GLOSSARY OF NOTATIONS

A = Earthquake peak ground acceleration.
A_0 = Cross-sectional area of the stream.
a_B = Barge bow damage depth.
AF = Annual failure rate.
b = River channel width.
BR = Vehicular braking force.
BR_a = Aberrancy base rate.
b_x = Bias of $\bar{x} = x/x_n$.
c = Wind analysis constant.
C' = Response spectrum modeling parameter.
CE = Vehicular centrifugal force.
C_F = Cost of failure.
C_H = Hydrodynamic coefficient that accounts for the effect of surrounding water on vessel collision forces.
C_I = Initial cost for building bridge structure.
C_p = Wind pressure coefficient.
CR = Creep.
C_T = Expected total cost of building bridge structure.
CT = Vehicular collision force.
CV = Vessel collision force.
D = Diameter of pile or column.
DC = Dead load of structural components and nonstructural attachments.
DD = Downdrag.
D_n = K–S maximum difference between measured cumulative probability and expected probability.
DW = Dead load of wearing surfaces and utilities.
e = Height of column above ground level.
EH = Horizontal earth pressure load earth surcharge load.
E_p = Modulus of elasticity for pile.
EQ = Earthquake.
EV = Vertical pressure from dead load of earth fill.
E_z = Wind exposure coefficient.
f = Location of maximum bending moment in pile shaft below the soil surface.
F_0 = Froude number.
F_a = Site soil coefficients for short periods.
F_{apl} = Equivalent applied force.
F_i = Equivalent inertial force.
F_K = Applied force for load type K.
FR = Friction.
F_v = Site soil coefficient for system with natural period T = 1 sec.
$F_Y(Y^*)$ = Cumulative probability = the probability that the variable Y takes a value less than or equal to Y^*.
G = Wind gust factor.
g = Acceleration caused by gravity.
H = Moment arm of applied force.
HL-93 = AASHTO LRFD design live load.
IC = Ice load.
I_{IM} = Dynamic amplification for live load.
I_{LL} = Live load intensity in terms of HL-93.
IM = Vehicular dynamic load allowance.
I_p = Moment of inertia of pile.
$I_{\rho H}$ = Soil influence coefficient for lateral force.
$I_{\rho M}$ = Soil influence coefficient for moment.
K_1, K_2, K_3, and K_4 = Scour coefficients that account for the nose shape of the pier, the angle between the direction of the flow and the direction of the pier, the streambed conditions, and the bed material size.
K_p = Rankine coefficient.
K_R = Pile flexibility factor, which gives the relative stiffness of the pile and soil.
L = Foundation depth.
L_e = Effective depth of foundation (distance from ground level to point of fixity).
LL = Vehicular live load.
LOA = Overall length of vessel.
LS = Live load surcharge.
$\max(x)$ = Maximum of all possible x values.
M_{cap} = Moment capacity.
M_{col} = Moment capacity of column.
M_{design} = Design moment.
n = Manning roughness coefficient.
N_i = Number of vessels (or flotillas) of type i.
PA = Probability of aberrancy.
P_B = Nominal design force for ship collisions.
P_{B0} = Base wind pressure.
P_{cap} = Axial force capacity.
$PC_{i,k}$ = Probability that bridge will collapse given that a vessel of type i has collided with bridge member k.
P_{col} = Axial capacity of column.
P_{design} = Design axial force.
P_f = Probability of failure.
PG = Geometric probability.
PL = Pedestrian live load.
P_p = Passive resultant resisting force of the soil.
P_{soil} = Soil bearing capacity.
Q = River flow discharge rate.
R = Resistance or member capacity.
R_B = Correction factor for impacting barge width.
R_{Ba} = Correction factor for bridge location for vessel aberrancy.
R_c = Correction factor for current acting parallel to vessel path.
R_D = Correction factor for vessel traffic density.
R_H = Hydraulic radius.
R_m = Response modification factor.
R_{xc} = Correction factor for crosscurrents acting perpendicular to vessel path.
S = Load effect.
S_0 = Slope of the river bed stream.
S_a = Spectral acceleration.
SC = Scour.
S_{D1} = Spectral acceleration for a natural period $T_1 = 1$ sec.
S_{Ds} = Spectral acceleration for short period $T_s = 0.2$ sec.

SE = Settlement.
SH = Shrinkage.
T = Natural period of the system.
t' = Natural period modeling factor.
T_0 = Natural period at which the maximum spectral acceleration is reached.
TG = Temperature gradient.
T_s = Natural period at which the spectral acceleration begins to decrease.
TU = Uniform temperature.
V = Velocity (for wind speed, vessels at impact, or river flow).
V_0 = Wind friction velocity.
V_{10} = Wind velocity above ground level.
V_B = Base wind velocity = 160 km/h (100 mph).
V_{col} = Shear capacity of column.
V_{DZ} = Design wind velocity at design elevation Z.
V_x = Coefficient of variation (COV) of x = standard deviation/mean value.
W = Weight (for vessel or structure).
w = Vessel weight modeling variable.
WA = Water load and stream pressure.
WL = Wind on live load.
WS = Wind load on structure.
x = Vessel collision modeling variable.
$\bar{x}$ = Mean value of random variable x.
$X_{max,T}$ = Maximum value of variable X in a period of time T.
x_n = Nominal value of x as specified by design code.
y_0 = Depth of river flow just upstream of bridge pier excluding local scour.
y_{max} = Maximum depth of scour.
y_{scour} = Scour depth.
Z = Safety margin = R–S.
Z_0 = Friction length for wind.
β_{target} = Target reliability index used for calibration.
β = Reliability index.
ε = Standard error in regression equation.
ϕ = Resistance factor.
ϕ_s = Angle of friction for sand.
Φ = Cumulative standard normal distribution function.
Φ_0 = Unit adjustment parameter = 1.486 for U.S. units or = 1.0 for SI units.
γ = Specific weight of sand.
γ_k = Load factor for load type K.
λ_{cyc} = Variable representing cyclic effects.
λ_{eq} = Modeling factor for the analysis of earthquake loads.
λ_{LL} = Live load modeling factor.
λ_{sc} = Scour modeling variable.
λ_{sys} = System factor that represents the capacity of the "system" to continue to carry loads after failure of first member.
λ_V = Statistical modeling for estimating wind speed V.
μ_{cap} = Ductility capacity of a concrete column.
$\mu_{specified}$ = Specified ductility capacity.
ν_i = Yearly rate of collisions for each vessel (or flotilla) of type i.
σ_x = Standard deviation of a random variable x.

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