SYMBOLS

A_3 = gross area of section 3

A_j = area of submerged piers or piles in section 3

a = area of subsection

b = width of bridge opening, defined as the distance between abutment faces (figs. 5-8)

b_s = width of bridge opening at the water surface

C' = coefficient of discharge for standard conditions

C = coefficient of discharge

E = a symbol representing the slope of the embankments expressed as, for example, 2 : 1, this being the ratio of the horizontal to the vertical distance

e = an eccentricity ratio $= \frac{K_a}{K_b} \leq 1.00$ (fig. 10)

F = the Froude number; for section 3, $F_3 = \frac{Q}{A_3\sqrt{gy_3}}$

g = acceleration of gravity = 32.16

h = height of water surface above an arbitrary datum

Δh = difference in elevation of water surface between section 1 and section 3

h_f = head loss due to friction from section 1 to section 3

j = ratio of projected area of the submerged portion of piers or piles in section 3 to the gross area of section 3 = A_j/A_3

K = conveyance of a section $= \frac{1.486}{n} R^{2/3} A$

K_a = the conveyance of a portion of section 1 (fig. 10)

K_b = the conveyance of a portion of sectio 1 (fig. 10)

K_c = the conveyance of a portion of section 1 (fig. 10)

k = an adjustment coefficient which accounts for the affect of secondary variables; $C = C' \times k_p \times K_e$, and others

k_p = a coefficient that adjusts C' for the influence of a nonstandard value of F

k_ϕ = a coefficient that adjusts C' for the influence of angularity of flow

k_θ = a coefficient that adjusts C' for the influence of angle of wing walls

k_e = a coefficient that adjusts C' for the influence of eccentricity of constriction

k_j = a coefficient that adjusts C' for the influence of piers and piles

k_r = a coefficient that adjusts C' for the influence caused by rounding entrance corner of abutment for vertical-faced constrictions

k_t = a coefficient that adjusts C' for the influence of submergence of bridge members

k_w = a coefficient that adjusts C' for the influence of length of wing walls

k_x = a coefficient that adjusts C' for the influence of the ratio of distances x/b (figs. 26-27)

k_y = a coefficient that adjusts for the influence of ratio of depth of water to width of opening, $\frac{y_a + y_b}{2b}$

L = length of the abutment (figs. 5-8)

L_c = distance from section 1 to the constriction (fig. 1)

D = distance from constriction to beginning of drawdown

m = the channel contraction ratio, expressed as a percent of channel contraction (figs. 11-12)

n = Manning's coefficient of roughness

Q = discharge in cubic feet per second

q = discharge that could pass through the opening without contraction

R = hydraulic radius

r = radius of rounding of entrance corner of abutment for vertical-faced constrictions

t = vertical distance between water level at section 1 and the lowest horizontal member of a partially submerged bridge (fig. 30B)

V = mean velocity in a section

v = mean velocity of an increment of area

W = a measure of the length of a wing wall or chamfer (fig. 8)

x = horizontal distance from the point of intersection of the abutment and embankment slopes to a point on the upstream embankment having the same elevation as section 1 (fig. 7)

y_a, y_b = depth of water at the toe of the abutments (fig. 6)

y_3 = average depth of water in section 3, $= \frac{A_3}{b_s}$

z = the difference between h and the average depth y at a section

α (alpha) = the velocity-head coefficient

θ (theta) = the acute angle between a wing wall and the plane of the constriction (fig. 8)

ϕ (phi) = the acute angle between the plane of the constriction and a line normal to the thread of the stream (fig. 9)