Symbols

A	Cross-sectional area of a pile, Equation (4-9) Cross-sectional area of shear wall boundary members or diaphragm chords in.^{2}, Equations (8-2), (8-4), (8-5)
A_b	Gross area of bolt or rivet, Equations (5-18), (5-22), (5-24) Sum of net mortared area of bed joints above and below the test unit, Equation (7-2)
Ac	Area of column, Equation (5-8)
A_e	Effective net area of the horizontal leg, Equation (5-20)
A_g	Gross area of the horizontal leg, Equation (5-19) Gross area of cast iron column, Equation (5-36) Gross area of column, in.^{2}, Equation (6-4)
A_j	Effective cross-sectional area of a beam-column joint, in.^{2}, in a plane parallel to plane of reinforcement generating shear in the joint calculated as specified in Section 6.5.2.3.1, Equation (6-5)
A_n	Area of net mortared/grouted section, Equations (7-1), (7-3), (7-5), (7-7), (7-9), (7-10), (7-11), (7-13)
A_{ni}	Area of net mortared/grouted section of masonry infill, Equation (7-15)
A_s	Area of nonprestressed tension reinforcement, in.^{2}, Tables 6-18, 6-20 Area of reinforcement, Equation (7-13)
$A's$	Area of compression reinforcement, in.^{2}, Tables 6-18, 6-20
A_w	Area of shear reinforcement, Equation (7-12) Nominal area of the web, Equation (5-7) Area of link stiffener web, Equation (5-28), (5-31) Area of the web cross section, = $b_w d$, Chapter 6
A_x	Accidental torsion amplification factor, Equation (3-1)
B	Width of footing, Equations (4-6), (4-7), (4-8)
B_1	Damping coefficient used to adjust one-second period spectral response for the effect of viscous damping, , Equations (1-10), (1-11)
B_{D1}	Numerical damping coefficient taken equal to the value of B_1, as set forth in Table 1-6, at effective damping β equal to the value of β_D, Equation (9-2)
B_{M1}	Numerical damping coefficient taken equal to the value of B_1, as set forth in Table 1-6, at effective damping β equal to the value of β_M, Equation (9-4)
B_S	Coefficient used to adjust short-period spectral response for the effect of viscous damping, Equations (1-8), (1-9), (1-11)
C (or C_j)	Damping coefficient for viscoelastic device (or device j), Equations (9-22), (9-24), (9-29), (9-30), (9-35), (9-37)
C_0	Modification factor to relate spectral displacement of an equivalent SDOF system to the roof displacement of the building MDOF system, Equation (3-15) Damping coefficient for fluid-viscous device, Equation (9-25)
C_1	Modification factor to relate expected maximum inelastic displacements to displacements calculated for linear elastic response, Equations (3-5), (3-6), (3-10), (3-15), (3-19)

C_2 Modification factor to represent the effects of pinched hysteresis shape, stiffness degradation and strength deterioration on the maximum displacement response, Equations (3-5), (3-6), (3-10), (3-15), (3-19)

C_3 Modification factor to represent increased displacements due to p-Δ effects, Equations (3-5), (3-6), (3-10), (3-15), (3-17), (3-19)

C_b Coefficient to account for effect of nonuniform moment given in AISC (1993) *LRFD Specifications*, Equation (5-9)

CF_i Stage combination factors for use with velocity-dependent energy dissipation devices as calculated by Equations (9-31) or (9-32)

C_m Effective mass factor from Table 3-1, Equations (3-10), (3-16)

C_t Numerical value for adjustment of period T, Equation (3-7)

C_{vx} Vertical distribution factor for the pseudo lateral load, Equations (3-11), (3-12)

D Generalized deformation, unitless
Relative displacement between two ends of an energy dissipation unit, Equations (9-1), (9-20), (9-22)

D^- Maximum negative displacement of an energy dissipation unit, Equations (9-21), (9-23)

D^+ Maximum positive displacement of an energy dissipation unit, Equations (9-21), (9-23)

$\dot{D}$ Relative velocity between two ends of an energy dissipation unit, Equations (9-22), (9-25)

D_{ave} Average displacement of an energy dissipation unit, equal to $(|D^+| + |D^-|)/2$, Equation (9-24)

D_{clear} Required clearance between a glass component and the frame, Equation (11-9)

DCR Demand-capacity ratio, computed in accordance with Equation (2-1) or required in Equation (2-2)

$\overline{DCR}$ Average demand-capacity ratio for a story, computed in accordance with Equation (2-2)

D_D Design displacement, in. (mm) at the center of rigidity of the isolation system in the direction under consideration, Equations (9-2), (9-6), (9-8), (9-10), (9-14), (9-15), (9-18), (9-22)

D'_D Design Earthquake target displacement, in. (mm) at a control node located at the center of mass of the first floor above the isolation system in the direction under consideration, as prescribed by Equation (9-10)

D_M Maximum displacement, in. (mm) at the center of rigidity of the isolation system in the direction under consideration, Equations (9-4), (9-7), (9-11), (9-16), (9-17), (9-19)

D'_M BSE-2 target displacement, in. (mm) at a control node located at the center of mass of the first floor above the isolation system in the direction under consideration, as prescribed by Equation (9-11)

D_p Relative seismic displacement that the component must be designed to accommodate, Equations (11-8), (11-9), (11-10), (11-11)

D_r Drift ratio for nonstructural components, Equation (11-7)

D_{TD} Total design displacement, in. (mm) of an element of the isolation system, including both translational displacement at the center of rigidity and the component of torsional displacement in the direction under consideration, as specified by Equation (9-6)

D_{TM}	Total maximum displacement, in. (mm) of an element of the isolation system, including both translational displacement at the center of rigidity and the component of torsional displacement in the direction under consideration, as specified by Equation (9-7)
E	Young's modulus of elasticity, Equations (4-9), (5-1), (5-2), (5-17), (8-2), (8-4), (8-5)
E_c	Modulus of elasticity of concrete, psi, Equation (6-6)
E_{fe}	Expected elastic modulus of frame material, ksi, Equation (7-14)
E_{Loop}	Energy dissipated, in kip-inches (kN-mm), in an isolator unit during a full cycle of reversible load over a test displacement range from Δ^+ to Δ^-, as measured by the area enclosed by the loop of the force-deflection curve, Equation (9-13)
E_{me}	Expected elastic modulus of masonry in compression as determined per Section 7.3.2.4, Equation (7-14)
E_s	Modulus of elasticity of reinforcement, psi, Chapter 6
E_{se}	Expected elastic modulus of reinforcing steel per Section 7.3.2.8
F	Force in an energy dissipation unit, Equations (9-1), (9-20), (9-22), (9-25)
F^-	Negative force, in k, in an isolator or energy dissipation unit during a single cycle of prototype testing at a displacement amplitude of Δ^-, Equations (9-12), (9-21), (9-23), (9-38)
F^+	Positive force, in k, in an isolator or energy dissipation unit during a single cycle of prototype testing at a displacement amplitude of Δ^+, Equations (9-12), (9-21), (9-23), (9-38)
F_a	Factor to adjust spectral acceleration in the short-period range for site class, Equation (1-7)
F_{cr}	Allowable axial buckling stress, see Equation (5-36)
F_{EXX}	Classification strength of weld metal, Chapter 5
F_i	Inertia force at floor level *i*, Equation (9-27) Lateral load applied at floor level *i*, Equation (3-13)
F_{mi}	m-th mode horizontal inertia force at floor level *i*, Equation (9-34)
F_p	Horizontal seismic force for design of a structural or nonstructural component and its connection to the structure, Equations (2-3), (2-4), (2-5), (2-6), (2-7) Component seismic design force applied horizontally at the center of gravity of the component or distributed according to the mass distribution of the component, Equations (11-1), (11-2), (11-3), (11-4)
F_{pv}	Component seismic design force applied vertically at the center of gravity of the component or distributed according to the mass distribution of the component, Equations (11-2), (11-5), (11-6)
F_{px}	Diaphragm lateral force at floor level *x*, Equation (3-13)
F_{te}	Expected tensile strength, Equations (5-20), (5-22), (5-24)
F_v	Factor to adjust spectral acceleration at one second for site class, Equation (1-8) Design shear strength of bolts or rivets, Chapter 5
F_{ve}	Unfactored nominal shear strength of bolts or rivets given in AISC(1993) *LRFD Specifications*, Equation (5-18)
F_x	Lateral load applied at floor level x, Equation (3-11)
F_y	Specified minimum yield stress for the type of steel being used, Equation (5-7)
F_{yb}	F_y of a beam, Chapter 5
F_{yc}	F_y of a column, Chapter 5

F_{ye} — Expected yield strength, Equations (5-1) to (5-8), (5-19), (5-23), (5-25), (5-31), (5-34)

F_{yf} — F_y of a flange, Chapter 5

F_{yLB} — Lower-bound yield strength, Chapter 5

G — Soil Shear modulus, Equation (4-6)
Shear modulus of steel, Equations (5-28), (5-33)
Modulus of rigidity of wood structural panels, psi, Equations (8-2), (8-4), (8-5)

G_d — Shear stiffness of shear wall or diaphragm assembly, Equations (8-1), (8-3)

G_{me} — Shear modulus of masonry as determined per Section 7.3.2.7

G_o — Initial or maximum shear modulus, Equations (4-4), (4-5)

H — Thickness of a soil layer in feet, Chapter 11
Horizontal load on footing, Chapter 4

H_{rw} — Height of the retaining wall, Equation (4-11)

I — Moment of inertia, Equation (6-6)

I_b — Moment of inertia of a beam, Equations (5-1), (5-17)

I_c — Moment of inertia of a column, Equation (5-2)

I_{col} — Moment of inertia of column section, Equation (7-14)

I_f — Moment of inertia of most flexible frame member confining infill panel, Chapter 7

I_g — Moment of inertia of gross concrete section about centroidal axis, neglecting reinforcement, Chapter 6

I_p — Component performance factor; 1.0 shall be used for the Life Safety Nonstructural Performance Level and 1.5 shall be used for the Immediate Occupancy Nonstructural Performance Level, Equations (11-1), (11-3), (11-4), (11-5), (11-6)

J — A coefficient used in linear procedures to estimate the actual forces delivered to force-controlled components by other (yielding) components, Equations (3-5), (3-19)

K — Length factor for brace; defined in AISC (1993) *LRFD Specifications*, Chapter 5

K' — Storage stiffness as prescribed by Equation (9-23)

K'' — Loss stiffness as prescribed by Equation (9-24)

K_θ — Rotational stiffness of a partially restrained connection, Equations (5-15), (5-16), (5-17)

K_b — Flexural stiffness, Equations (5-27), (5-29)

K_{Dmax} — Maximum effective stiffness, in k/in., of the isolation system at the design displacement in the horizontal direction under consideration, as prescribed by Equation (9-14)

K_{Dmin} — Minimum effective stiffness, in k/in. (kN/mm), of the isolation system at the design displacement in the horizontal direction under consideration, as prescribed by Equation (9-15)

K_e — Effective stiffness of the building in the direction under consideration, for use with the NSP, Equation (3-14)
Elastic stiffness of a link beam, Equations (5-27), (5-30)

K_i — Elastic stiffness of the building in the direction under consideration, for use with the NSP, Equation (3-14)

K_{Mmax} — Maximum effective stiffness, in k/in., of the isolation system at the maximum displacement in the horizontal direction under consideration, as prescribed by Equation (9-16)

K_{Mmin} — Minimum effective stiffness, in k/in., of the isolation system at the maximum displacement in the horizontal direction under consideration, as prescribed by Equation (9-17)

K_s — Shear stiffness, Equations (5-27), (5-28)

L — Length of footing in plan dimension, Equations (4-7), (4-8)
Length of pile in vertical dimension, Equation (4-9)
Length of member along which deformations are assumed to occur, Chapter 6
Length of wall or pier, Equations (7-4), (7-5)
Diaphragm span, distance between shear walls or collectors, Equations (8-3), (8-4), (8-5)

L_b — Length or span of beam, Equations (5-6), (5-17)
Distance between points braced against lateral displacement of the compression flange or between points braced to prevent twist of the cross-sections; given in AISC (1993) *LRFD Specifications*, Equation (5-9)

L_{inf} — Length of infill panel, Equations (7-17), (7-19)

L_p — The limiting unbraced length between points of lateral restraint for the full plastic moment capacity to be effective; given in AISC (1993) *LRFD Specifications*, Equations (5-6), (5-9)

L_r — The limiting unbraced length between points of lateral support beyond which elastic lateral torsional buckling of the beam is the failure mode; given in AISC (1993) *LRFD Specifications*, Equation (5-9)

M — Design moment at a section, Equation (6-4)
Moment on masonry section, Equation (7-11)

M_c — Ultimate moment capacity of footing, Equation (4-8)

M_{CE} — Expected flexural strength of a member or joint, Equation (5-3), (5-4), (5-6), (5-15), (5-16), (5-18), (5-22), (5-24), (5-25), (5-26), (5-32)

M_{CEx} — Expected bending strength of a member about the x-axis, Equations (5-10), (5-11), (5-13), (6-1)

M_{CEy} — Expected bending strength of a member about y-axis, Equations (5-10), (5-11), (5-13), (6-1)

M_{CLx} — Lower-bound flexural strength of the member about the x-axis, Equation (5-12)

M_{CLy} — Lower-bound flexural strength of the member about the y-axis, Equation (5-12)

M_{gCS} — Moment acting on the slab column strip, Chapter 6

M_n — Nominal moment strength at section, Chapter 6

M_{nCS} — Nominal moment strength of the slab column strip, Chapter 6

M_{OT} — Total overturning moment induced on the element by seismic forces applied at and above the level under consideration, Equations (3-5), (3-6)

M_{PCE} — Expected plastic moment capacity, Equation (5-6)

M_{ST} — Stabilizing moment produced by dead loads acting on the element, Equations (3-5), (3-6)

M_{UD} — Design moment, Chapter 6

M_{UDx} — Design bending moment about x axis for axial load P_{UF}, kip-in., Equation (6-1)

M_{UDy} — Design bending moment about y axis for axial load P_{UF}, kip-in., Equation (6-1)

M_{UFx} — Bending moment in the member about the x-axis, calculated in accordance with Section 3.4.2.1.2, Equation (5-12)

M_{UFy} — Bending moment in the member about the y-axis, calculated in accordance with Section 3.4.2.1.2, Equation (5-12)

M_x — Bending moment in a member for the x-axis, Equations (5-10), (5-11), (5-13)

M_y Bending moment in a member for the y-axis, Equations (5-10), (5-11), (5-13)
Yield moment strength at section, Equation (6-6)

N Number of piles in a pile group, Equation (4-9)

$\overline{N}$ Average SPT blow count in soil within the upper 100 feet of soil, calculated in accordance with Equation (2-8)

$(N_1)_{60}$ Standard Penetration Test blow count normalized for an effective stress of 1 ton per square foot and corrected to an equivalent hammer energy efficiency of 60%, Equation (4-5)

N_b Number of bolts or rivets, Equations (5-18), (5-22), (5-24)

N_u Factored axial load normal to cross-section occurring simultaneously with V_u. To be taken as positive for compression, negative for tension, and to include effects of tension due to creep and shrinkage, Equation (6-4)

P Vertical load on footing, Equation (4-8)
Axial force in a member, Equations (5-2), (5-4)

P_c Lower bound of vertical compressive strength for wall or pier, Equations (7-7), (7-13)

P_{CE} Expected axial strength of a member or joint, Equations (5-19), (5-20), (5-21), (5-26)
Expected gravity compressive force, Equations (7-1), (7-4)

P_{CL} Lower-bound axial strength of column, Equations (5-10), (5-11), (5-12), (5-36)
Lower bound axial compressive force due to gravity loads specified in Equation (3-4)

P_{EY} Probability of exceedance in Y years, expressed as a decimal, Equation (1-2)

PI Plasticity Index for soil, determined as the difference in water content of soil at the liquid limit and plastic limit, Section 1.6.1.4.1

P_i Portion of the total weight of the structure including dead, permanent live, and 25% of transient live loads acting on the columns and bearing walls within story level i, Equation (3-2)

P_o Nominal axial load strength at zero eccentricity, Chapter 6

P_R Mean return period, Equation (1-2)

P_{UF} Design axial force in a member, Equations (5-10), (5-11), (5-12)

P_{ye} Expected yield axial strength of a member, Equations (5-2), (5-4)

Q Generalized force in a component, Figures 2-3, 2-5, 5-1, 6-1, 7-1, 8-1

Q_{allow} Allowable bearing load specified for the design of deep foundations for gravity loads (dead plus live loads) in the available design documents, Equation (4-2)

Q_c Expected bearing capacity of deep or shallow foundation, Equations (4-2), (4-3), (4-7)

Q_{CE} Expected strength of a component or element at the deformation level under consideration, Equations (2-1), (3-20), (5-3) to (5-8), (5-18), (5-22), (5-24), (5-25), (5-26), (5-30), (5-31), (5-32), (5-34), (5-35), (7-3), (7-4), (7-15)

Q_{CEb} Expected bending strength of the beam, Equation (5-14)

Q_{CL} Lower-bound estimate of the strength of a component or element at the deformation level under consideration, Equations (3-21), (5-36), (6-5), (7-5) to (7-8), (7-13), (7-21)

Q_{CLc} Lower-bound strength of the connection, Equation (5-14)

Q_D Design action due to dead load, Equations (3-3), (3-4)

Q_E Design action due to design earthquake loads, Equations (3-18), (3-19)

Q_G Design action due to gravity loads, Equation (3-3), (3-4), (3-18), (3-19)

Q_L Design action due to live load, Equations (3-3), (3-4)

Q_S Design action due to snow load, Equations (3-3), (3-4)

Q_{UD} Deformation-controlled design action due to gravity and earthquake loads, Equations (2-1), (3-18), (3-20)

Q_{UF} Force-controlled design action due to gravity and earthquake loads, Equations (3-19), (3-21))

Q_y Yield strength of a component, Figures 2-3, 2-5

Q'_y Substitute yield strength, Figure 2-5

R Ratio of the elastic-strength demand to the yield-strength coefficient, Equations (3-15), (3-16), (3-17)

R_{OT} Response modification factor for overturning moment M_{OT}, Equation (3-6)

R_p Component response modification factor from Table 11-2, Equation (11-3))

S_1 Spectral response acceleration parameter at a one-second period, obtained from response acceleration maps, Equations (1-1), (1-3), (1-5)

S_a Spectral response acceleration, g, Equations (1-8), (1-9), (1-10), (3-10), (3-15), (3-16)

S_n Distance between nth pile and axis of rotation of a pile group, Equation (4-10)

S_S Spectral response acceleration parameter at short periods, obtained from response acceleration maps, Equations (1-1), (1-3), (1-7)

S_{X1} Spectral response acceleration parameter at a one-second period for any earthquake hazard level and any damping, adjusted for site class, Equations (1-5), (1-10), (1-11), (1-13), (1-14), (1-15), (1-16)

S_{XS} Spectral response acceleration parameter at short periods for the selected Earthquake Hazard Level and damping, adjusted for site class, and determined in accordance with Section 1.6.1.4 or 1.6.2.1, Equation (1-4), (1-8), (1-9), (1-11), (1-13), (1-14), (1-15), (1-16), (4-11), (11-1), (11-3), (11-4), (11-5), (11-6)

T Fundamental period of the building in the direction under consideration, seconds, Equations (1-8), (1-10), (3-7), (3-8), (3-9), (3-10), (9-29)
Tensile load in column, Equation (5-13)

T_0 Period at which the constant acceleration region of the design response spectrum begins at a value = $0.2T_S$, Equations (1-8), (1-12)

T_{CE} Expected tensile strength of column computed in accordance with Equation (5-8)

T_D Effective period, in seconds, of the seismic-isolated structure at the design displacement in the direction under consideration, as prescribed by Equation (9-3)

T_e Effective fundamental period of the building in the direction under consideration, for use with the NSP, Equations (3-14), (3-15), (3-17)
Effective fundamental period, in seconds, of the building structure above the isolation interface on a fixed base in the direction under consideration, Equations (9-10), (9-11)

T_i Elastic fundamental period of the building in the direction under consideration, for use with the NSP, Equation (3-14)

T_M Effective period, in seconds, of the seismic-isolated structure at the maximum displacement in the direction under consideration, as prescribed by Equation (9-5)

T_m m-th mode period of the rehabilitated building including the stiffness of the velocity-dependent devices, Equation (9-35)

T_S — Period at which the constant acceleration region of the design response spectrum transitions to the constant velocity region, Equations (1-8), (1-9), (1-10), (1-11), (1-12), (1-13), (3-10), (3-15)

T_{ss} — Secant fundamental period of a rehabilitated building calculated using Equation (3-14) but replacing the effective stiffness (K_e) with the secant stiffness (K_s) at the target displacement, Equation (9-37)

V — Pseudo lateral load, Equations (3-10), (3-11)
Design shear force at section, Equation (6-4)
Shear on masonry section, Equation (7-11)

V^* — Modified equivalent base shear, Chapter 9

V_b — The total lateral seismic design force or shear on elements of the isolation system or elements below the isolation system, as prescribed by Equation (9-8)

V_{bjs} — Expected shear strength of wall or pier based on bed-joint sliding shear stress, see Equation (7-3)

V_c — Nominal shear strength provided by concrete, Equation (6-4)

V_{CE} — Expected shear strength of a member, Equations (5-11), (5-31), (5-32), (5-34)

V_{CL} — Lower bound shear strength, Equations (7-8), (7-9), (7-10)

V_{dt} — Lower bound shear strength based on diagonal tension stress for wall or pier, Chapter 7

V_{fre} — Expected story shear strength of the bare steel frame taken as the shear cpacity of the column, Chapter 7

V_g — Shear acting on slab critical section due to gravity loads, Chapter 6

V_i — The total calculated lateral shear force in the direction under consideration in an element or at story *i* due to earthquake response to the selected ground shaking level, as indicated by the selected linear analysis procedure, Equations (2-2), (3-2)

V_{ine} — Expected shear strength of infill panel, Equation (7-15)

V_{mL} — Lower bound shear strength provided by masonry, Equations (7-8), (7-11)

V_n — Nominal shear strength at section, Equation (6-5)

V_o — Shear strength of slab at critical section, Chapter 6

V_{pz} — Panel zone shear, Chapter 5

V_r — Expected shear strength of wall or pier based on rocking shear, Equation (7-4)

V_s — Nominal shear strength provided by shear reinforcement, Chapter 6
The total lateral seismic design force or shear on elements above the isolation system, as prescribed by Section 9.2.4.4.2, Equation (9-9)

V_{sL} — Lower bound shear strength provided by shear reinforcement, Equations (7-8), (7-12)

V_t — Base shear in the building at the target displacement, Chapter 3

V_{tc} — Lower bound shear strength based on toe compressive stress for wall or pier, Chapter 7

V_{test} — Test load at first movement of a masonry unit, Equation (7-2)

V_u — Factored shear force at section, Chapter 6

V_y — Yield strength of the building in the direction under consideration, for use with the NSP, Equation (3-16)

V_{ya} — Nominal shear strength of a member modified by the axial load magnitude, Chapter 5

W — Weight of a component, calculated as specified in this standard, Chapter 2.
Effective seismic weight of a building including total dead load and applicable portions of other gravity loads listed in Section 3.3.1.3.1, Equations (3-10), (3-16)
The total seismic dead load in kips (kN). For design of the isolation system, *W* is the total seismic dead-load weight of the structure above the isolation interface, Equations (9-3), (9-5)

W_D — Energy dissipated in a building or element thereof or energy dissipation device during a full cycle of displacement, Equations (9-24), (9-39)

W_j — Work done by an energy dissipating device, *j*, in one complete cycle corresponding to floor displacement, Equations (9-26), (9-28), (9-29), (9-36), (9-37)

W_k — Maximum strain energy in a frame as calculated by Equation (9-27)

W_{mj} — Work done by device *j* in one complete cycle corresponding to modal floor displacements δ_{mi} Equation (9-33)

W_{mk} — Maximum strain energy in the frame in the *m*-th mode determined using Equation (9-34)

W_p — Component operating weight, Equations (11-1), (11-3), (11-4), (11-5), (11-6)

X — Height of upper support attachment at level *x* as measured from grade, see Equation (11-7)

Y — Time period in years corresponding to a mean return period and probability of exceedance, Equation (1-2)
Height of lower support attachment at level *y* as measured from grade, see Equation (11-7)

Z — Plastic section modulus, Equations (5-1), (5-2), (5-3), (5-4), (5-6)

Z' — Adjusted resistance for mechanical fastener, Chapter 8

a — Parameter used to measure deformation capacity in component load-deformation curves, Figures 2-3, 5-1, 6-1
Clear width of wall between columns, Equations (5-33), (5-34)
Equivalent width of infill strut, Equations (7-14), (7-16), (7-17), (7-18), (7-19)

a' — Parameter used to measure deformation capacity in component load-deformation curve, Figure 2-5

a_p — Component amplification factor from Table 11-2, Equation (11-3)

b — Parameter used to measure deformation capacity in component load-deformation curves, Figures 2-3, 5-1, 6-1
Shear wall length or width, Equations (8-1), (8-2)
Diaphragm width, Equations (8-4), (8-5)
The shortest plan dimension of the rehabilitated building, in ft. (mm), measured perpendicular to *d*, Equations (9-6), (9-7)

ba — Connection dimension, Equations (5-22), (5-23)

b_{bf} — Beam flange width in Equations for Beam-Column Connections in Sections 5.5.2.4.2 and 5.5.2.4.3

b_{cf} — Column flange width in Equations for Beam-Column Connections in Sections 5.5.2.4.2 and 5.5.2.4.3

b_f — Flange width, Tables 5-5, 5-6, 5-7

b_p — Width of rectangular glass, Equation (11-9)

b_t — Connection dimension, Equations (5-24), (5-25)

b_w — Web width, in., Equation (6-4)

c — Parameter used to measure residual strength, Figures 2-3, 5-1, 6-1, 7-1, 8-1

c_1 Size of rectangular or equivalent rectangular column, capital, or bracket measured in the direction of the span for which moments are being determined, in, Section 6.5.4.3
Clearance (gap) between vertical glass edges and the frame, Equation (11-9)

c_2 Clearance (gap) between horizontal glass edges and the frame, Equation (11-9)

d Depth of soil sample for calculation of effective vertical stress, Equation (4-5)
Parameter used to measure deformation capacity, Figures 2-3, 5-1, 6-1, 7-1, 8-1
Distance from extreme compression fiber to centroid of tension reinforcement, in., Equation (6-4)
The longest plan dimension of the rehabilitated building, in ft. (mm), Equations (9-6), (9-7)

d_a Elongation of anchorage at end of wall determined by anchorage details and load magnitude, Equation (8-1)
Deflection at yield of tie-down anchorage or deflection at load level to anchorage at end of wall determined by anchorage details and dead load, in., Equation (8-2)

d_b Overall beam depth, Equations (5-7), (5-8), (5-21), (5-22), (5-23), (5-24), (5-25), (5-26), (5-29)
Nominal diameter of bar, in., Equation (6-3)

d_{bg} Depth of the bolt group, Table 5-5

d_c Column depth, Equation (5-5)

d_i Depth, in feet, of a layer of soils having similar properties, and located within 100 feet of the surface, Equations (1-6), (1-7)

d_v Length of component in the direction of shear force, Equations (7-11), (7-12)

d_w Depth to ground-water level, Equation (4-5)

d_z Overall panel zone depth between continuity plates, Chapter 5

e Length of EBF link beam, Equations (5-28), (5-29), (5-30), (5-32)
Parameter used to measure deformation capacity, Figures 2-3, 5-1, 6-1, 7-1, 8-1
Actual eccentricity, ft. (mm), measured in plan between the center of mass of the structure above the isolation interface and the center of rigidity of the isolation system, plus accidental eccentricity, ft. (mm), taken as 5% of the maximum building dimension perpendicular to the direction of force under consideration, Equations (9-6), (9-7)

e_n Nail deformation at yield load per nail for wood structural panel sheathing, Equations (8-2), (8-4), (8-5)

f_1 Fundamental frequency of the building, Equation (9-24)

f_a Axial compressive stress due to gravity loads specified in Equations (3-3), (7-5), (7-6)

f_{ae} Expected vertical compressive stress, Chapter 7

f_c Compressive strength of concrete, psi, Equations (6-4), (6-5)

f'_{dt} Lower bound masonry diagonal tension strength, Equation (7-5)

f'_{m} Lower bound masonry compressive strength, Equations (7-6), (7-7), (7-9), (7-10), (7-11), (7-13), (7-21)

f_{me} Expected compressive strength of masonry as determined in Section 7.3.2.3

f_{pc} Average compressive stress in concrete due to effective prestress force only (after allowance for all prestress losses), Chapter 6

f_s Stress in reinforcement, psi, Equations (6-2), (6-3)

f'_{t} Lower bound masonry tensile strength, Chapter 7

f_{te} Expected masonry flexural tensile strength as determined in Section 7.3.2.5

f_{vie} Expected shear strength of masonry infill, Equation (7-15)

f_y Yield strength of tension reinforcement, Equations (6-2), (6-3)
Lower bound of yield strength of reinforcing steel, Equations (7-12), (7-13)

fye Expected yield strength of reinforcing steel as determined in Section 7.3.2.8

g Acceleration of gravity (386.1 in./sec.^{2}, or 9,807 mm/sec^2 for SI units), Equations (3-15), (9-2), (9-3), (9-4), (9-5), (9-30)

h Average story height above and below a beam-column joint, Equation (5-17)
Clear height of wall between beams, Equations (5-33), (5-35)
Distance from inside of compression flange to inside of tension flange, Equation (5-7)
Height of member along which deformations are measured, Chapter 6
Overall thickness of member, in, Equation (6-4)
Height of a column, pilaster, or wall, Chapter 7
Shear wall height, Equations (8-1), (8-2)
Average roof elevation of structure, relative to grade elevation, Equation (11-3)

h_c Assumed web depth for stability, Chapter 5
Gross cross-sectional dimension of column core measured in the direction of joint shear, in, Chapter 6

h_{col} Height of column between beam centerlines, Equation (7-14)

h_{eff} Effective height of wall or pier components under consideration, Equations (7-4), (7-5), (7-6)

h_i Height from the base of a building to floor level i, Equations (3-12), (9-9)
Height of story i between two floors at common points of reference, Equation (3-2)

h_{inf} Height of infill panel, Equations (7-14), (7-17), (7-19), (7-20), (7-21)

h_n Height to roof level, ft, Equation (3-7)

h_p Height of rectangular glass, Equation (11-9)

h_x Height from base to floor level x, ft, Equations (3-12), (9-9)

k Exponent used for determining the vertical distribution of lateral forces, Equation (3-12)
Coefficient used for calculation of column shear strength, Chapter 6

k_1 Distance from the center of the split tee stem to the edge of the split tee flange fillet, Equation (5-25)

k_{eff} Effective stiffness of an isolator unit, as prescribed by Equation (9-12), or an energy dissipation unit, as prescribed by Equations (9-23) or (9-38)

k_h Horizontal seismic coefficient in soil acting on retaining wall, Equation (4-11)

k_{sr} Winkler spring stiffness in overturning (rotation) for pile group, expressed as moment/unit rotation, Equation (4-10)

k_{sv} Winkler spring stiffness in vertical direction, expressed as force/unit displacement/unit area, Equation (4-6)
Pile group axial spring stiffness expressed as force/unit displacement, Equation (4-9)

k_v Shear buckling coefficient, Chapter 5

k_{vn} Axial stiffness of nth pile in a pile group, Equation (4-10)

l_b Length of beam, Equation (5-1)
Provided length of straight development, lap splice, or standard hook, in., Equation (6-2)

l_{beff} Assumed distance to infill strut reaction point for beams, Equation (7-18)

l_c Length of column, Equations (5-2), (5-36)

l_{ceff} Assumed distance to infill strut reaction point for columns, Equation (7-16)

l_d Required length of development for a straight bar, in., Equation (6-2)

l_e Length of embedment of reinforcement, in., Equation (6-3)

l_p Length of plastic hinge used for calculation of inelastic deformation capacity, in., Equation (6-6)

l_w Length of entire wall or a segment of wall considered in the direction of shear force, in., Chapter 6

m Modification factor used in the acceptance criteria of deformation-controlled components or elements, indicating the available ductility of a component action, Equations (3-20), (5-9)

m_e Effective m-factor, Equation (5-9)

m_t Value of m-factor for the column in tension, Equation (5-13)

m_x Value of m for bending about x-axis of a member, Equations (5-10), (5-11), (5-13), (6-1)

m_y Value of m for bending about y-axis of a member, Equations (5-10), (5-11), (5-13), (6-1)

n Total number of stories in a vertical seismic framing, Equations (3-12), (3-13)

p_{D+L} Expected gravity stress at test location, Equation (7-2)

q Vertical bearing pressure, Equation (4-8)

q_{allow} Allowable bearing pressure specified in the available design documents for the design of shallow foundations for gravity loads (dead plus live loads), Equation (4-1)

q_c Expected bearing capacity of shallow foundation expressed in load per unit area, Equations (4-1), (4-3), (4-7), (4-8)

q_{in} Expected transverse strength of an infill panel, Equation (7-21)

r Governing radius of gyration, Equation (5-36)

r_{inf} Diagonal length of infill panel, Equation (7-14)

s Spacing of shear reinforcement, Equation (7-12)

s_i Minimum separation distance between adjacent buildings at level i, Equation (2-8)

s_u Undrained shear strength of soil, pounds/ft.^{2}, Chapter 1

$\overline{s_u}$ Average value of the undrained soil shear strength in the upper 100 feet of soil, calculated in accordance with Equation (1-6), pounds/ft.^{2}

t Effective thickness of wood structural panel or plywood for shear, in., Equations (8-2), (8-4), (8-5)

t_a Thickness of angle, Equations (5-21), (5-23)

t_{bf} Thickness of beam flange, Chapter 5

t_{bw} Thickness of beam web, Chapter 5

t_{cf} Thickness of column flange, Chapter 5

t_{cw} Thickness of column web, Chapter 5

t_f Thickness of flange, Equations (5-25), (5-29)

t_{inf} Thickness of infill panel, Equations (7-14), (7-20), (7-21)

t_p Thickness of panel zone including doubler plates, Equation (5-5)
Thickness of flange plate, Equation (5-26)

t_s Thickness of split tee stem, Equations (5-24), (5-25)

t_w Thickness of web, Equations (5-7), (5-29)
Thickness of plate wall, Equation (5-33)
Thickness of wall web, in., Chapter 6

t_z Thickness of panel zone (doubler plates not necessarily included), Chapter 5

v Maximum shear in the direction under consideration, Equation (8-5)

v_{me} Expected masonry shear strength, Equation (7-1)
Expected masonry bed-joint sliding shear strength, Equation (7-3)

v_{te} Average bed-joint shear strength, Equation (7-1)

v_{to} Bed-joint shear stress from single test, Equation (7-2)

v_y Shear at yield in the direction under consideration in lb./ft., Equations (8-1), (8-2), (8-3), (8-4), (8-5)

w Water content of soil, calculated as the ratio of the weight of water in a unit volume of soil to the weight of soil in the unit volume, expressed as a percentage, Section 1.6.1.4.1
Length of connection member, see Equations (5-23), (5-25)

w_i Portion of the effective seismic weight corresponding to floor level *i*, Equations (3-12), (3-13), (9-9)

w_x Portion of the effective seismic weight corresponding to floor level *x*, Equations (3-12), (3-13), (9-9)

w_z Width of panel zone between column flanges, Chapter 5

x Elevation in structure of component relative to grade elevation, Equation (11-3)

y The distance, in ft. (mm), between the center of rigidity of the isolation system rigidity and the element of interest, measured perpendicular to the direction of seismic loading under consideration, Equations (9-6), (9-7)

Δ Generalized deformation, Figures 2-3, 2-5, 5-1, 6-1, 8-1
Total elastic and plastic displacement, Chapter 5
Calculated deflection of diaphragm, wall, or bracing element, in.

Δ^- Negative displacement amplitude, in. (mm), of an isolator or energy dissipation unit during a cycle of prototype testing, Equations (9-12), (9-13), (9-38)

Δ^+ Positive displacement amplitude, in. (mm), of an isolator or energy dissipation unit during a cycle of prototype testing, Equations (9-12), (9-13), (9-38)

Δ_{ave} Average displacement of an energy dissipation unit during a cycle of prototype testing, equal to $(|\Delta^+| + |\Delta^-|)/2$, Equation (9-39)

Δ_d Diaphragm deformation, Equations (3-8), (3-9)

Δ_{eff} Differentiated displacement between the top and bottom of the wall or pier components under consideration over a height, h_{eff}, Figure 7-1

$\Delta_{fallout}$ Relative seismic displacement (drift) causing glass fallout from the curtain wall, storefront, or partition, as determined in accordance with an approved engineering analysis method, Equations (11-10), (11-11)

Δ_i Inter-story displacement (drift) of story *i* divided by the story height, Chapter 5

Δ_{i1} Estimated lateral deflection of building 1 relative to the ground at level *i*, Equation (2-8)

Δ_{i2} Estimated lateral deflection of building 2 relative to the ground at level *i*, Equation (2-8)

Δ_{inf} Deflection of infill panel at mid-length when subjected to transverse loads, Equation (7-20)

Δp Additional earth pressure on retaining wall due to earthquake shaking, Equation (4-11)

Δ_w Average in-plane wall displacement, Equation (3-8)

Δ_y Generalized yield deformation, unitless, Figure 5-1
Calculated deflection of diaphragm, shear wall, or bracing element at yield, see Equations (8-1), (8-2), (8-3), (8-4), (8-5)

$\Sigma(\Delta_c X)$ Sum of individual chord-splice slip values on both sides of the diaphragm, each multiplied by its distance to the nearest support, Equations (8-4), (8-5)

ΣE_D Total energy dissipated, in in-kips, in the isolation system during a full cycle of response at the design displacement, D_D, Equation (9-18)

ΣE_M Total energy dissipated, in in-kips, in the isolation system during a full cycle of response at the maximum displacement, D_M, Equation (9-19)

$\Sigma|F^+_D|_{max}$ Sum, for all isolator units, of the maximum absolute value of force, in kips (kN), at a positive displacement equal to D_D, Equation (9-14)

$\Sigma|F^+_D|_{min}$ Sum, for all isolator units, of the minimum absolute value of force, in kips (kN), at a positive displacement equal to D_D, Equation (9-15)

$\Sigma|F^+_M|_{max}$ Sum, for all isolator units, of the maximum absolute value of force, in kips (kN), at a positive displacement equal to D_M, Equation (9-16)

$\Sigma|F^+_M|_{min}$ Sum, for all isolator units, of the minimum absolute value of force, in kips (kN), at a positive displacement equal to D_M, Equation (9-17)

$\Sigma|F^-_D|_{max}$ Sum, for all isolator units, of the maximum absolute value of force, in kips (kN), at a negative displacement equal to D_D, Equation (9-14)

$\Sigma|F^-_D|_{min}$ Sum, for all isolator units, of the minimum absolute value of force, in kips (kN), at a negative displacement equal to D_D, Equation (9-15)

$\Sigma|F^-_M|_{max}$ Sum, for all isolator units, of the maximum absolute value of force, in kips (kN), at a negative displacement equal to D_M, Equation (9-16)

$\Sigma|F^-_M|_{min}$ Sum, for all isolator units, of the minimum absolute value of force, in kips (kN), at a negative displacement equal to D_M, Equation (9-17)

α Ratio of post-yield stiffness to effective stiffness, Equation (3-17)
Factor equal to 0.5 for fixed-free cantilevered shear wall, or 1.0 for fixed-fixed pier, Equation (7-4)
Velocity exponent for a fluid viscous device in Equation (9-25)

β Modal damping ratio, Table 1-6
Factor to adjust fundamental period of the building, Equation (3-7)
Ratio of expected frame strength, v_{fre}, to expected infill strength, v_{ine}, Chapter 7
Damping inherent in the building frame (typically equal to 0.05), Equations (9-26), (9-28), (9-30)

β_b Equivalent viscous damping of a bilinear system, Chapter 9

β_D Effective damping of the isolation system at the design displacement, as prescribed by Equation (9-18))

β_{eff} Effective damping of isolator unit, as prescribed by Equation (9-13), or an energy dissipation unit, as prescribed by Equation (9-39); also used for the effective damping of the building, as prescribed by Equations (9-26), (9-28), (9-30), (9-31), (9-32), (9-36)

$\beta_{eff\text{-}m}$ Effective damping in m-th mode prescribed by Equation (9-33)

β_M Effective damping of the isolation system at the maximum displacement, as prescribed by Equation (9-19))

β_m m-th mode damping in the building frame, Equation (9-33)

γ Unit weight, weight/unit volume (pounds/ft^3 or N/m^3), Equation (4-4)
Coefficient for calculation of joint shear strength, Equation (6-5)

γ_f Fraction of unbalanced moment transferred by flexure at slab-column connections, Chapter 6

γ_t Total unit weight of soil, Equations (4-5), (4-11)

γ_w Unit weight of water, Equation (4-5)

δ_i Lateral drift in story i, in the direction under consideration, at its center of rigidity, using the same units as for measuring h_i, Equation (3-2)
Displacement at floor i, Equations (9-26), (9-27)

δ_{mi} m-th mode horizontal displacement at floor i, Equation (9-34)

δ_{mrj} m-th relative displacement between the ends of device j along its axis, Equation (9-35)

δ_{rj} Relative displacement between the ends of energy dissipating device j along the axis of the device, Equations (9-29), (9-37)

δ_t Target displacement, Figure 3-1

δ_{xA} Deflection at level x of Building A, determined by an elastic analysis as defined in Chapter 3, Equations (11-7), (11-8)

δ_{xB} Deflection at level x of Building B, determined by an elastic analysis as defined in Chapter 3, Equation (11-8)

δ_{yA} Deflection at level y of Building A, determined by an elastic analysis as defined in Chapter 3, Equation (11-7)

η Displacement multiplier, greater than 1.0, to account for the effects of torsion, Equation (3-1)

θ Generalized deformation, radians, Figures 5-1, 6-1
Angle between infill diagonal and horizontal axis, $\tan\theta = h_{inf}/L_{inf}$, radians, see Equation (7-14)

θ_b Angle between lower edge of compressive strut and beam, radians, Equations (7-18), (7-19)

θ_c Angle between lower edge of compressive strut and column, radians, Equations (7-16), (7-17)

θ_i Stability coefficient indicative of the stability of a structure under gravity loads and earthquake-induced deflection, Equation (3-2)
Inter-story drift ratio, radians, Chapter 5

θ_j Angle of inclination of energy dissipation device, Equation (9-30)

θ_y Generalized yield deformation, radians, Figure 5-1
Yield rotation, radians, Equations (5-1), (5-2), (5-30), (5-35), (6-6)

κ A knowledge factor used to reduce component strength based on the level of knowledge obtained for individual components during data collection, Equations (3-20), (3-21), (6-1)

λ Correction factor related to unit weight of concrete, Equation (6-5)

λ_1 Coefficient used to determine equivalent width of infill strut, Equation (7-14)

λ_2 Infill slenderness factor, Equation (7-21)

λ_p Limiting slenderness parameter for compact element, Chapter 5

λ_r Limiting slenderness parameter for noncompact element, Chapter 5

μ Coefficient of shear friction, Chapter 6

ν Poisson’s ratio of soil, Equation (4-4)

v_s	Shear wave velocity in soil, in feet/sec., Section 1.6.1.4.1 Shear wave velocity at low strains, Equation (4-4)
$\overline{v_s}$	Average value of the soil shear wave velocity in the upper 100 feet of soil, calculated in accordance with Equation (1-6), feet/sec.
ρ	Ratio of non-prestressed tension reinforcement, Chapter 6
ρ_{bal}	Reinforcement ratio producing balanced strain conditions, Chapter 6
ρ_g	Ratio of area of total wall or pier vertical plus horizontal reinforcement to area of wall or pier cross-section, Chapter 7
ρ_{lp}	Yield deformation of a link beam, Chapter 5
ρ_n	Ratio of distributed shear reinforcement in a plane perpendicular to the direction of the applied shear, Chapter 6
ρ'	Ratio of non-prestressed compression reinforcement, Chapter 6
ρ''	Reinforcement ratio for transverse joint reinforcement, Chapter 6
σ	Standard deviation of the variation of the material strengths, Chapter 2
σ'_o	Effective vertical stress, Equation (4-5)
ϕ	Strength reduction factor
ϕ_i	Modal displacement of floor *i*, see Equation (9-30)
ϕ_{rj}	Relative modal displacement in horizontal direction of energy dissipation device *j*, Equation (9-30)
χ	A factor to calculate horizontal seismic force, F_p, Equations (2-6), (2-7)
ω_1	Fundamental angular frequency equal to $2\pi f_1$, Equation (9-24)