E-y* diagram.

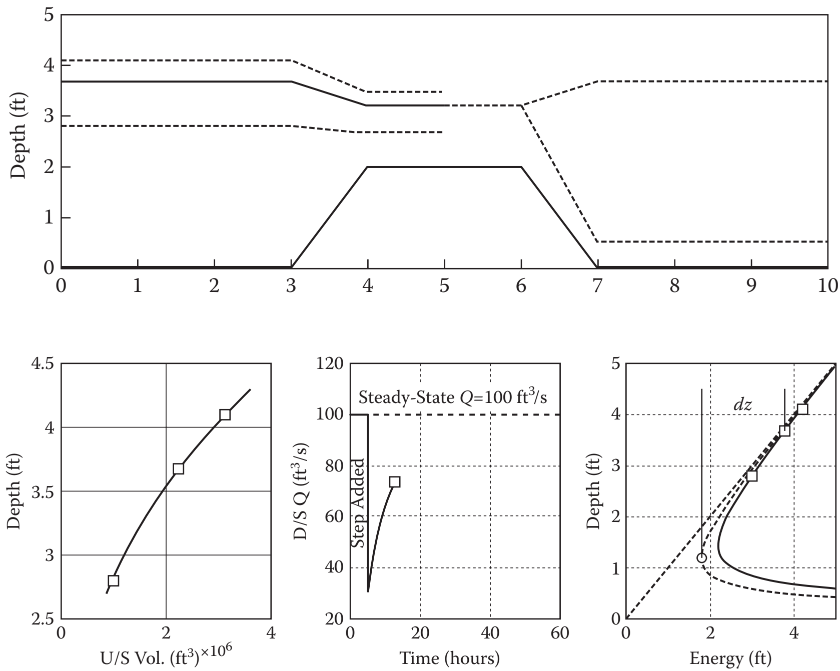

Figure 2.15 Screen capture from step_transient.avi animation. Capture shows a step height of 2 ft, that appears instantaneously at time = 2 hours. Upper subplot shows physical system with the right/lower dashed trace showing the initial water surface at the introduction of the step and right/upper dashed trace shows the final, steady-state water surface. The solid trace shows the water surface at the current place in the evolution. Dashed lines on right side indicate that both subcritical and supercritical flow are accessible downstream. Lower-left subplot shows depth-storage relationship upstream of step with the lowest square marking the initial condition, the middle square marking the current condition, and the highest square marking the ultimate, steady-state condition. Lower-middle subplot shows the discharge passing the step as a function of time. Lower-right subplot shows the transient *E-y* diagram in the dashed curve and the ultimate, steady-state *E-y* diagram in the solid curve.

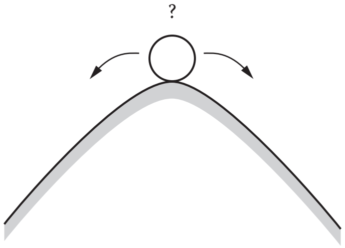

Figure 2.16 Mental experiment: A ball is placed at the exact top of a perfectly symmetrical hill. Which way does it roll down?

002x016.eps

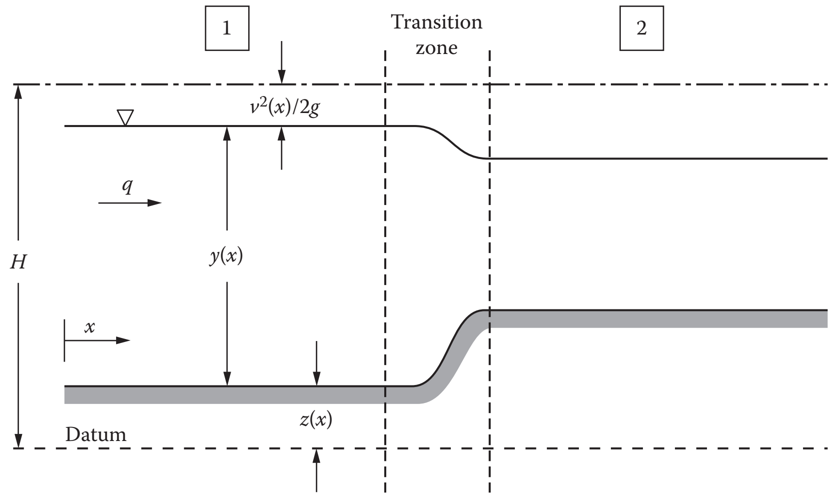

Figure 2.17 Definition sketch for water surface shapes discussion.

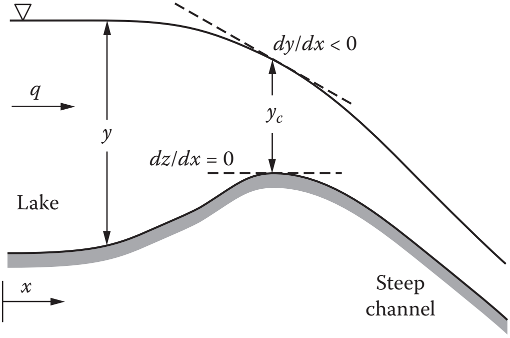

Figure 2.18 Flow depth transitioning through critical depth, y_c, at the outfall from a lake.

002x018.eps

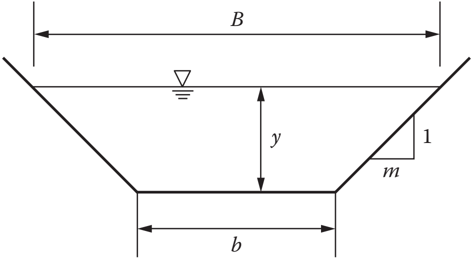

Figure 2.19 Definition sketch for trapezoidal section geometry.

002x019.eps

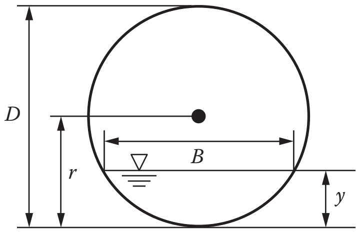

Figure 2.20 Definition sketch for a circular section geometry.

002x020.eps

	A	B	C	D	E	F
1						
2			Depth, y_2 (m)	Area (m^2)	Specific Energy (m)	
3			1	3.5	1.33702	
4						

Figure 2.21 Initial programming of spreadsheet for Goal Seek root-finding exercise to determine the alternate depth, y_2, in a trapezoidal section that produces a desired specific energy.

002x021.eps

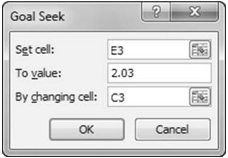

Figure 2.22 The Excel "Goal Seek" dialog with entries populated to solve for the alternate depth to $y_1 = 2$ m in Example 2.7.

002x022.eps

	A	B	C	D	E	F
1						
2			Depth, y_2 (m)	Area (m^2)	Specific Energy (m)	
3			0.62361	1.71321	2.03019	
4						

Figure 2.23 Final programming of spreadsheet for Goal Seek root-finding exercise. Note that the depth indicated for y_2, approximately 0.62 m, produces an energy of 2.03 m which was the goal indicated in the "Goal Seek" dialog shown in Figure 2.22.

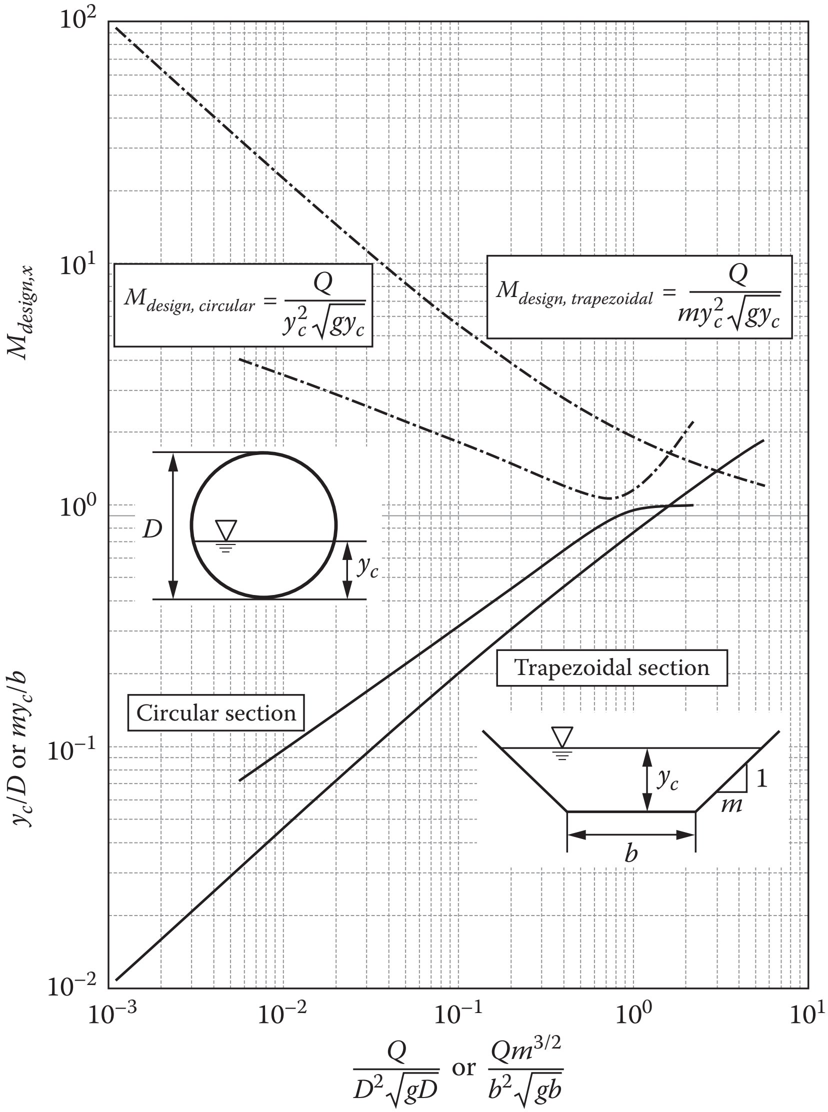

Figure 2.24 Critical depth, y_c, in trapezoidal and circular cross-sections.

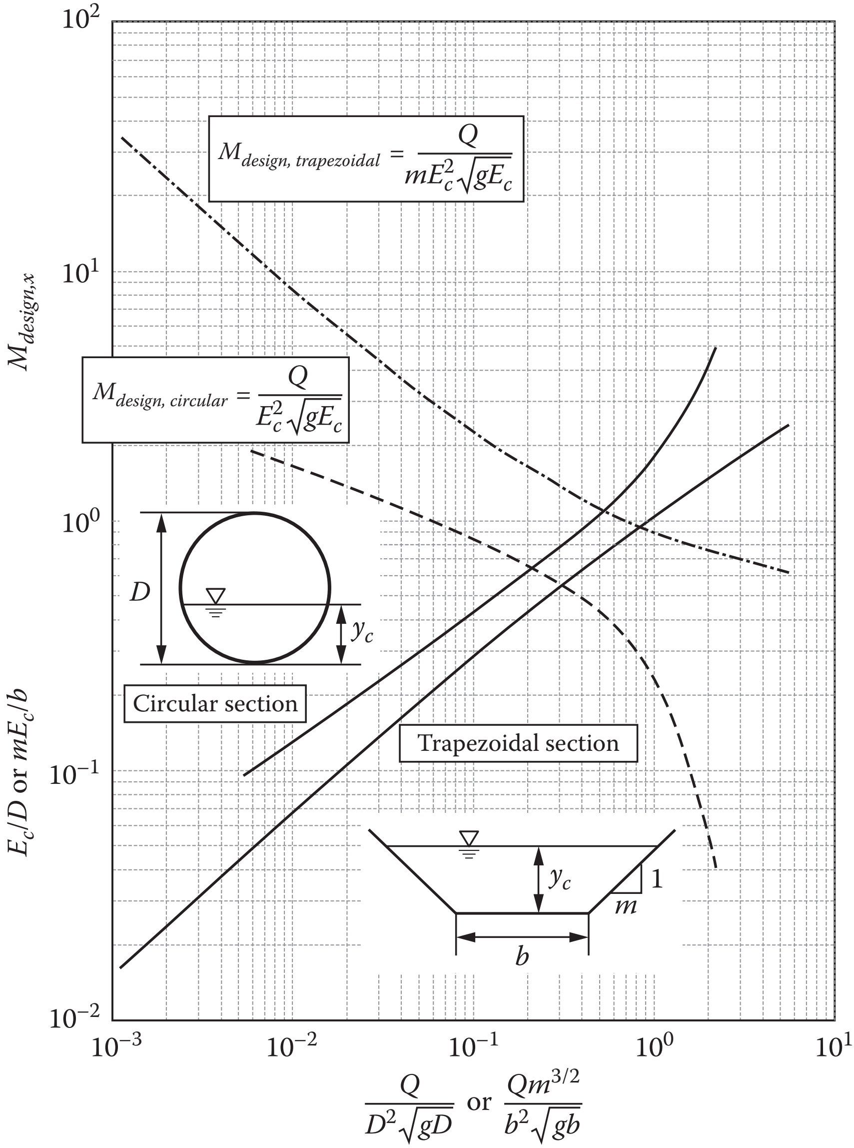

Figure 2.25 Critical energy, E_c, in trapezoidal and circular cross-sections.

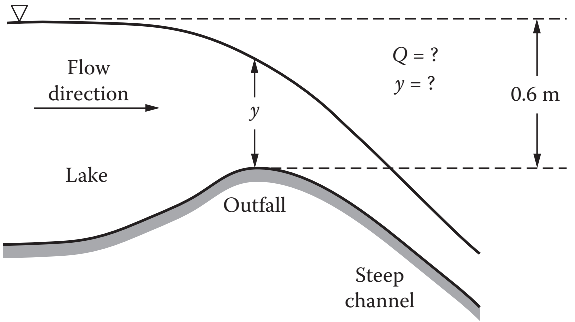

Figure 2.26 Flow conditions at lake outlet structure for Examples 2.8a and 2.8b.

002x026.eps