Chapter 2 Commentary

GLOSSARY AND NOTATIONS

2.1 GLOSSARY:

Active Fault: A fault for which there is an average historic slip rate of 1mm per year or more and geographic evidence of seismic activity within Holocene times (past 11,000 years).

Addition: An increase in the *building* area, aggregate floor area, height, or number of stories of a *structure*.

Adjusted Resistance (*D'*): The reference resistance adjusted to include the effects of all applicable adjustment factors resulting from end use and other modifying factors. Time effect factor (λ) adjustments are not included.

Alteration: Any construction or renovation to an existing *structure* other than an *addition*.

Appendage: An architectural *component* such as a canopy, marquee, ornamental balcony, or statuary.

Approval: The written acceptance by the authority having jurisdiction of documentation that establishes the qualification of a material, system, *component*, procedure, or person to fulfill the requirements of the *Provisions* for the intended use.

Architectural Component Support: Those structural members or assemblies of members, including braces, frames, struts and attachments, that transmit all loads and forces between architectural systems, *components*, or elements and the *structure*.

Attachments: Means by which *components* and their supports are secured and connected to the *seismic-force-resisting system* of the structure. Such *attachments* include anchor bolts, welded connections, and mechanical fasteners.

Base: The level at which the horizontal seismic ground motions are considered to be imparted to the *structure*.

Base Shear: Total design lateral force or shear at the *base.*

Basement: A *basement* is any story below the lowest *story* above grade.

Boundary Elements: *Diaphragm* and *shear wall boundary members* to which sheathing transfers forces. *Boundary members* include chords and drag *struts* at *diaphragm* and *shear wall* perimeters, interior openings, discontinuities, and re-entrant corners.

Braced Wall Line: A series of *braced wall panels* in a single *story* that meets the requirements of Sec. 12.5.2.

Braced Wall Panel: A section of *wall* braced in accordance with Sec. 12.5.2.

Building: Any *structure* whose use could include shelter of human occupants.

Boundary Members: Portions along *wall* and *diaphragm* edges strengthened by longitudinal and transverse reinforcement and/or structural steel members.

Cantilevered Column System: A *seismic-force-resisting system* in which lateral forces are resisted entirely by columns acting as cantilevers from the foundation.

Component: A part or element of an architectural, electrical, mechanical, or structural system.

> **Component, Equipment:** A mechanical or electrical *component* or element that is part of a mechanical and/or electrical system within or without a *building* system.
>
> **Component, Flexible:** *Component,* including its *attachments,* having a fundamental period greater than 0.06 sec.
>
> **Component, Rigid:** *Component,* including its *attachments,* having a fundamental period less than or equal to 0.06 sec.

Concrete:

> **Plain Concrete:** *Concrete* that is either unreinforced or contains less reinforcement than the minimum amount specified in ACI 318 for *reinforced concrete.*
>
> **Reinforced Concrete:** *Concrete* reinforced with no less than the minimum amount required by ACI 318, prestressed or non-prestressed, and designed on the assumption that the two materials act together in resisting forces.

Confined Region: The portion of *reinforced concrete component* in which the concrete is confined by closely spaced *special transverse reinforcement* restraining the concrete in directions perpendicular to the applied stress.

Construction Documents: The written, graphic, electronic, and pictorial documents describing the design, locations, and physical characteristics of the project required to verify compliance with the *Provisions*.

Container: A large-scale independent *component* used as a receptacle or a vessel to accommodate plants, refuse, or similar uses.

Coupling Beam: A beam that is used to connect adjacent concrete *wall* piers to make them act together as a unit to resist lateral loads.

Damping Device: A flexible structural element of the *damping* system that dissipates energy due to relative motion of each end of the device. *Damping devices* include all pins, bolts gusset plates, brace extensions, and other components required to connect damping devices to the other elements of the *structure. Damping devices* may be classified as either displacement-dependent or velocity-dependent, or a combination thereof, and may be configured to act in either a linear or nonlinear manner.

Damping System: The collection of structural elements that includes all the individual *damping devices,* all structural elements or bracing required to transfer forces from *damping devices* to the

base of the *structure,* and the structural elements required to transfer forces from damping *devices* to the *seismic-force-resisting system*.

Deformability: The ratio of the ultimate *deformation* to the limit *deformation.*

> **High Deformability Element:** An element whose *deformability* is not less than 3.5 when subjected to four fully reversed cycles at the limit *deformation*.
>
> **Limited Deformability Element:** An element that is neither a low *deformability* nor a high deformability element.

Low Deformability Element: An element whose *deformability* is 1.5 or less.

Deformation:

> **Limit Deformation:** Two times the initial *deformation* that occurs at a load equal to 40 percent of the maximum strength.
>
> **Ultimate Deformation:** The *deformation* at which failure occurs and which shall be deemed to occur if sustainable load reduces to 80 percent or less of the maximum strength.

Design Earthquake Ground Motion: The earthquake effects that *buildings* and *structures* are specifically proportioned to resist as defined in Sec. 4.1.

Design Earthquake: Earthquake effects that are two-thirds of the corresponding *maximum considered earthquake.*

Designated Seismic System: Those architectural, electrical, and mechanical systems and their *components* that require design in accordance with Sec. 6.1 and that have a *component* importance factor (I_p) greater than 1.

Diaphragm: A roof, floor, or other membrane system acting to transfer lateral forces to the vertical resisting elements. *Diaphragms* are classified as either flexible or rigid according to the requirements of Sec. 5.2.3.1 and 12.4.1.1.

Diaphragm, Blocked: A *diaphragm* in which all sheathing edges not occurring on a framing member are supported on and fastened to blocking.

Diaphragm Boundary: A location where shear is transferred into or out of the *diaphragm* sheathing. Transfer is either to a *boundary element* or to another free-resisting element.

Diaphragm Cord: A *diaphragm boundary element* perpendicular to the applied load that is assumed to take axial stresses due to the *diaphragm* moment in a manner analogous to the flanges of a beam. Also applies to *shear walls.*

Displacement:

> **Design Displacement:** The *design earthquake* lateral *displacement,* excluding additional *displacement* due to actual and accidental torsion, required for design of the *isolation system*.

Total Design Displacement: The *design earthquake* lateral *displacement,* including additional *displacement* due to actual and accidental torsion, required for design of the *isolation system* or an element thereof.

Total Maximum Displacement: The *maximum considered earthquake* lateral *displacement,* including additional *displacement* due to actual and accidental torsion, required for verification of the stability of the *isolation system* or elements thereof, design of *structure* separations, and vertical load testing of *isolator unit* prototypes.

Displacement-Dependent Damping Device: The force response of a *displacement-dependent damping device* is primarily a function of the relative displacement between each end of the device. The response is substantially independent of the relative velocity between each end of the device and/or the excitation frequency.

Displacement Restraint System: A collection of structural elements that limits lateral *displacement* of seismically isolated structures due to *maximum* considered *earthquake* ground shaking.

Drag Strut (Collector, Tie, Diaphragm Strut): A *diaphragm* or *shear wall boundary element* parallel to the applied load that collects the transfered *diaphragm* shear forces to the vertical-force-resisting elements or distributes forces within the *diaphragm or shear wall.* A *drag strut* often is an extension of a *boundary element* that transfers forces into the *diaphragm or shear wall.*

Effective Damping: The value of equivalent viscous damping corresponding to energy dissipated during cyclic response of the *isolation system*.

Effective Stiffness: The value of lateral force in the *isolation system*, or an element thereof, divided by the corresponding lateral *displacement.*

Enclosure: An interior space surrounded by *walls.*

Equipment Support: Those structural members or assemblies of members or manufactured elements, including braces, frames, legs, lugs, snuggers, hangers or saddles, that transmit *gravity load* and operating load between the equipment and the *structure.*

Essential Facility: A facility or structure required for post-earthquake recovery.

Factored Resistance ($\lambda\phi$ D): *Reference resistance* multiplied by the time effect and resistance factors. This value must be adjusted for other factors such as size effects, moisture conditions, and other end-use factors.

Flexible Equipment Connections: Those connections between equipment *components* that permit rotational and/or transitional movement without degradation of performance. Examples included universal joints, bellows expansion joints, and flexible metal hose.

Frame:

Braced Frame: An essentially vertical truss, or its equivalent, of the concentric or eccentric type that is provided in a *building frame system* or *dual frame system* to resist shear.

Concentrically Braced Frame (CBF): A *braced frame* in which the members are subjected primarily to axial forces.

Eccentrically Braced Frame (EBF): A diagonally *braced frame* in which at least one end of each brace frames into a beam a short distance from a beam-column joint or from another diagonal brace.

Ordinary Concentrically Braced Frame (OCBF): A steel *concentrically braced frame* in which members and connections are designed in accordance with the provisions of AISC Seismic without modification.

Special Concentrically Braced Frame (SCBF): A steel or composite steel and concrete *concentrically braced frame* in which members and connections are designed for ductile behavior

Moment Frame: A frame provided with restrained connections between the beams and columns to permit the frame to resist lateral forces through the flexural rigidity and strength of its members.

Intermediate Moment Frame: A *moment frame* of reinforced concrete meeting the detailing requirements of ACI 318, of structural steel meeting the detailing requirements of AISC Seismic, or of composite construction meeting the requirements of AISC Seismic.

Ordinary Moment Frame: A *moment frame* or reinforced concrete conforming to the requirements of ACI 318 exclusive of Chapter 21, of structural steel meeting the detailing requirements of AISC Seismic or of composite construction meeting the requirements of AISC Seismic

Special Moment Frame: A *moment frame* of reinforced concrete meeting the detailing requirements of ACI 318, of structural steel meeting the detailing requirements of AISC Seismic, or of composite construction meeting the requirements of AISC Seismic.

Frame System:

Building Frame System: A structural system with an essentially complete *space frame system* providing support for vertical loads. Seismic-force resistance is provided by *shear walls* or *braced frames.*

Dual Frame System: A structural system with an essentially complete *space frame system* providing support for vertical loads. Seismic force resistance is provided by a *moment resisting frame* and *shear walls* or *braced frames* as prescribed in Sec. 5.2.2.1

Space Frame System: A structural system composed of interconnected members, other than *bearing walls*, that is capable of supporting vertical loads and that also may provide resistance to shear.

Glazed Curtain Wall: A *nonbearing wall* that extends beyond the edges of the building floor slabs and includes a glazing material installed in the curtain wall framing.

Glazed Storefront: A *nonbearing wall* that is installed between floor slabs typically including entrances and includes a glazing material installed in the storefront framing.

Grade Plane: A reference plane representing the average of the finished ground level adjoining the *structure* at the exterior *walls*. Where the finished ground level slopes away from the exterior walls, the reference plane shall be established by the lowest points within the area between the *buildings* and the lot line or, where the lot line is more than 6 ft (1829 mm) from the *structure,* between the *structure* and a point 6 ft (1829 mm) from the *structure*.

Hazardous Contents: A material that is highly toxic or potentially explosive and in sufficient quantity to pose a significant life-safety threat to the general public if an uncontrolled release were to occur.

High Temperature Energy Source: A fluid, gas, or vapor whose temperature exceeds 220 degrees F (378 K).

Inspection, Special: The observation of the work by the *special inspector* to determine compliance with the approved *construction documents* and the *Provisions*.

> **Continuous Special Inspection:** A full-time observation of the work by an approved *special inspector* who is present in the area where work is being performed.
>
> **Periodic Special Inspection:** The part-time or intermittent observation of the work by an approved *special inspector* who is present in the area where work has been or is being performed.

Inspector, Special (who shall be identified as the Owner's Inspector): A person approved by the authority having jurisdiction as being qualified to perform *special inspection* required by the approved *quality assurance plan.* The quality assurance personnel of a fabricator is permitted to be approved by the authority having jurisdiction as a *special inspector*.

Inverted Pendulum Type Structures: *Structures* that have a large portion of their mass concentrated near the top and, thus, have essentially one degree of freedom in horizontal translation. The *structures* are usually T-shaped with a single column supporting the beams or framing at the top.

Isolation Interface: The boundary between the upper portion of the *structure,* which is isolated, and the lower portion of the *structure,* which moves rigidly with the ground.

Isolation System: The collection of structural elements that includes all individual *isolator units,* all structural elements that transfer force between elements of the *isolation system,* and all connections to other structural elements. The *isolation system* also includes the *wind-restraint system,* energy-dissipation devices, and/or the *displacement restraint system* if such systems and devices are used to meet the design the requirements of Chapter 13.

Isolator Unit: A horizontally flexible and vertically stiff structural element of the *isolation system* that permits large lateral *deformations* under design seismic load. An *isolator unit* is permitted to be used either as part of or in addition to the weight-supporting system of the *structure.*

Joint: The portion of a *column* bounded by the highest and lowest surfaces of the other members framing into it.

Load:

Dead Load: The *gravity load* due to the weight of all permanent structural and nonstructural *components* of a *building* such as *walls,* floors, roofs, and the operating weight of fixed service equipment.

Gravity Load (W): The total *dead load* and applicable portions of other loads as defined in Sec. 5.4.1.

Live Load: The load superimposed by the use and occupancy of the *building* not including the wind load, earthquake load, or *dead load*; see Sec. 5.4.1.

Maximum Considered Earthquake Ground Motion: The most severe earthquake effects considered by the *Provisions* as defined in Sec. 4.1.

Nonbuilding Structure: A *structure,* other than a *building,* constructed of a type included in Chapter 14 and within the limits of Sec. 14.1.1.

Occupancy Importance Factor: A factor assigned to each *structure* according to its *Seismic Use Group* as prescribed in Sec. 1.4.

Owner: Any person, agent, firm, or corporation having a legal or equitable interest in the property.

Partition: A nonstructural interior *wall* that spans from floor to ceiling, to the floor or roof structure immediately above, or to subsidiary structural members attached to the *structure* above.

P-Delta Effect: The secondary effect on shears and moments of structural members induced due to *displacement* of the *structure.*

Quality Assurance Plan: A detailed written procedure that establishes the systems and *components* subject to *special inspection* and testing.

Reference Resistence: The resistence (force or moment as appropriate) of a member or connection computed at the reference end use conditions.

Registered Design Professional: An architect or engineer registered or licensed to practice professional architecture or engineering as defined by statuary requirements of the professional registrations laws of the state in which the project is to be constructed.

Roofing Unit: A unit of roofing material weighing more than 1 pound (0.5 kg).

Seismic Design Category: A classification assigned to a *structure* based on its *Seismic Use Group* and the severity of the *design earthquake ground motion* at the site.

Seismic-Force-Resisting System: That part of the structural system that has been considered in the design to provide the required resistence to the *shear wall* prescribed herein.

Seismic Forces: The assumed forces prescribed herein, related to the response of the *structure* to earthquake motions, to be used in the design of the *structure* and its *components.*

Seismic Response Coefficient: Coefficient C_s as determined from Sec. 5.4.1.

Seismic Use Group: A classification assigned to the *structure* based on its use as defined in Sec. 1.3.

Shallow Anchors: Anchors with embedment length-to-diameter ratios of less than 8.

Shear Panel: A floor, roof, or *wall component* sheathed to act as a *shear wall* or *diaphragm.*

Site Class: A classification assigned to a site based on the types of soils present and their engineering as defined in Sec. 4.1.2.

Site Coefficients: The values of F_a and F_v indicated in Tables 4.1.2.4a and 4.1.2.4b, respectively.

Special Transverse Reinforcement: Reinforcement composed of spirals, closed stirrups, or hoops and supplementary cross-ties provided to restrain the concrete and qualify the portion of the *component,* where used, as a confined region.

Storage Racks: Include industrial pallet racks, moveable shelf racks, and stacker racks made of cold-formed and hot-rolled structural members. Does not include other types of racks such as drive-in and drive-through racks, cantilever racks, portable racks, or racks made of materials other than steel.

Story: The portion of a *structure* between the top to top of two successive finished floor surfaces and, for the topmost story. From the top of the floor finish to the top of the roof structural element.

Story Above Grade: Any *story* having its finished floor surface entirely above grade, except that a *story* shall be considered as the *story above grade* where the finished floor surface of the *story* immediately above is more than 6 ft (1829 mm) above the *grade plane,* more than 6 ft (1829 mm) above the finished ground level for more than 40 percent of the total *structure* perimeter, or more than 12 ft (3658 mm) above the finished ground level at any point. This definition is illustrated in Figure 2.1.

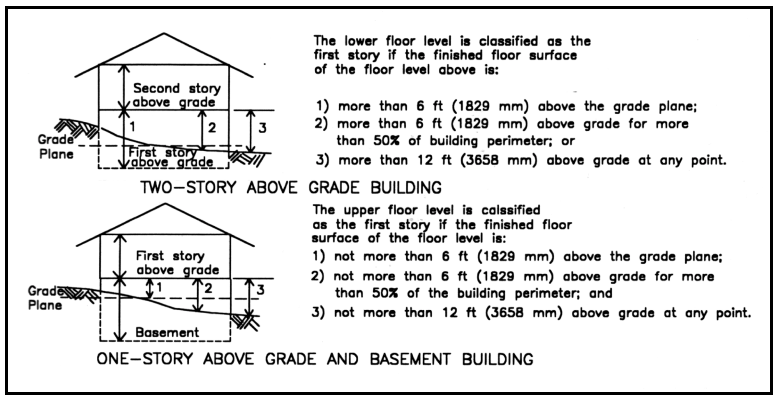

FIGURE 2.1 Definition of story above grade.

Story Drift Ratio: The *story* drift, as determined in Sec. 5.4.6, divided by the *story* height.

Story Shear: The summation of design lateral forces at levels above the *story* under consideration.

Strength:

Design Strength: *Nominal strength* multiplied by the strength reduction factor, ϕ.

Nominal Strength: Strength of a member or cross section calculated in accordance with the requirements and assumptions of the strength design methods of the *Provisions* (or the reference standards) before application of any strength reduction factors.

Required Strength: Strength of a member, cross section, or connection required to resist factored loads or related internal moments and forces in such combinations as stipulated by the *Provisions.*

Structure: That which is built or constructed and limited to *buildings* and *nonbuilding structures* as defined herein.

Structural Observations: The visual observations performed by the *registered design professional* in responsible charge (or another *registered design professional)* to determine that the *seismic-force-resisting system* is constructed in general conformance with the *construction documents.*

Wood Structural Panel: A wood-based panel product that meets the requirements of PS 1 or PS 2 and is bonded with a waterproof adhesive. Included under this designation is plywood, oriented strand board, and composite panels.

Subdiaphragm: A portion of a diaphragm used to transfer *wall* anchorage forces to the *diaphragm* cross ties.

Testing Agency: A company or corporation that provides testing and/or inspection services. The person in responsible charge of the *special inspector(s)* and the testing services shall be a *registered design professional*.

Tie-Down (Hold-Down): A device used to resist uplift of the chords of *shear walls*. These devices are intended to resist load without significant slip between the device and the *shear wall* chord or be shown with cyclic testing to not reduce the *wall* capacity and ductility.

Time Effect Factor: A factor applied to the adjusted resistence to account for effects of duration load.

Torsional Force Distribution: The distribution of horizontal *shear wall* through the rigid *diaphragm* when the center of the mass of the *structure* at the level under consideration does not coincide with the center of the rigidity (sometimes referred to as diaphragm rotation).

Toughness: The ability of a material to absorb energy without losing significant *strength.*

Utility or Service Interface: The connection of the *structure's* mechanical and electrical distribution systems to the utility or service company's distribution system.

Velocity-Dependent Damping Device: The force-displacement relation for a *velocity-dependent damping device* is primarily a function of the relative velocity between each end of the device and also may be a function of the relative displacement between each end of the device.

Veneers: Facings or ornamentations of brick, concrete, stone, tile, or similar materials attached to a backing.

Wall: A *component* that has a slope of 60 degrees or greater with the horizontal plane used to enclose or divide space.

Bearing Wall: An exterior or interior *wall* providing support for vertical loads.

Cripple Wall: A framed stud *wall*, less than 8 ft (2400 mm) in height, extending from the top of the foundation to the underside of the lowest floor framing. *Cripple walls* can occur in both engineered *structures* and conventional construction.

Light-Framed Wall: A *wall* with wood or steel studs.

Light-Framed Wood Shear Wall: A *wall* constructed with wood studs and sheathed with material rated for shear resistance.

Nonbearing Wall: An exterior or interior *wall* that does not provide support for vertical loads other than its own weight or as permitted by the building code administered by the authority having jurisdiction.

Nonstructural Wall: All walls other than *bearing walls* or *shear walls*.

Shear Wall (Vertical Diaphragm): A *wall* designed to resist lateral forces parallel to the plane of the *wall* (sometimes referred to as a vertical *diaphragm).*

Wall System, Bearing: A structural system with *bearing walls* providing support for all or major portions of the vertical loads. *Shear walls* or *braced frames* provide seismic-force resistance.

Wind-Restraint System: The collection of structural elements that provides restraint of the seismic-isolated *structure* for wind loads. The *wind-restraint system* may be either an integral part of *isolator units* or a separate device.

2.2 NOTATIONS:

A, B, C, D, E, F	*Site classes* as defined in Sec. 4.1.2.
A_b	Area (in.^{2} or mm^2) of anchor bolt or stud in Chapters 6 and 11.
A_{ch}	Cross sectional-area (in.^{2} or mm^2) of a *component* measured to the outside of the special lateral reinforcement.
A_n	Net-cross sectional area of masonry (in.^{2} or mm^2) in Chapter 11.
A_o	The area of the load-carrying foundation (ft^2 or m^2).
A_p	Projected area on the masonry surface of a right circular cone for anchor bolt allowable shear and tension calculations (in.^{2} or mm^2) in Chapter 11.
A_s	The area of an assumed failure surface taken as a pyramid in Eq. 2.4.1-3 or in Chapter 9.
A_s	Cross-sectional area of reinforcement (in.^{2} or mm^2) in Chapters 6 and 11.

A_{sh}	Total cross-sectional area of hoop reinforcement (in.^{2} or mm^2), including supplementary cross-ties, having spacing of s_h and crossing a section with a core dimension of h_c.
A_{vd}	Required area of leg (in.^{2} or mm^2) of diagonal reinforcement.
A_x	The torsional amplification factor.
a_b	Length of compressive stress block (in. or mm) in Chapter 11.
a_d	The incremental factor related to *P-delta effects* in Sec. 5.4.5.
a_p	The *component* amplification factor as defined in Sec. 6.1.3.
B_a	Nominal axial strength of an anchor bolt (lb or N) in Chapter 11.
B_D	Numerical coefficient as set forth in Table 13.3.3.1 for effective damping equal to β_D.
B_{ID}	Numerical coefficient as set forth in Table 13A.3.1 for effective damping equal to β_{ml} (m=1) and period of *structure* equal to T_{11}.
B_m	Numerical coefficient as set forth in Table 13.3.3.1 for effective damping equal β_M
B_{IM}	Numerical coefficient as set forth in Table 13A.3.1 for effective damping equal to β_{mM} (m=1) and period of *structure* equal to T_{IM}.
B_{mD}	Numerical coefficient as set forth in Table 13A.3.1 for effective damping equal to β_{ml} and period of *structure* equal to T_m.
B_{mM}	Numerical coefficient as set forth in Table 13A.3.1 for effective damping equal to β_{mM} and period of *structure* equal to T_m.
B_R	Numerical coefficient as set forth in Table 13A.3.1 for effective damping equal to β_R and the period of *structure* equal to T_R.
B_v	Nominal shear strength of an anchor bolt (lb or N) in Chapter 11.
$B_{V\text{-}1}$	Numerical coefficient as set forth in Table 13A.3.1 for effective damping equal to the sum of viscous damping in the fundamental mode of vibration of the *structure* in the direction of interest, β_{Vm} (m = 1), plus inherent damping, β_l, and period of *structure* equal to T_1.
b	The shortest plan dimension of the *structure*, in ft (mm), measured perpendicular to d.
b_a	Factored axial force on an anchor bolt (lb or N) in Chapter 11.
b_v	Factored shear force on an anchor bolt (lb or N) in Chapter 11.
b_w	Web width (in.or mm) in Chapter 11.

C_u	Coefficient for upper limit on calculated period; see Table 5.4.2.
C_d	The deflection amplification factor as given in Table 5.2.2.
C_{mFD}	Force coefficient as set forth in Table 13A.7.3.2.1.
C_{mFV}	Force coefficient as set forth in Table 13A.7.3.2.2.
C_s	The *seismic response coefficient* (dimension-less) determined in Sec. 5.4.1.1.
C_{S1}	Seismic response coefficient (dimension-less) of the fundamental mode of vibration of the *structure* in the direction of interest. Sec. 13A.4.3.4 or Sec. 13A.5.3.4 (m = 1).
C_{sm}	The modal *seismic response coefficient* (dimension-less) determined in Sec. 5.5.4..
C_{Sm}	*Seismic response coefficient* (dimension-less) of the m^{th} mode of vibration of the *structure* in the direction of interest, Sec. 13A.5.3.4 (m = 1) or Sec. 13A.5.3.6 (m > 1).
C_{SR}	*Seismic response coefficient* (dimension-less) of the residual mode of vibration of the *structure* in the direction of interest, Sec. 13A.4.3.8.
C_{vx}	The vertical distribution factor as determined in Sec. 5.4.3.
c	Distance from the neutral axis of a flexural member to the fiber of maximum compressive strain (in. or mm).
c_{eq}	Effective energy dissipation device damping coefficient (Eq. 13.3.2.1).
D	Reference resistance in Chapter 12.
D	The effect of *dead load* in Sec. 5.2.7 and Chapter 13.
D	Adjusted resistance in Chapter 12.
D_D	*Design displacement* (in. or mm) at the center of rigidity of the *isolation system* in the direction under consideration as prescribed by Eq. 13.3.3.1.
D_D'	*Design displacement* (in. or mm), at the center of rigidity of the *isolation system* in the direction under consideration, as prescribed by Eq. 13.4.2-1.
D_{1D}	Fundamental mode *design displacement* at the center rigidity of the roof level of *structure* in the direction under consideration, Sec. 13A.4.4.3 (in. or mm).
D_{1M}	Fundamental mode *maximum displacement* at the center of rigidity of the roof level of the *structure* in the direction under consideration, Sec. 13A.4.4.6 (in. or mm).

D_{mD}	*Design displacement* at the center of rigidity of the roof level of the *structure* due to the m^{th} mode of vibration in the direction under consideration, Sec. 13A.5.4.3 (in. or mm).
D_{mM}	*Maximum displacement* at the center of rigidity of the roof level of the *structure* due to the m^{th} mode of vibration in the direction under consideration, Sec. 13A.5.4.6 (in. or mm).
D_M	Maximum *displacement* (in. or mm), at the center of rigidity of the *isolation system* in the direction under consideration as prescribed by Eq. 13.3.3.3.
D_M	*Maximum displacement* (in. or mm), at the center of rigidity of the *isolation system* in the direction under consideration as prescribed by Eq. 13.4.2-2.
D_p	Relative seismic *displacement* that the *component* must be designed to accommodate as defined in Sec. 6.1.4.
D_{RD}	Residual mode *design displacement* at the center of rigidity of the roof level of the *structure* in the direction under consideration, Sec. 13A.4.4.3 (in. or mm).
D_{RM}	Residual mode *maximum displacement* at the center of rigidity of the roof level of the *structure* in the direction under consideration, Sec. 13A.4.4.6 (in. or mm).
D_s	The total depth of the stratum in Eq. 5.8.2.1.2-4 (ft or m).
D_Y	Displacement at the center of rigidity of the roof level of the *structure* at the effective yield point of the *seismic-force-resisting system*, Sec. 13A.3.4 (in. or mm).
D_{TD}	Total *design displacement* (in. or 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 prescribed by Eq. 13.3.3.5-1.
D_{TM}	Total *maximum displacement* (in. or 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 prescribed by Eq. 13.3.3.5-2.
d	Overall depth of member (in.or mm) in Chapters 5 and 11.
d	The longest plan dimension of the *structure* (ft.or mm) in Chapter 13.
d_b	Diameter of reinforcement (in.or mm) in Chapter 11.
d_e	Distance from the anchor axis to the free edge (in.or mm) in Chapter 9.
d_p	The longest plan dimension of the *structure* (ft or mm).

E	The effect of horizontal and vertical earthquake-induced forces (Sec. 5.2.7 and Chapter 13).
E_{loop}	Energy dissipated (kip-inches or kN-mm), in an *isolator unit* during a full cycle of reversible load over a test *displacement* range from $\Delta+$ to $\Delta-$ as measured by the area enclosed by the loop of the loop of the force-deflation curve.
E_m	Chord modulus of elasticity of masonry (psi or MPa) in Chapter 11.
E_s	Modulus of elasticity of reinforcement (psi or MPa) in Chapter 11.
E_v	Modulus of rigidity of masonry (psi or Mpa) in Chapter 11.
e	The actual eccentricity (ft or 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 or mm), taken as 5 percent the maximum *building* dimension perpendicular to the direction of the force under consideration.
F_a	Acceleration-based site coefficient (at 0.3 sec period).
F-	Maximum negative force in an *isolator unit* during a single cycle of prototype testing a *displacement* amplitude of Δ-.
F-	Positive force in kips (kN) in an *isolator unit* during a single cycle of prototype testing at a *displacement* amplitude of Δ-.
F_i, F_n, F_x	The portion of the seismic base shear, V, induced at level i, n, or x, respectively, as determined in Sec. 5.4 (kip or kN).
F_{i1}	Inertial force at Level i (or mass point i) in the fundamental mode of vibration of the *structure* in the direction of interest, Sec. 13A.4.3.9.
F_{im}	Inertial force at Level i (or mass point i) in the m^{th} mode of vibration of the *structure* in the direction of interest, Sec. 13A.5.3.7.
F_{iR}	Inertial force at Level i (or mass point i) in the residual mode of vibration of the *structure* in the direction of interest, Sec. 13A.4.3.9.
F_p	The seismic design force center of gravity and distributed relative to the *component's* weight distribution as determined in Sec. 6.1.3.
F_v	Velocity-based site coefficient (at 1.0 sec period).
F_x	Total force distributed over the height of the *structure* above the isolation interface as prescribed by Eq. 13.3.5.
F_{xm}	The portion of the seismic *base shear*, V_m, induced at a Level x as determined in Sec. 5.5.5 (kip or kN).
f_c'	Specified compressive strength of concrete used in design

f_i	Lateral force at Level *i* of the *structure* distributed approximately in accordance with Equation 5.3.4-2, Sec. 13A.4.3.3.
f_m'	Specified compressive strength of masonry (psi or MPa) at the age of 28 days unless a different age is specified, Chapter 11.
f_r	Modulus of rupture of masonry (psi or MPa) in Chapter 11.
f_s'	Ultimate tensile strength (psi or MPa) of the bolt, stud or insert leg wires. For A307 bolts or A108 studs, is permitted to be assumed to be 60,000 psi (415 Mpa).
f_y	Specified yield strength of reinforcement (psi or kPa).
f_{yh}	Specified yield stress of the special lateral reinforcement (psi or kPa).
G	$\gamma v_s^2/g$ = the average shear modulus for the soils beneath the foundation at large strain levels (psf of Pa).
G_o	$\gamma v_{so}^2/g$ = the average shear modulus for the soils beneath the foundation at small strain levels (psf of Pa).
g	Acceleration of gravity in in./sec^2 (mm/s^2).
H	Thickness of soil.
h	The height of a *shear wall* measured as the maximum clear height from the foundation to the bottom of the floor or roof framing above or the maximum clear height from the top of the floor or roof framing to the bottom of the floor or roof framing above.
$\overline{h}$	The effective height of the *building* as determined in Sec. 5.8.2.1.1 (ft or m).
h	Height of a wood shear panel or *diaphragm* (ft or mm) in Chapter 12.
h	The roof elevation of a *structure* in Chapter 6.
h	Height of the member between points of support (in. or mm) on Chapter 11.
h_c	The core dimension of a *component* measured to outside of the special lateral reinforcement (in. or mm).
h_i, h_n, h_x	The height above the *base* Level *I*, *n*, or *x*, respectively (ft or m).
h_r	Height of the *structure* above the *base* to the roof level (ft or m), Sec. 13A.4.3.3.
h_{sx}	The *story* height below Level $x = h_x - h_{x-1}$ (ft. Or m).
I	The *occupancy importance factor* in Sec. 1.4.
I_{cr}	Moment of inertia of the cracked section (in.^{4} or mm) in Chapter 11.

I_n	Moment of inertia of the net cross-sectional area of a member (in.^{4} or mm^4) in Chapter 11.
I_o	The static moment of inertia of the load-carrying foundation , see Sec. 5.8.2.1 (in.^{4} or mm^4).
I_p	The *component* importance factor as prescribed in Sec. 6.1.5.
I	The *building* level referred to by the subscript I; I = 1 designates the first level above the *base*.
K_p	The stiffness of *component* or attachment as defined in Sec. 6.3.3.
K_y	The lateral stiffness of the foundation as defined in Sec. 5.8.2.1.1 (lb/in. or N/m).
K_θ	The rocking stiffness of the foundation as defined in Sec. 5.8.2.1.1 (ft.lb/degree or N m/rad).
KL/r	The lateral slenderness of a compression member measured in terms of its effective buckling length, KL, and the least radius of gyration of the member cross section, $\boldsymbol{r}$.
k	The distribution exponent given in Sec. 5.4.3.
K_{dmax}	Maximum effective stiffness, in kips/inch (kN/mm) of the *isolation system* at the *design displacement* in the horizontal direction under consideration as prescribed by Eq. 13.9.5.1-1.
K_{Dmin}	Minimum effective stiffness (kips/inch or kN/mm) of the *isolation system* at the *design displacement* in the horizontal direction under consideration as prescribed by Eq. 13.9.5.1-2.
K_{max}	Maximum effective stiffness (kips/inch or kN/mm) of the *isolation system* at the maximum *displacement* in the horizontal direction under consideration as prescribed by Eq 13.9.5.1-3.
K_{Min}	Minimum effective stiffness (kips/inch or kN/mm) of the *isolation system* at the maximum *displacement* in the horizontal direction under consideration, as prescribed by Eq. 13.9.5.1-4.
k_{eff}	Effective stiffness of an *isolator unit* as prescribed by Eq. 13.9.3-1.
$\bar{k}$	The stiffness of the *building* as determined in Sec. 5.8.2.1.1 (lb/ft or N/m).
L	The overall length of the *building* (ft or m) at the *base* in the direction being analyzed.
L	Length of bracing member (in. or mm) in Chapter 8.
L	Length of coupling beam between coupled *shear walls* in Chapter 11 (in. or mm).

L	The effect of *live load* in Chapter 13.
L_o	The overall length of the side of the foundation in the direction being analyzed, Sec. 5.8.2.1.2 (ft or m).
l	The dimension of a *diaphragm* perpendicular to the direction of application of force. For open-front *structures, l* is the length from the edge of the *diaphragm* at the open front to the vertical resisting elements parallel to the direction of the applied force. For a cantilevered *diaphragm, l* is the length from the edge of the *diaphragm* at the open front to the vertical resisting elements parallel to the direction of the applied force.
ℓ_b	Effective embedment length of anchor bolt (in. or mm) in Chapter 11.
ℓ_{bc}	Anchor bolt edge distance (in. or mm) in Chapter 11.
ℓ_d	Development length (in. or mm) in Chapter 11.
ℓ_{dh}	Equivalent development length for a standard hook (in. or mm) in Chapter 11.
ℓ_{1d}	Minimum lap splice length (in. or mm) in Chapter 11.
M	Moment on a masonry section due to un-factored loads (in. lb or N · mm) in Chapter 11.
M_a	Maximum moment in a member at deflation is computed (in. ·lb or N · mm) in Chapter 11.
M_{cr}	Cracking moment strength of the masonry (in. ·lb or N ·mm) in Chapter 11.
M_d	Design moment strength (in. ·lb or N ·mm) in Chapter 11.
M_f	The foundation overturning design moment as defined in Sec. 5.4.5 (ft ·kip or kN ·m).
$M_{o,}\ M_{o1}$	The overturning moment at the foundation-soil interface as determined in Sec. 5.8.2 and 5.8.3 (ft ·lb or N ·m)
M_{nb}	Un-factored ultimate moment capacity at balanced strain conditions.
M_t	The torsional moment resulting from the location of the *building* masses (ft ·kip or kN ·m).
M_{ta}	The accidental torsional moment as determined in Sec. 5.4.4.2 (ft ·kip or kN ·m).
M_u	Required flexural strength due to factored loads (in.·lb or N ·mm) in Chapter 11.
M_1, M_2	Nominal moment strength at the ends of the coupling beam (in ·lb or N ·mm) in Chapter 11.

M_x	The *building* overturning design moment at Level *x* as defined in Sec. 5.4.5 or Sec. 5.5.9 (ft ·kip or kN ·m).
m	A subscript denoting the mode of vibration under consideration; i.e., *m*=1 for the fundamental mode.
N	Number of *stories*, Sec. 5.4.2.1.
N	Standard penetration resistance, ASTM D1536-84.
$\overline{N}$	Average field standard penetration test for the top 100 ft (30 m); see Sec. 4.1.
N_{ch}	Average standard penetration of cohesion-less soil layers for the top 100 ft (30 m); see Sec. 4.1.
N_v	Force acting normal to shear surface (lb or N) in Chapter 11.
n	Designates the level that is uppermost in the main portion of the *building*.
n	Number of anchors in Chapter 9.
P	Axial load on a masonry section due to unfactored loads (lb or N) in Chapter 11.
P_c	Design tensile strength governed by concrete failure of anchor bolts in Chapter 9.
P_D	Required axial strength on a column resulting from the application of *dead load, D,* in Chapter 5 (kip or kN).
P_E	Required axial strength on a column resulting from the application of the amplified earthquake load, *E′,* in Chapter 5 (kip or kN).
P_L	Required axial strength on a column resulting from application of *live load, L*, in Chapter 5(kip or kN).
P_n	Nominal axial load strength (lb or N) in Chapter 8.
P_n	The algebraic sum of the *shear wall* and the minimum gravity loads on the joint surface acting simultaneously with the shear (lb or N).
P_n	Nominal axial load strength (lb or N) in Chapter 11.
P_s	Design tensile strength governed by steel of anchor bolts in Chapter 9.
P_u	Required axial load (lb or N) in Chapter 11.
P_u	Tensile strength required due to factored loads (lb or N) in Chapter 9.
$P_u^\star$	Required axial strength on a brace (kip or kN) in Chapter 8.
P_x	The total unfactored vertical design load at and above level *x* (kip or kN).
PI	Plasticity index, ASTM D4318-93.

Q_{DSD}	Force in an element of the *damping system* required to resist design seismic forces of *displacement-dependent damping devices,* Sec. 13A.7.3.2.
Q_E	The effect of horizontal seismic forces (kip or kN) in Chapters 5 and 13.
Q_{mDSV}	Forces in an element of the *damping system* required to resist design seismic forces of *velocity-dependent damping devices* due to the m^{th} mode of vibration of *structure* in the direction of interest, Sec. 13A.7.3.2.
Q_{mSFRS}	Force in a element of the *damping system* equal to the design seismic force of the m^{th} mode of vibration of the *seismic force resisting system* in the direction of interest, 13A.7.3.2.
Q_v	The load equivalent to the effect of the horizontal and vertical shear strength of the vertical segment in the Appendix to Chapter 8.
q_H	Hysteresis loop adjustment factor as determined in Sec. 13A.3.3.
R	The response modification coefficient as given in Table 5.2.2.
R_1	Numerical coefficient related to the type of lateral-force-resisting system above the *isolation system* as set forth in Table 13.3.4.2 for seismically isolated *structures*.
R_p	The *component* response modification system factor as defined in Chapter 6.
r	The characteristic length of the foundation as defined in Chapter 5 (ft or m)
r	Radius of gyration (in. or mm) in Chapter 11.
r_a, r_m	The characteristic foundation length defined in Sec. 5.8.2.1.1 (ft or m).
r_x	The ratio of the design *story shear* resisted by the most heavily loaded single element in the story, in direction *x,* to the total *story shear.*
S	Section modules based on net cross sectional area of a *wall* (in.^{3} or mm^3) in Chapter 11.
S_1	The *maximum considered earthquake,* 5 percent damped, spectral response acceleration at a period of 1 second as defined in Chapter 4.
S_{D1}	The design, 5 percent damped, spectral response acceleration at a period of 1 second as defined in Chapter 4..
S_{DS}	The design, 5 percent damped, spectral response acceleration at short periods as defined in Chapter 4.
S_{M1}	The *maximum considered earthquake,* 5 percent damped, spectral response acceleration at a period of one second adjusted for *site class* effects as defined in Chapter 4.

S_{MS} The *maximum considered earthquake,* 5 percent damped, spectral response acceleration at short periods adjusted for *site class* effects as defined in Chapter 4.

S_s The mapped *maximum considered earthquake,* 5 percent damped, spectral response acceleration at short periods as defined in Chapter 4.

S_{pr} Probable strength of precast element connectors (Sec. 9.1.1.12).

$\overline{s}_u$ Average undrained shear strength in top 100 ft (30.5 m); see Sec. 4.1.2.3, ASTM D2166-91 or ASTM D2850-87.

s_h Spacing of special lateral reinforcement (in. or mm). .

T The period (sec) of the fundamental mode of vibration of the structure in the direction of interest as determined in Chapter 5.

$\widetilde{T}$, $\widetilde{T}_1$ The effective fundamental period (sec) of the *building* as determined in Chapter 5.

T_1 Period, in seconds, of the fundamental mode of vibration of the *structure* in the direction of interest, Sec. 13A.4.3.3.

T_a The approximate fundamental period (sec) of the *building* as determined in Chapter 5.

T_D Effective period, in seconds (sec), of the seismically isolated *structure* at the design *displacement* in the direction under consideration as prescribed by Eq. 13.3.3.2.

T_{1D} Effective period, in seconds, of the fundamental mode of vibration of the *structure* at the *design displacement* in the direction under consideration, as prescribed by Sec. 13A.4.3.5 or Sec. 13A.5.3.5.

T_{1M} Effective period, in seconds, of the fundamental mode of vibration of the *structure* at the *maximum displacement* in the direction under consideration, as prescribed by Sec. 13A.4.3.5 or Sec. 13A.5.3.5.

T_M Effective period, in seconds (sec), of the seismically isolated *structure* at the maximum *displacement* in the direction under consideration as prescribed by Eq. 13.3.3.4.

T_m The period (sec) of the mth mode of vibration of the *structure in the direction of interest* determined in Chapter 5.

T_m Period, in seconds, of the m^{th} mode of vibration of the *structure* in the direction under consideration, Sec. 13A.5.3.6.

T_0 $0.2S_{D1}/S_{DS}$

T_p The fundamental period (sec) of the *component* and its attachment(s) as defined in Sec. 6.3.3.

T_R	Period, in seconds, of the residual mode of vibration of the *structure* in the direction under consideration, Sec. 13A.4.3.7.
T_S	S_{DI}/S_{DS}.
T_4	Net tension in steel cable due to *dead load*, prestress, *live load*, and seismic load.
t	Specified *wall* thickness dimension or least lateral dimension of a column (in. or mm) in Chapter 11.
t_c	Thickness of masonry cover over reinforcing bars measured from the surface of the masonry to the surface of the reinforcing bars (in. or mm) in Chapter 11.
V	The total design shear at the base of the *structure* in the direction of interest, as determined using the procedure of Sec. 5.3, including Sec. 5.4.1 (kip or kN).
V	Shear on a masonry section due to un-factored loads (lb or N) in Chapter 11.
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 Eq. 13.3.4.1.
V_m	Shear strength provided by masonry (lb or N) in Chapter 11.
V_m	Design value of the seismic *base shear* of the m^{th} mode of vibration of the *structure* in the direction of interest, Sec. 5.4.5 or Sec. 13A.5.3.2 (kip or kN).
V_{mm}	Minimum allowable value of *base shear* permitted for design of the *seismic-force-resisting system* of the *structure* in the direction of interest, Sec. 13A.2.4.1 (kip or kN).
V_n	Nominal shear strength (lb or N) in Chapter 11.
V_R	Design value of the seismic *base shear* of the residual mode of vibration of the *structure* in a given direction, as determined in Sec. 13A.4.3.6 (kip or kN).
V_s	The total lateral seismic design factor or shear on elements above the *isolation system* as prescribed by Eq. 13.3.4.2.
V_s	Shear strength provided by shear reinforcement (lb or N) in Chapters 6 and 11.
V_t	The design value of the seismic *base shear* as determined in Chapter 5 (kip or N).
V_u	Required shear strength (lb or N) due to factored loads in Chapters 6 and 11.

V_x	The seismic design shear in *Story x* as determined in Chapter 5 (kip or kN).
V_1	The portion of seismic *base shear, V,* contributed by the fundamental mode as determined in Chapter 5 (kip or kN).
V_l	The design value of the seismic base shear of the fundamental mode in a given direction as determined in Chapter 5 (kip or kN).
ΔV	The reduction in *V* as determined in Chapter 5 (kip or kN).
ΔV_1	The reduction of V_1 as determined in Chapter 5 (kp or kN).
v_s	The average shear wave velocity for the soils beneath the foundation at large strain levels as determined in Chapter 5 (ft/s or m/s).
$\bar{v}_s$	Average shear wave velocity in top one 100 ft (30 m); see Chapter 4.
v_{so}	The average shear wave velocity for the soils beneath the foundation at small strain levels as determined in Chapter 5 (ft/s or m/s).
W	The total gravity load of the *structure* defined in Chapter 5 (kip or kN). For calculation of a seismically isolated building *structure,* the period, *W*, is the total seismic dead load weight of the *structure* above the isolation system (kip or kN).
$\overline{W}$	The effective *gravity load* of the structure as defined in Sec. 5.8.2 (kip or kN).
$\overline{W}_1$	Effective fundamental mode *gravity load* of *structure* including portions of the live load determined in accordance with Eq. 5.4.5-2 for $m = 1$ (kip or kN).
$\overline{W}_R$	Effective residual mode *gravity load* of the *structure* determined in accordance with Eq. 13A.4.3.7-3 (kip or kN).
W_D	The energy dissipated per cycle at the *story displacement* for the *design earthquake.*
$\overline{W}_m$	The effective gravity load of m^{th} mode of vibration of the *structure* determined in Chapter 5 (kip or kN).
W_p	*Component* operating weight (lb or N).
w	Width of wood *shear panel* or *diaphragm* in Chapter 9 (ft or mm).
w	Moisture content (in percent), ASTM D2216-92.
w	The dimension of a diaphragm or *shear wall* in the direction of application of force.

$w_{i,}\, w_x$	The portion of the total *gravity load*, *W*, located or assigned to Level *I* or *x* (kip or kN).
z	The level under consideration; $x = 1$ designates the first level above the *base*.
x	Elevation in *structure* of a *component* addressed by Chapter 6.
y	Elevation difference between points of attachment in Chapter 6.
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.
α	The relative weight density of the *structure* and the soil as determined in Chapter 5.
α	Angle between diagonal reinforcement and longitudinal axis of the member (degree or rad).
α	Velocity power term relating *damping device* force to *damping* device velocity.
β	Ratio of shear demand to shear capacity for the *story* between Level *x* and *x*-1.
β	The fraction of critical damping for the coupled *structure*-foundation system determined in Chapter 5.
β_D	Effective damping of the *isolation system* at the *design displacement* as prescribed by Eq. 13.9.5.2-1.
β_{eff}	Effective damping of the *isolation system* as prescribed by Eq. 13.9.3-2.
β_{HD}	Component of effective damping of the *structure* in the direction of interest due to post-yield hysteric behavior of the *seismic-force-resisting system* and elements of the *damping system* at effective ductility demand μ_D, Sec. 13A.3.2.2.
β_{HM}	Component of effective damping of the *structure* in the direction of interest due to post-yield hysteric behavior of the *seismic-force-resisting system* and elements of the *damping system* at effective ductility demand, μ_M, Sec. 13A.3.2.2.
β_I	Component of effective damping of the *structure* due to the inherent dissipation of energy by elements of the *structure*, at or just below the effective yield displacement of the *seismic-force-resisting system*, Sec. 13A.3.2.1.
β_M	Effective damping of the *isolation system* at the maximum *displacement* as prescribed by Eq. 13.9.5.2-2.

β_{mD}	Total effective damping of the m^{th} mode of vibration of the *structure* in the direction of interest at the *design displacement*, Sec. 13A.3.2.
β_{mM}	Total effective damping of the m^{th} mode of vibration of the *structure* in the direction of interest at the *maximum displacement* , Sec. 13A.3.2.
β_o	The foundation damping factor as specified in Chapter 5.
β_R	Total effective damping in the residual mode of vibration of the *structure* in the direction of interest, calculated in accordance with Sec. 13A.3.2 (μ_D =1.0 and μ_M = 1.0).
β_{Vm}	Component of effective damping of the m^{th} mode of vibration of the *structure* in the direction of interest due to viscous dissipation of energy by the *damping system*, at or just below the effective yield displacement of the *seismic-force-resisting system*, Sec. 13A.3.2.3.
γ	Lightweight concrete factor
γ	The average unit weight of soil (lb/ft^3 or kg/m^3).
Δ	The design *story* drift as determined in Chapter 5 (in. or mm).
Δ	The *displacement* of the dissipation device and device supports across the story.
Δ	Suspended ceiling lateral deflection (calculated) in Chapter 6 (in. or mm).
Δ_a	The allowable *story* drift as specified in Chapter 5 (in. or mm).
Δ_D	Total *design earthquake* story drift of the *structure* in the direction of interest, Sec. 13A.4.4.4 (in. or mm).
Δ_{ID}	*Design earthquake* story drift due to the fundamental mode of vibration of the *structure* in the direction of interest, Sec. 13A.4.4.4 (in. or mm).
Δ_M	Total *maximum earthquake* story drift of the *structure* in the direction of interest, Sec. 13A.4.4.6 (in. or mm).
Δ_m	The design modal *story* drift determined in Chapter 5 (in. or mm).
Δ_{mD}	*Design earthquake* story drift due to the m^{th} mode of vibration of the *structure* in the direction of interest, Sec. 13A.4.4.4 (in. or mm).
Δ_p	Relative *displacement* that the *component* must be designed to accommodate as defined in Chapter 6.
Δ_{RD}	*Design earthquake* story drift due to the residual mode of vibration of the *structure* in the direction of interest, Sec. 13A.4.4.4 (in. or mm).
Δ^-	Maximum positive *displacement* of an *isolator unit* during each cycle of prototype testing.

Δ^-	Maximum negative *displacement* of an *isolator unit* during each cycle of prototype testing.
δ_{avg}	The average of the *displacements* at the extreme points of the *structure* at Level *x* (in. or mm).
δ_{cr}	Deflation based on cracked section properties (in. or mm) in Chapter 11.
δ_i	Elastic deflection of Level *i* of the *structure* due to applied lateral force, f_i, Sec. 13A.4.3.3 (in. or mm).
δ_{iID}	Fundamental mode *design earthquake* deflection of Level *i* at the center of rigidity of the *structure* in the direction under consideration, Sec. 13A.4.4.2 (in. or mm).
δ_{iD}	Total *design earthquake* deflection of Level *i* at the center of rigidity of the *structure* in the direction under consideration, Sec. 13A.4.4.2 (in. or mm).
δ_{iM}	Total *maximum earthquake* deflection of Level *i* at the center of rigidity of the *structure* in the direction under consideration, Sec. 13A.4.4.2 (in. or mm).
δ_{iRD}	Residual mode *design earthquake* deflection of Level *i* at the center of rigidity of the *structure* in the direction under consideration, Sec. 13A.4.4.2 (in. or mm).
δ_{im}	Deflection of Level *i* in the m^{th} mode of vibration at the center of rigidity of the *structure* in the direction under consideration, Sec. 13A.5 (in. or mm).
δ_{max}	The maximum *displacement* at Level *x* (in. or mm).
δ_x	The deflection of Level *x* at the center of the mass at and above Level *x* as determined in Chapter 5 (in. or mm).
δ_{xe}	The deflection of Level *x* at the center of the mass at and above Level *x* determined by an elastic analysis as specified in Chapter 5 (in. or mm).
δ_{xem}	The modal deflection of Level *x* at the center of the mass at and above Level *x* determined by an elastic analysis as specified in Chapter 5 (in. or mm).
δ_{xmv} δ_{xm}	The modal deflection of Level *x* at the center of the mass at and above Level *x* as determined in Chapter 5 (in. or mm).
δ_x, δ_{xl}	The deflection of Level *x* at the center of the mass at and above Level *x* as determined in Chapter 5 (in. or mm).
ϵ_{mu}	Maximum useable compressive strain of masonry (in./in. or mm/mm) in Chapter 11.
μ	Effective ductility demand on the *seismic-force-resisting system* in the direction of interest.

μ_D	Effective ductility demand on the *seismic-force-resisting system* in the direction of interest due to the *design earthquake,* Sec. 13A.4.
μ_M	Effective ductility demand on the *seismic-force-resisting system* in the direction of interest due to the *maximum considered earthquake,* Sec. 13A.4.
μ_{max}	Maximum allowable effective ductility demand on the *seismic-force-resisting system* due to *design earthquake,* Sec. 13A.3.5.
θ	The stability coefficient for *P-delta effects* as determined in Chapter 5.
τ	The overturning moment reduction factor.
ρ	A reliability coefficient based on the extent of structural redundancy present in a *building* as defined in Chapter 5.
ρ	Ratio of the area of reinforcement to the net cross-sectional area of masonry in a plane perpendicular to the reinforcement in Chapter 11.
ρ_b	Reinforcement ratio producing balanced strain conditions in Chapter 11.
ρ_h	Ratio of the area of shear reinforcement to the cross sectional area of masonry in a plane perpendicular to the reinforcement in Chapter 11.
ρ_s	Spiral reinforcement ratio for precast prestressed piles in Chapter 7.
ρ_v	Ratio of vertical or horizontal reinforcement in *walls*.
ρ_x	A reliability coefficient based on the extent of structural redundancy present in the *seismic-force-resisting system* of a *building* in the *x* direction.
λ	Time effect factor.
ϕ	The capacity reduction factor.
ϕ	Strength reduction factor in Chapters 6 and 11.
ϕ	Resistance factor for steel in Chapter 8 and wood in Chapter 12.
ϕ_{il}	Displacement amplitude at Level *i* of the fundamental mode of vibration of the *structure* in the direction of interest, normalized to unity at the roof level, Sec. 13A.4.3.3.
ϕ_{im}	The displacement amplitude at the i^{th} level of the *structure* for the fixed base condition in the m^{th} mode of vibration in the direction of interest normalized to unity at the roof level as determined in Chapter 5.
ϕ_{iR}	Displacement amplitude at Level *i* of the residual mode of vibration of the *structure* in the direction of interest normalized to unity at the roof level, Sec. 13A.4.3.7.

Γ_1	Participation factor of fundamental mode of vibration of the *structure* in the direction of interest, Sec. 13A.4.3.3 or Sec. 13A.5.3.3 (m = 1).
Γ_m	Participation factor on the m^{th} mode of vibration of the *structure* in the direction of interest, Sec. 13A.5.3.3.
Γ_R	Participation factor of the residual mode of vibration of the *structure* in the direction of interest, Sec. 13A.4.3.7.
∇_{lD}	*Design earthquake* story velocity due to the fundamental mode of vibration of the *structure* in the direction of interest, Sec. 13A.4.4.5 (in/sec or mm/sec).
∇_D	Total *design earthquake* story velocity of the *structure* in the direction of interest, Sec. 13A.4.4.5 (in/sec or mm/sec).
∇_M	Total *maximum earthquake* story velocity of the *structure* in the direction of interest, Sec. 13A.4.4.6 (in/sec or mm/sec).
∇_{mD}	*Design earthquake* story velocity due to the m^{th} mode of vibration of the *structure* in the direction of interest, Sec. 13A.4.4.5 (in/sec or mm/sec).
Ω_0	Overstrength factor as defined in Table 5.2.2.
Ω	Factor of safety in Chapter 8.
$\sum E_D$	Total energy dissipated, in kip-inches (kN-mm), in the *isolation system* during a full cycle of response at the design *displacement*, D_D.
$\sum E_M$	Total energy dissipated, in kip-inches (kN-mm), on the *isolation system* during a full cycle of response at the maximum *displacement* , D_M.
$\sum \lvert F_D^+ \rvert_{max}$	Sum, for all *isolator units*, of the maximum absolute value of force, in kips (kN), at a positive *displacement* equal to D_D.
$\sum \lvert F_D^+ \rvert_{min}$	Sum, for all *isolator units*, of the minimum absolute value of force, in kips (kN), at a positive *displacement* equal to D_D.
$\sum \lvert F_D^- \rvert_{max}$	Sum, for all *isolator units*, of the maximum absolute value of force, in kips (kN), at a negative *displacement* equal to D_D.
$\sum \lvert F_D^- \rvert_{min}$	Sum, for all *isolator units*, of the minimum absolute value force , in kips (kN), at a negative *displacement* equal to D_D.
$\sum \lvert F_M^- \rvert_{max}$	Sum, for all *isolator units*, of the maximum absolute value of force, in kips (kN), at a positive *displacement* equal to D_M.
$\sum \lvert F_M^- \rvert_{min}$	Sum, for all *isolator units*, of the minimum absolute value of force, in kips (kN), at a positive *displacement* equal to D_M.

$\sum |F_M^-|_{max}$ Sum, for all *isolator units*, of the minimum absolute value of force, in kips (kN), at a negative *displacement* equal to D_M.

$\sum |F_M^-|_{min}$ Sum, for all *isolator units*, of the minimum absolute value of force, in kips (kN), at a negative *displacement* equal to D_M.