H. Glossary

Air gap: For vibration isolated equipment, the air gap is the nominal clearance between the equipment support frame and the bumper restraint or snubber. Where the air gap exceeds 0.25", the seismic design force must be doubled ($2F_p$) per ASCE/SEI 7-10. The optimal size of this air gap is a subject of continuing study and laboratory testing.

Anchorage: Connection or attachment of a nonstructural component to the structure typically through the use of welding, bolts, screws, post-installed anchors or other mechanical fasteners that provide a positive connection. Based on the configuration and the deformability of the components used, the anchorage may behave as a rigid attachment or a flexible attachment.

Anchors in Concrete and Masonry: Anchors into concrete or masonry are required for the attachments of many nonstructural components. See ACI 318 Appendix D for requirements for anchors embedded in concrete. See TMS 402/ACI 503/ASCE 5 for anchors embedded in masonry. See also post-installed anchors and power actuated fasteners.

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

Base: The portion of a building embedded in or resting on the ground surface. Seismic forces are delivered to the base of a building. This term is also used to describe the interface of a freestanding nonstructural component with the floor or roof of a building where it is supported. Seismic forces from the floor or roof level of the building are delivered to the base of the nonstructural component.

Base Isolation: A method whereby a building superstructure is separated from its foundation using flexible bearings in order to reduce the earthquake forces. Special detailing is required to provide flexible connections for architectural components, building utilities, piping, etc. that cross the isolation plane into the building. This method can also be used to protect individual pieces of critical, sensitive, or expensive equipment, museum artifacts, etc.

Base Shear: The total design lateral force or shear at the base of a building structure or nonbuilding structure.

Bending: The curvature of structural or nonstructural components in response to certain types of applied loading. (For example, a beam bends or flexes in response to the weight it supports or to seismic loading).

Cantilever Elements: Elements supported only at the base such as parapets, chimneys, freestanding partitions, or freestanding exterior walls.

Component Importance Factor, I_p: A factor equal to 1.0 for standard installations or 1.5 used for the design of Designated Seismic Systems that are required for post-earthquake life safety or for the continued operations of essential facilities; defined in ASCE/SEI 7-10 Section 13.1.3. Note that this is not the same as the Importance Factor, I_c, assigned for the building structure as a whole.

Consequential Damage: Essential components, such as designated seismic systems, must be protected from damage which might result from the failure of adjacent or connected elements. Thus both the functional and physical interrelationships of essential or nonessential components with essential components must be considered in order to properly safeguard the essential components.

Construction Documents: The written, graphic, electronic, or pictorial documents describing the design, locations, physical characteristics of a project. These documents are typically required to communicate the design intent to contractors and installers and may also be required to demonstrate compliance with applicable building codes or meet specific requirements of the jurisdiction where a project is located.

Construction Observation: The visual observation by a licensed design professional to determine that the elements of the project are constructed in general conformance with the construction documents. The architect, mechanical engineer, structural engineer, etc. may each have an independent duty to perform construction observation. This type of observation is distinct from special inspection.

Damper: Mechanical devices used to dissipate energy and reduce seismic displacements. Dampers come in many shapes and sizes and may be viscous, viscoelastic, lead extrusion, friction, plate yielding, shape memory, or unbonded braces.

Deformability: The ease with which a component deforms under seismic loading. Per ASCE/SEI 7-10, different design parameters are used for high-, limited-, and low-deformability elements and attachments. For example, a high-deformability element is one whose ultimate deformation is not less than 3.5 times the limit deformation (see ASCE/SEI 7-10 for clarification of these terms).

Design Force: The earthquake forces used for design typically expressed as a percentage of the acceleration of gravity such as 0.3g or 1.0g. Minimum code specified design forces for

nonstructural components are found in ASCE/SEI 7-10 Chapter 13 or in the appropriate Building Code in effect where the Project is located.

Design Spectral Response Acceleration Parameters: S_{DS} and S_{D1} are two parameters used in ASCE/SEI 7-10 to characterize the intensity of the ground motion and determine the Seismic Design Category. S_{DS} refers to the 5% damped spectral response acceleration at short periods; S_{D1} refers to the spectral response acceleration at a period of 1 second.

Designated Seismic Systems: This term is applied to those architectural, electrical and mechanical systems or their components that require design in accordance with ASCE/SEI 7-10 Chapter 13 and for which the component importance factor, I_p, is greater than one. This includes systems required to function for life safety purposes after an earthquake including sprinkler systems and egress stairways; components used to convey, support or contain toxic, highly toxic, or explosive substances or hazardous materials; or components needed for continued operation of essential facilities.

Distortion: The change in the configuration of an object or building as it bends or twists out of shape in response to earthquake loading.

Drift: The horizontal displacement of a building resulting from the application of lateral forces, usually forces from earthquake or wind. See also interstory drift.

Earthquake Shaking: The vibratory movement of the earth's crust caused by seismic activity.

Egress, Emergency Egress: Path provided for safe exit from a building in case of emergency. Extra care may be warranted in designing restraints or anchorage for nonstructural components along emergency egress routes and may be required for essential facilities in some jurisdictions. Exit doors, partitions, ceilings, glazing, lighting and piping along the egress route may need special details; furniture and cabinets should be removed or anchored.

Egress Stairways: Stairways required for life-safety purposes in an emergency may be considered designated seismic systems and require special design treatment per ASCE/SEI 7-10 Chapter 13. This requirement may apply to partitions, infill, lighting, piping, etc. in the stairway as well as to the structural supports for stairs that are not part of the building structure.

Essential Facility: Occupancy Category IV facility such as hospital, emergency call center, fire station, emergency shelter as defined in ASCE/SEI 7-10.

Expansion Joint: A separation joint provided to allow for thermal expansion and contraction.

Flexible Connection: The anchorage of an object to a structural member or braced nonstructural component, usually using hardware such as springs, cables, or corrugated tubing, which is designed to allow the object to move relative to the structural member or braced nonstructural component without degradation of performance. Also used to describe connections of pipe or duct to fixed equipment that allows for relative movement; for example, flexible hose connections are advisable for all gas-fired equipment.

Flexible Nonstructural Component: Per ASCE/SEI 7-10, these are nonstructural components with a fundamental period greater than 0.6 seconds. The fundamental period of the nonstructural component (including its supports and attachment to the structure) may be computed per Section 13.6.2 of ASCE 7-10. The design parameters for nonstructural components may depend on whether an item is rigid or flexible.

FM Approved: Third-party certified by FM Approvals.

Foundation: That part of a structure which serves to transmit vertical and lateral forces from the superstructure of a building to the ground.

Frame: A type of structural system in which the loads are carried by a grid or framework of beams and columns, rather than by load-bearing walls. Special purpose frames built up from struts or steel shapes are used to support many types of nonstructural components such as piping, ducts, etc.

Friction Clip: A mechanical device that relies on friction to resist applied loads in one or more directions to anchor a nonstructural component. Friction is applied mechanically and is not due to the frictional resistance produced by the effects of gravity. For Seismic Design Categories D, E and F, friction clips may not be used to support sustained loads in addition to resisting seismic forces.

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. (See also IBC 2009 Chapter 4).

Importance Factor, I_c : Per ASCE/SEI 7-10 Section 11.5-1 and Table 1.5-2, the factor applies to the building structure. This factor is distinct from the Component Importance Factor, I_p.

Inertial Forces: Forces necessary to overcome the tendency for a body at rest to stay at rest or for a body in motion to stay in motion.

Inspection Body: Organization or individual accredited to ISO 17020 and regularly engaged in factory inspection services for seismic restraint of nonstructural components and equipment.

Intensity: See Shaking intensity.

Interstory Drift: The horizontal displacement that occurs over the height of one story of a building resulting from the application of lateral forces, usually forces from earthquake or wind. This is often expressed as an interstory ratio; the ratio of the displacement to the height of the story. Interstory drifts from the structural design of a building are often needed in design calculations for nonstructural components such as glazing, pipe risers or precast panels that are attached to more than one floor.

Lateral Force Resisting System: The elements of a structure that resist horizontal forces. These structural elements are typically frames, braces or shear walls.

Magnitude: A measure of earthquake size which describes the amount of energy released.

Mitigation: An action taken to reduce the consequences of a future earthquake. Other terms such as retrofit, rehabilitation or upgrade are also used to describe these actions.

Moment: The moment of a force about a given point, typically referred to as "the moment", is the turning effect, measured by the product of the force and its perpendicular distance from the point.

Nonbuilding Structures: These are self-supporting structures and other structures governed by the design provisions in ASCE/SEI 7-10 Chapter 15. There is some overlap between the definitions for large nonstructural components and nonbuilding structures; it is recommended to check both provisions to see which apply for large or industrial items. Storage racks, tanks, signs, and chimneys are examples of items that may be covered in either Chapter 13 or 15 depending upon the size and support conditions.

Nonstructural Component: Any architectural element; mechanical, electrical, plumbing (MEP) equipment or systems or part thereof; any furniture, fixtures, equipment (FF&E) or building contents. This term is used to describe any and all components within or without a building or nonbuilding structure which are not an explicit part of the structural system. The seismic design of nonstructural components is governed by provisions in ASCE/SEI 7-10 Chapter 13. Some large nonstructural components may qualify as nonbuilding structures (see ASCE/SEI 7-10 Chapter 15).

OSHPD Approved: Approved by the State of California, Office of Statewide Health Planning and Development.

Risk Category: A category used to determine structural and nonstructural design requirements in ASCE/SEI 7-10 Table 1.5-1 based on a building's occupancy. Occupancy Category I is used for the buildings and other structures with the lowest risk to human life such as agricultural facilities; Occupancy Category IV is used for essential facilities such as hospitals which may pose a substantial hazard to humans and to the community.

Partition: A nonstructural interior wall used to subdivide interior spaces. Partitions may span horizontally or vertically from support to support; support may be provided by the building structure or secondary framing members. Partitions may be full-height or partial-height, often stopping just above the ceiling level and are typically constructed of steel or wood studs and gypsum board, wood studs and plaster, brick, or concrete masonry unit infill. Glass block and glazed partitions are also in use.

Positive Connection: A means of anchorage between a nonstructural item and a structural member or braced nonstructural component that does not rely on friction to resist the anticipated earthquake forces. Positive connections are typically made using hardware such as bolts, steel angles, or cables rather than C-clamps or thumb screws. Nails, adhesives and toggle bolts typically do not have enough capacity to provide positive connections for the seismic anchorage of nonstructural items.

Post-installed Anchors: Post-installed anchors in concrete or masonry are those which are drilled and placed into existing construction. Post-installed anchors must be prequalified for seismic applications; for instance, post-installed anchors in concrete must be prequalified in accordance with ACI 355.2 or other approved qualification procedure.

Pounding: The impact of two structures during an earthquake. Pounding frequently occurs when the seismic gap between two adjacent wings of a building, or the gap between two neighboring buildings, is insufficient to accommodate the relative lateral movement of both buildings.

Power Actuated Fasteners: Use of power actuated fasteners to resist seismic loading may be restricted depending on the substrate (concrete, steel, masonry, etc.) and the Seismic Design Category. See ASCE/SEI 7-10 Section 13.4.5 for restrictions and exemptions.

Professional Engineer: A professional engineer is one who is legally qualified to practice in the jurisdiction where the Project is located, who is experienced in providing engineering services of the kind indicated, and is registered with the state where the project is located.

Restraint/Bracing: Bracing or anchorage used to limit movement under seismic forces. Cables or rigid elements (struts, pipes, angles, etc) used to resist forces by uniaxial tension or compression. The term "bracing" may also be used to describe design to resist lateral forces through the use of wall or frame elements.

Rigid Connection: The anchorage of an object to a structural member or braced nonstructural component, usually using hardware such as bolts or brackets, which is designed to prohibit the object to move relative to the structural member or braced nonstructural component.

Rigid Nonstructural Component: Per ASCE/SEI 7-10, these are nonstructural components with a fundamental period less than or equal to 0.6 seconds. The fundamental period of the nonstructural component (including its supports and attachment to the structure) may be computed per Section 13.6.2 of ASCE 7-10. The design parameters for nonstructural components may depend on whether an item is rigid or flexible.

Schematic Upgrade Detail: A drawing outlining the basic elements of an upgrade scheme, but lacking dimensions, element sizes, and other specific information necessary for construction. The terms upgrade, retrofit, rehabilitation, and mitigation are often used interchangeably.

Seismic: Of, relating to, or caused by an earthquake.

Seismic Deformations: Drifts, deflections and seismic relative displacements determined in accordance with the applicable seismic requirements of ASCE/SEI 7-10 or the Building Codes currently in effect where the Project is located.

Seismic Design Category: A classification assigned to a building structure based on its risk category or occupancy and the severity of the design earthquake ground motion. See ASCE/SEI 7-10 Table 1.5-1 for the Risk Category; see Section 11.4 for ground motion; see Section 11.6 for Seismic Design Category. Requirements for nonstructural components depend on the Seismic Design Category which ranges from A to F, from A for the lowest seismicity to F for the highest seismicity. Structures rated Seismic Design Category A are exempt from the nonstructural requirements in Chapter 13; structures rated Seismic Design Categories D, E and F have the most stringent requirements for nonstructural components.

Seismic Drift: The horizontal displacement of a building resulting from the application of lateral earthquake forces. See also interstory drift.

Seismic Force: The force that will act on a nonstructural component during an earthquake is the product of its mass and the seismic acceleration.

Seismic Gap or Seismic Joint: The distance between adjacent buildings, or two portions of the same building, which is designed to accommodate relative lateral displacements during an earthquake.

Seismic Risk: The chance of injury, damage, or loss resulting from earthquake activity.

Seismic Stop: A rigidly mounted bumper or snubber used to limit the range of lateral motion of spring-mounted mechanical equipment. See also air gap, snubber, and vibration isolation.

Seismic Upgrade: Improvement of the resistance of a structural or nonstructural component to provide a higher level of safety or resistance to earthquake forces. For nonstructural components, seismic upgrade schemes typically involve the addition of anchorage hardware or braces to attach the nonstructural item to the surrounding structure. In some instances, the nonstructural item may also require internal strengthening.

Separation Joint: The distance between adjacent buildings, or two portions of the same building, which is designed to accommodate relative displacements between the two structures. Seismic gaps and expansion joints are two types of separation joint.

Shaking Intensity: The amount of energy released by an earthquake as measured or experienced at a particular location. Intensity is subjectively measured by the effects of the earthquake on people and structures.

Shear Wall: A wall designed to resist lateral forces parallel to the wall.

Snubber: A device, such as a mechanical or hydraulic shock absorber, used to absorb the energy of sudden impulses or shocks in machinery or structures. Snubbers are often used to brace pipe runs where thermal expansion and contraction is an important consideration. Snubbers are also required for many equipment items mounted on vibration isolators in order to limit the seismic movement. See also vibration isolation and air gap.

Special Inspection: The observation of work by a Special Inspector or Inspection Body to determine compliance with the approved construction documents and the standards of the authority having jurisdiction over the project. Continuous special inspection requires full-time observation by a special inspector who is present in the area where work in being performed. Periodic special inspection may be part-time or intermittent observation by a special inspector

who is present in the area where the work has been or is being performed. Requirements for continuous or periodic special inspection are typically specified by the jurisdiction.

Special Inspector: An International Accreditation Service (IAS) accredited International Building Code (IBC) special inspection agency or qualified professional engineer who demonstrates competence, to the satisfaction of the building official, for inspection of the designated seismic systems. The owner or the registered design professional in responsible charge acting as the owner's agent shall employ one or more special inspectors to provide periodic inspections during installation of designated seismic systems.

Supports: Those members, assemblies of members or manufactured elements including braces, frames, legs, shear lugs, snubbers, hangers, saddles, struts, and associated fasteners that transmit loads between nonstructural components and their attachments to the structure. Some supports may carry only gravity loads (the weight of the item), such as vertical hangers. Some supports may resist both gravity loads and seismic loads; some may resist only seismic loads.

UL Listed: Approved by the Underwriters Laboratories.

Upgrade Detail: A drawing presenting the necessary elements of an upgrade scheme, including dimensions, element sizes, and other specific information in sufficient detail so that the drawing can be used for construction.

Veneer: An architectural facing or ornamentation of brick, tile, concrete, stone or similar materials attached to a backing substrate. Veneer may be adhered to the substrate or anchored using mechanical anchors.

Vertical Force Resisting System: The elements of a structure that resist the gravity loads or self-weight.

Vibration Isolation: Mechanical equipment is often placed on specially designed springs to prevent the transmission of mechanical vibrations into the building. Components mounted on vibration isolators also require bumper restraints or snubbers in each horizontal direction to resist seismic loading. The nominal clearance between the snubbers and equipment may affect the seismic design forces; see also snubbers and air gap.