GLOSSARY

**Acceleration** – Rate of change of velocity with time.

**Acceleration Response Spectrum** – A graphical plot of the maximum acceleration that structures having different characteristics will experience when subjected to a specific earthquake ground motion.

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

**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.

**Amplification** – A relative increase in the magnitude of a quantity, such as ground motion or building shaking.

**Amplitude** – The maximum value of a time-varying quantity.

**Architectural Components** – Components such as exterior cladding, ceilings, partitions, and finishes.

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

**Base Shear Force** – A term used in linear structural analysis techniques to describe the vector sum of the lateral forces that are applied to the structure to represent the effects of earthquake shaking.

**Beam** – A horizontal structural element.

**Bearing Wall System** – A structural system in which vertical structural walls serve the dual purpose of providing vertical support for a significant portion of the structure’s weight as well as resistance to lateral forces.

**Building** – An enclosed structure generally used for human occupancy.

**Building Frame System** – A structural system in which vertical forces associated with the structure’s weight and that of its supported contents are carried by beams and columns while lateral forces associated with wind or earthquake loading are carried by either diagonal braces or vertical walls that do not support significant portions of the structure’s weight.

**Braced Frame** – A structural system in which diagonally inclined members provide the structure’s primary resistance to lateral forces.

**Cantilever Column System** – A structural system in which resistance to lateral forces is provided by the bending strength of the vertical column elements, which are fixed against rotation at their bases and free to translate and rotate at their tops.

**Center of Mass** – Point on the building plan about which, the building’s weight is evenly distributed.

**Coefficient of Variation** – A measure of the amount of scatter between the average value in a normally distributed group or population and the value that is exceeded by only 84 percent of the members of the population divided by the average value.
**Column** – A slender vertical structural element.

**Component (also Element)** – Part of an architectural, structural, electrical, or mechanical system.

**Concrete** – A mixture of Portland cement, sand, rock, water, and other materials that is placed into forms, and allowed to harden into a structural element.

**Concrete Tilt-up Building** – A type of reinforced concrete structure in which the exterior concrete walls are constructed laying flat against the ground and then tilted vertically into position.

**Configuration** – The size, shape, and geometrical proportions of a building.

**Connection** – A method by which different components are joined to one another.

**Cycle of Motion** – For a shaking object, the motion that occurs as the object moves from an initial position to a maximum displacement in one direction, back through the initial position to a maximum displacement in the opposite direction, and then back to the initial position.

**Damping** – The natural dissipation of energy that occurs in a vibrating structure as a result of friction, cracking, and other behaviors and that eventually brings a vibrating structure to rest.

**Damping Device** – A structural element that dissipates energy due to relative motion of each end of the device.

**Dead Load** – The weight of a structure and all of its permanently attached appurtenances including cladding and mechanical, plumbing, and electrical equipment.

**Deflection** – The state of being displaced from an initial at-rest position; see also “Drift.”

**Deformation** – Load-induced distortion of structural or nonstructural elements or components.

**Design Earthquake Shaking** – In the Provisions, the earthquake shaking that is two/thirds of maximum considered earthquake shaking.

**Design Seismic Map** – A map contained in building codes and referenced standards that specifies the geographic distribution of the value of ground shaking parameters that are specified as minimum values to be used in design.

**Designated Seismic System** – A nonstructural component that must remain functional to protect life safety or to support the operation of an essential facility.

**Diaphragm** – A horizontal or nearly horizontal assembly of structural elements used to tie a structure together, typically at a floor or roof level.

**Diaphragm Discontinuity Irregularity** – A type of horizontal irregularity.

**Displacement** – Movement of a structure due to applied forces.

**Distribution, Force** – Portion of the total forces applied to a structure that is resisted by each structural element.

**Drift** – Vertical deflection of a building or structure caused by lateral forces; see also “Story Drift.”

**Dual System** – A structural system in which a combination of moment-resistant frames and braced frames or walls are provided to resist lateral forces.
Ductility – The ability of some structural systems to experience extensive deformation and
damage without loss of load-carrying capability

Earthquake – A sudden motion or vibration in the earth caused by the abrupt release of
energy in the earth’s lithosphere.

Eccentricity – Non coincidence between the center of mass and center of resistance of
a building or characteristic of a braced frame design in which the center lines of the
braces and the structural members to which they are connected do not meet at a point.

ELF - See “Equivalent Lateral Force Procedure.”

Elastic – Capable of recovering size and shape after deformation.

Elastic Analysis – See “Linear Analysis.”

Essential Facility – A building or structure intended for use during post-earthquake recov-
ery operations including police and fire stations, hospitals, and emergency communica-
tions centers

Equivalent Lateral Force Procedure – An approximate method of structural analysis used
to predict the forces and deformations induced in a structure by earthquake ground
shaking that represents the effects of such shaking as a series of lateral static forces ap-
plied to the structure.

Exceedance Probability – The probability that a specified level of ground motion will be
exceeded at a site or in a region during a specified exposure time.

Extreme Stiffness Irregularity – A type of vertical structural irregularity sometimes also
referred to as extreme soft story irregularity.

Extreme Torsional Irregularity – A type of horizontal irregularity.

Extreme Weak Story Irregularity – A type of vertical structural irregularity.

Fault – A fracture in the earth’s crust along which displacement of one side of the fracture
with respect to the other in a direction parallel to the fracture can occur.

Fault, Active – A fault that has moved one or more times in the past 10,000 years.

Fault Trace – The path along the earth’s surface that overlies a zone of fracture in the earth’s
crust along which past earthquake movement has occurred

Flexible Diaphragm – A floor, roof, or horizontal bracing system that experiences lateral
deformations equal to or greater than those experienced by the vertical frames or walls
it connects.

Force – In physics, the influence that causes a free body to undergo an acceleration. Force
also can be described by intuitive concepts such as a push or pull that can cause an
object with mass to change its velocity (which includes to begin moving from a state
of rest) or that can cause a flexible object to deform.

Frame, Braced – A structural framework which derives it resistance to lateral displacement
through the action of diagonal members.

Frame System, Building – A structural system with an essentially complete space frame
providing support for vertical loads; seismic forces are resisted by shear walls or braced
frames.

Frame System, Moment Resisting – A structural frame that derives resistance to lateral
displacement through the rigid or nearly rigid interconnection of beams and columns.
Frame, Space – 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 seismic forces.

Frame-Shear Wall Interactive System – A type of structural system in which a structure’s resistance to lateral forces is provided by a combination of moment-resisting frames and shear walls without limitation on the relative strength of each.

Frequency – For a vibrating structure, the number of times per second that the structure will undergo one complete cycle of motion.

g – The acceleration due to gravity or 32 feet per second per second.

Ground Failure – Physical changes to the ground surface produced by an earthquake; these include landslides, lateral spreading, and liquefaction.

Grout – A mixture of sand, Portland cement, water, and other elements used to fill voids in masonry construction, bond the masonry units together, and bond reinforcing steel.

Hysteretic Properties – For a structural element or member, the variation of stress in the element as a function of imposed deformation considering the prior loading history.

Inelastic Structural Response – The force and deformation behavior of a structure after the onset of damage.

Intensity – The apparent effect that an earthquake produces at a given location; in the United States, intensity generally is measured by the Modified Mercalli intensity (MMI) scale.

Intermediate System – A structural system that has been designed to provide more ductility and toughness than that required for an “ordinary” system but less than that for a “special” system.

Interstory Drift – The difference in peak lateral displacement from the at-rest position of the center of mass of the diaphragm levels immediately above and below a story.

Interstory Drift Ratio – The ratio of interstory drift in a story to the story height.

In-plane Discontinuity Irregularity – A type of vertical structural irregularity.

Irregularity – A condition relating to a structure’s shape or the distribution of its weight, stiffness, or strength that could lead to atypical behavior when subjected to earthquake shaking.

Irregular Structure – A structure that has one or more specified irregularities.

Landslide – Disturbance in hillside ground, sometimes caused by earthquake ground motion, in which one land mass slides down and over another.

Lateral Force – A force that affects an element or portion of a structure as a result of the building’s horizontal acceleration in an earthquake.

Linear Analysis – Any method of structural analysis that ignores the effects of both structural damage and large displacements on internal forces and displacements.

Linear Dynamic Analysis – An approximate method of structural analysis that predicts the forces and deformations induced in a structure by ground shaking without consideration of the effects of structural damage that may occur.

Liquefaction – The conversion of a solid into a liquid by heat, pressure, or violent motion; sometimes occurs to the ground in earthquakes.
**Live Load** – The weight of objects supported by a structure but not permanently attached to it; the live load changes frequently with time and includes the weight of occupants, furniture, and similar items.

**Loss** – Any adverse economic or social consequences caused by earthquakes.

**Masonry** – A form of structural construction in which individual blocks of fired clay (bricks) or concrete are stacked together and joined with mortar to form an integral element.

**Mass** – A constant quantity or aggregate of matter; the inertia or sluggishness that an object, when frictionlessly mounted, exhibits in response to any effort made to start it or stop it or to change in any way its state of motion.

**Mat Foundation** – A form of foundation in which a monolithic reinforced concrete slab underlying a large portion of a structure or perhaps the entire structure is used to transfer the structure’s weight to the underlying soil.

**Mercalli Scale (or Index)** – A measure of earthquake intensity named after Giuseppe Mercalli, an Italian priest and geologist.

**Moment** – The force effect associated with the application of a force at a distance from the point under consideration.

**Moment Resisting Frame** – A structural system in which the rigid or nearly rigid interconnection of the horizontal beams and vertical columns provides the primary resistance to lateral forces.

**Monolithic** – In reinforced concrete construction, a term used to describe elements that are cast in one continuous placement of concrete without joints.

**Mortar** – A mixture of sand, cement, lime, and water used to bond bricks or concrete blocks together to form an integral structural element.

**Natural Period** – The time, in seconds or fractions of a section, that a structure in free vibration will take to undergo one complete cycle of motion.

**Nonbuilding Structure** – Generally, a self-supporting structure, other than a building, that carries gravity loads and that may be required to resist the effects of earthquakes.

**Nonstructural Components** – Components of a building that are not designed to contribute to its structural resistance.

**Nonlinear Analysis** – Any of several types of structural analysis that consider the effects of structural damage and large displacement on forces and displacements.

**Nonlinear Response History Analysis** – A method of structural analysis that uses numerical integration of the equation of motion to simulate the forces and deformations that occur in a structure in response to earthquake shaking considering the effects of structural damage that may occur.

**Nonparallel Systems Irregularity** – A type of horizontal irregularity.

**Nonstructural Component** – A portion of a building or structure that is provided for purposes other than acting as a structural element including doors, windows, some types of wall, and mechanical and electrical equipment.

**Occupancy Category** – A categorization of buildings and other structures based on their intended use and the risk that structural failure would pose to the public.
Ordinary System – A structural system that has been designed with only limited ductility and toughness.

Out-of-Plane Offset Irregularity – A type of horizontal irregularity.

P-delta Effects – A tendency of vertical loads placed on a laterally displaced structure to increase the lateral displacements, potentially capable of causing instability.

Permanent Deformation – A change in the permanent shape and geometry of the ground or of a structure that occurs as a result of damage sustained during an earthquake.

Period – The elapsed time (generally in fractions of a second or seconds) of a single cycle of a vibratory motion or oscillation; the inverse of frequency.

Pier Foundation – A type of cast-in-place concrete pile that has a large diameter, usually greater than 18 inches and sometimes as large as 5 or 6 feet.

Pile Foundation – A type of foundation in which a vertical or nearly vertical element (the pile) is embedded directly into the ground to transfer the weight of a structure into the ground either through friction between the sides of the pile and the surrounding soil or end bearing of the pile against stiff soils and rock beneath it.

Plain Concrete – A structural element of concrete construction that does not include sufficient steel reinforcement or prestressing to be classified as reinforced or prestressed concrete.

Plain Masonry – A structural element of masonry construction that does not include sufficient steel reinforcement to be classified as reinforced masonry. Also termed “unreinforced masonry” or “URM.”

Prestressed Concrete – A form of concrete construction in which reinforcement is provided by steel cables or rods that have been embedded in the concrete and then stressed in tension to place the concrete in compression.

Recurrence Interval – see “Return Period.”

Redundancy – A property of some structures in which multiple elements are used to provide support for the structure so that if one or some of these elements are damaged, other elements are available to continue to support the structure.

Re-entrant Corner Irregularity – A type of horizontal irregularity.

Regular Structure – A structure that does not have any specified irregularities.

Reinforced Concrete – A type of structural element formed of concrete with embedded steel rod reinforcement.

Reinforced Masonry – A type of structural element formed of masonry units with embedded steel rod reinforcement.

Reinforcing Steel – Round steel bars that have been deformed to provide bond with concrete and/or grout.

Response Spectrum Analysis – An approximate method of linear dynamic analysis that computes the forces and deformations induced in a structure by earthquake shaking using a response spectrum as the representation of the ground motion.

Resonance – The amplification of a vibratory motion occurring when the period of an impulse or periodic stimulus coincides with the period of the oscillating body.
**Response, Building** – The way in which a building reacts to earthquake ground motion; includes, for example, rocking, sliding, distorting, and collapsing.

**Response Modification Factor** – The factor in the equivalent lateral force equation that accounts for damping and ductility inherent in the structure; often referred to as the “R factor.”

**Return Period** – The average time interval, in years, that can be expected between repeat occurrences of similar extreme events such as earthquakes, floods, snow and ice accumulations.

**Rigid Diaphragm** – A floor, roof, or horizontal bracing system that deflects substantially less than the vertical frames or walls it connects when subjected to lateral forces.

**Risk-Targeted Maximum Considered Earthquake Shaking** – The most severe earthquake effects considered by the 2009 NEHRP Recommended Seismic Provisions.

**Seismic Design Category** – A categorization of buildings and other structures based on consideration of each structure’s seismic risk.

**Seismic-Force-Resisting System** – The part of a structural system designed to provide required resistance to prescribed seismic forces.

**Seismic Hazard Map** – A map showing contours of the maximum ground motion intensity or acceleration expected across a geographic region within a defined return period or probability of exceedance; in the United States, these maps are produced by the U.S. Geological Survey.

**Seismic-Load-Resisting System** – The assembly of columns, beams, braces, walls, and other structural elements that provide a structure’s resistance to seismic loads.

**Seismic Risk** – A measure of the severity of the possible losses associated with the behavior of a building or structure in likely earthquakes.

**Shear** – A force that acts by attempting to cause the fibers or planes of an object to slide over one another.

**Site Class** – A system used to categorize site soil conditions in general terms based on the stiffness and depth of soil deposits and the likely effect of these characteristics on ground shaking strength and frequency content.

**Static Load** – A force that remains constant with time.

**Stiffness** – A quantitative measure of the amount of force required to produce a unit amount of deflection or displacement in a structure.

**Stiffness Irregularity** – A type of vertical structural irregularity.

**Story Drift** – Vertical deflection of a single story of a building caused by lateral forces.

**Strain** – Deformation of a material per unit of the original dimension.

**Strength** – The capability of a material or structural member to resist or withstand applied forces.

**Stress** – Applied load per unit area or the internal resistance of a material to deformation forces.

**Soft Story Irregularity** – See “Stiffness Irregularity.”
Special System – A structural system that is designed to provide high levels of ductility and toughness.

Structural Element – A piece of a structure that is used to both support the structure’s weight and that of its supported contents and attachments and resist various types of environmental loads including earthquakes and wind.

Structural Steel – An alloy of iron, carbon, and other elements that has been formed by a hot rolling process into either flat plates or shaped elements for use in construction.

Spectral acceleration – The maximum acceleration that a structure having a specific natural period of vibration would experience when subjected to a particular earthquake.

Spread Footing Foundation – A type of foundation in which individual reinforced concrete slabs are placed beneath individual building columns (or sometimes closely spaced groups of columns) to transfer the weight supported by the column(s) to the underlying soil.

System – An assembly of components or elements designed to perform a specific function (e.g., a structural system or a force-resisting system).

Torsion – Structural behavior associated with twisting about a vertical axis for structures or a longitudinal axis for individual structural elements.

Torsional Irregularity – A type of horizontal irregularity.

Transient Deformation – Deformation (movement) of the ground or a structure supported on the ground that occurs during an earthquake event; all or a part of this deformation may be disappear after the earthquake is over.

Unreinforced Masonry – Masonry construction that does not include sufficient steel reinforcement to be classified as reinforced masonry; also referred to as “plain masonry.”

Vertical Bearing Support – The mechanism by which the weight of a structure and its supported contents is transferred to and resisted by the ground.

Vertical Force – A force that acts vertically; vertical earthquake forces represent the effects of vertical accelerations experienced in an earthquake.

Weak Story Irregularity – A type of vertical structural irregularity.

Weight/Mass Irregularity – A type of vertical structural irregularity.
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