D. CHECKLIST OF NONSTRUCTURAL SEISMIC HAZARDS

This checklist is intended to be used in surveying buildings to assess whether the nonstructural elements (architectural, MEP, FF&E, or contents) pose a danger to the building occupants or are likely to cause financial loss or interruption following an earthquake.

This checklist of nonstructural hazards is intended for use in areas where seismic hazards are a significant concern. Review the discussion in Section 1.3 for the applicability of these nonstructural guidelines and the sidebar in Section 5.3.1 for rules regarding exemptions from the nonstructural provisions in ASCE/SEI 7-10 *Minimal Design Loads for Buildings and Other Structures* (ASCE, 2010) that apply to new construction.

The form includes eight columns marked as follows:

ITEM NO.: ID number to indicate the type of component (architectural, MEP, FF&E or contents) and the subgroup. These numbers are based on the section or subsection in this text and as shown in the tables in Chapter 6.

COMPONENT NAME(S): Name or description of item.

PRINCIPAL CONCERNS: List of problems often associated with this type of item such as falling hazard, water or fuel leakage, broken glass. These concerns should be taken into account when answering the checklist questions. For example, the primary concern for adhered veneer is that it may pose a falling hazard. If a facility has adhered veneer, but only at the base of the building below 6 ft, then this might be checked “Compliance,” if the purpose of the survey is to identify life safety hazards or might be rated “Noncompliance,” if the survey is also intended to help control property damage and limit losses.

EXAMPLE: Example number. All examples, which contain photos and detailed drawings when applicable, can be found in Chapter 6.

COMPLIANCE (C): The questions in this form have been stated in such a way that an affirmative answer indicates that the item is not likely to pose a nonstructural hazard.

NONCOMPLIANCE (NC): The questions in this checklist are stated in such a way that the answer "No" or “Unknown” indicates that the component may be noncompliant and likely to pose a nonstructural earthquake hazard. All of the noncompliant components should be entered as individual line items on the facility inventory form in Appendix A. Comments should

be entered in the survey form noting the location, condition, presence or absence of anchorage details, proximity to other hazardous items, issues with secondary damage such as leaks or hazardous materials release, and whether the component in question is important for functionality of the facility.

NOT APPLICABLE (N/A): This column should be checked if none of the listed items are present and has been included, so that it is clear that the item was not missed or overlooked when performing the survey.

CHECKLIST QUESTIONS: Questions are all "Yes-No" questions, which are answered by checking the appropriate box from among the previous three columns.

6.3	Architectural Components						
Item No.	**Component Name**	**Principal Concerns**	**Example**	**C**	**NC**	**NA**	**Checklist Questions (Yes=Compliance; No or Unknown=Noncompliance; NA=Not Applicable)**
6.3.1	**Exterior Wall Components**						*[Exterior falling hazards are a primary concern, especially items situated above 10 feet and items that may fall over exits, walkways, or sidewalks.]*
	Adhered veneer	Falling hazard	6.3.1.1				Is the adhered veneer adequately attached to the structure? [This includes relatively thin sections of tile, masonry, stone, terra cotta, ceramic tile, glass mosaic units, stucco, or similar materials attached to a structural wall or framework by means of an adhesive].
							Based on visual observations and/or tapping, is the veneer free of cracked or loose sections that may fall during an earthquake?
	Anchored veneer	Falling hazard	6.3.1.2				Is the anchored veneer adequately attached to the structure? [This includes thicker masonry, stone, or stone slab units that are attached to the structure by mechanical anchors].
							Is the masonry or other veneer supported by shelf angles or other elements at each floor?
							Is the masonry or other veneer connected to a structural back-up wall at adequate spacing?
							Has the veneer been adequately maintained? Are the anchors in good condition, free of significant corrosion, and inspected regularly?
	Prefabricated panels	Falling hazard, damage to panels and connections, broken glass	6.3.1.3				Were the panels and connections designed by an architect or engineer to accommodate the expected seismic distortion of the surrounding structure?
							Are prefabricated cladding panels detailed to allow relative movement between the panel and the structure?
							Are prefabricated panels supported for vertical loads with at least two connections per panel?

Item No.	Component Name	Principal Concerns	Example	C	NC	NA	Checklist Questions (Yes=Compliance; No or Unknown=Noncompliance; NA=Not Applicable)
							Are prefabricated panels supported for out-of-plane loads with at least four connections per panel?
							Have the panels been adequately maintained? Are the panel connections in good condition, free of significant corrosion, and inspected regularly?
							Are there adequate separations between panels so they will not come into contact with each other during an earthquake?
	Glazing exterior wall system	Falling hazard, broken glass	6.3.1.4				Is it known that the glazing was designed by an architect or engineer to accommodate the expected seismic distortion of the surrounding structure?
							Do large window panes and storefront windows have safety glass? [All exterior glazing should be laminated, annealed or laminated heat-strengthened safety glass or other glazing system that will remain in the frame when the glass is cracked. This is particularly important for glazing located over 10 feet above an exterior walking surface].
	Glass blocks	Falling hazard, broken glass	6.3.1.5				Are partial-height glass block walls laterally braced to the structure?
							Is the glass block reinforced with panel anchors and panel reinforcing wire?
	Overhead glazing or skylights	Falling hazard, broken glass	6.3.1.6				Are transoms (glass panes over doors) made of safety glass?
							Are skylights made of safety glass or covered with shatter-resistant film?
							Are large panes made of safety glass or is it known whether the glazing assembly was designed by an architect or engineer to accommodate the expected seismic distortion of the surrounding structure?

Item No.	Component Name	Principal Concerns	Example	C	NC	NA	Checklist Questions (Yes=Compliance; No or Unknown=Noncompliance; NA=Not Applicable)
6.3.2	**Partitions**						
	Heavy	Falling hazard; collapse or spalling with debris in exitways; large cracks often mistaken for structural damage	6.3.2.1				Are block wall partitions reinforced? [This would include concrete masonry unit (CMU), brick, and hollow clay tile partitions. Most brick and hollow clay tile walls in pre-1933 buildings in California are unreinforced; unreinforced masonry partitions may still be found in current construction in other parts of the country.]
							Are unreinforced masonry walls braced at regular intervals? [In zones of low and moderate seismicity, are partitions braced at 10 foot intervals or less? In zones of high seismicity, are partitions braced at 6 foot intervals or less?]
							Are full-height CMU partitions detailed to allow sliding at the top?
	Light	Cracking of plaster or gypsum board; costly to patch and paint	6.3.2.2				Are partial-height stud wall partitions braced to the structure above the ceiling line?
							Are full-height stud wall partitions detailed to allow sliding at the top?
							If partitions function as lateral support for tall shelving or other nonstructural components, are these partitions adequately anchored or braced to the structure above the ceiling line?
	Glazed	Broken glass	6.3.2.3				Are interior glazed or glass block partitions laterally braced to the structure?
6.3.3	**Interior Veneers**						
	Stone and tile	Falling hazard, debris in exitways	6.3.3.1				Is the adhered veneer adequately attached to the structure?
							Is the anchored veneer adequately attached to the structure?

Item No.	Component Name	Principal Concerns	Example	C	NC	NA	Checklist Questions (Yes=Compliance; No or Unknown=Noncompliance; NA=Not Applicable)
6.3.4	**Ceilings, Soffits**						
	Suspended acoustic lay-in tile ceiling	Dropped acoustical tiles, perimeter damage, separation of runners and cross runners; falling hazard if grid and lights come down	6.3.4.1				Does the suspended ceiling have adequate diagonal bracing wires and compression struts to support seismic loads from the ceiling grid plus all lay-in items that do not have independent lateral supports?
							If the ceiling supports lay-in lighting or diffusers, do the lay-in items all have independent vertical supports consisting of wires located at least at two diagonally opposite corners?
							Do lay-in fixtures weighing over 50 pounds additionally have independent lateral bracing wires at all four corners?
							If located in a high seismic zone, is the suspended ceiling supported by a heavy duty ceiling grid with adequate capacity and does the grid include supplemental hanger wires at light fixtures or other mechanical items?
	Directly applied to structure	Falling hazard	6.3.4.2				Are decorative ceiling panels and/or latticework securely attached, particularly beneath exterior eves over exits?
							Are decorative finishes and/or latticework on beam soffits or beneath exterior eves securely attached, particularly over exits?
							For plaster ceilings or stucco soffits, is the wire mesh or wood lath securely attached to the structural framing above?
							Is the plaster or stucco in good condition and not deteriorated by water damage or corrosion?
	Suspended heavy ceilings	Falling hazard	6.3.4.3				If the suspended gypsum board ceiling extends over more than one level, does the suspended ceiling system have adequate diagonal bracing?

Item No.	Component Name	Principal Concerns	Example	C	NC	NA	Checklist Questions (Yes=Compliance; No or Unknown=Noncompliance; NA=Not Applicable)
							Is the suspended wire mesh or wood lath securely attached to the structural framing above?
							Is the plaster ceiling in good condition and not deteriorated by water damage?
6.3.5	**Parapets, Appendages, Roof Tiles**						
	Unreinforced masonry parapet	Falling hazard	6.3.5.1				Are unreinforced masonry parapets adequately braced? [If there is a local parapet ordinance, is it known if the bracing complies with the local ordinance?]
	Parapets, cornices, appendages	Falling hazard					Are parapets and cornices reinforced and adequately braced?
							Do other decorative elements and appendages have positive anchorage to the building?
							Are hanging appendages braced or secured with a safety cable?
6.3.6	**Canopies, Marquees, Signs**						
	Canopy, Marquees, Signs	Falling hazard	6.3.6.1				Are cantilevered elements braced to the structure with steel shapes, not chains, to provide restraint and prevent bouncing?
							Are exterior signs or billboards adequately braced and anchored?
							Are interior signs securely attached with positive connections?
	Flagpoles	Falling hazard					Are flagpoles securely attached to the structure?
6.3.7	**Chimneys and Stacks**						
	Unreinforced masonry chimney	Falling hazard	6.3.7.1				Is the brick chimney restrained with braces to the roof near the top of the chimney?
							Is the brick chimney anchored near the roof line?

Item No.	Component Name	Principal Concerns	Example	C	NC	NA	Checklist Questions (Yes=Compliance; No or Unknown=Noncompliance; NA=Not Applicable)
	Stacks	Falling hazard					Are stacks anchored to the supports or foundation by means of anchor bolts of adequate length and double nuts?
6.3.8	**Stairways**						
	Stairways		6.3.8.1				Do steel stairs in multistory buildings have sliding supports at one end that can accommodate the anticipated interstory displacements?
							Have any unreinforced masonry partitions, piping, or lighting in stairwells been removed, strengthened, encapsulated or braced, especially if the stairway is used as a primary exit route?
6.3.9	**Freestanding Walls or Fences**						
	Freestanding Walls or Fences	Falling hazard if over 4' tall	6.3.9.1				Were freestanding walls or fences designed by an architect/engineer to resist lateral forces?
							Are CMU walls adequately reinforced with vertical bars set in grout-filled cells and horizontal bars embedded in the mortar joints?
							Were CMU walls or fences built with adequate foundations to prevent them from tipping over in an earthquake?

6.4	Mechanical, Electrical and Plumbing Components						
Item No.	**Component Name**	**Principal Concerns**	**Example**	**C**	**NC**	**NA**	**Checklist Questions (Yes=Compliance; No or Unknown=Noncompliance; NA=Not Applicable)**
6.4.1	**Mechanical Equipment**						
	Boilers, furnaces, pumps and chillers (HVAC wet-side equipment)	Sliding, overturning, broken gas/fuel or exhaust lines, leaking fluids, loss of function	6.4.1.1				Are the boilers, pumps, chillers and similar wet-side HVAC equipment securely anchored to the floor or wall with adequately sized bolts?
							Do HVAC wet-side equipment items that are mounted on vibration isolators have adequate lateral restraint provided by snubbers, bumpers, or restrained vibration isolators?
							Are housekeeping pads under boilers and similar equipment anchored to the floor slab?
							Does the gas line have a flexible connection to the water heater or boiler that is able to accommodate movement?
							Are furnaces, and furnace or boiler bases, constructed without using unreinforced masonry?
	General manufacturing and process machinery	Falling hazards, hazardous material leaks or spills, loss of function	6.4.1.2				Is manufacturing and process machinery and related equipment, cranes, tanks, piping, chutes, and conveyors all adequately restrained and anchored, particularly items that may fall and injure workers, result in hazardous materials release, or create hazardous electrical conditions?
							Have all life safety hazards been addressed by bracing or anchoring clear falling hazards and other hazardous items?
							If immediate occupancy or operations is a project objective, has a design professional familiar with nonstructural anchorage of manufacturing and process machinery been engaged to perform a detailed survey of the plant?

Item No.	Component Name	Principal Concerns	Example	C	NC	NA	Checklist Questions (Yes=Compliance; No or Unknown=Noncompliance; NA=Not Applicable)
	HVAC equipment with vibration isolation	Fall off isolators, overturning, broken gas/fuel or exhaust lines, leaking fluids, loss of function	6.4.1.3				Do HVAC dry-side equipment items such as air compressors, fans, blowers and filters that are mounted on vibration isolators have adequate lateral restraint provided by snubbers, bumpers, or restrained vibration isolators?
							If large equipment is mounted on a concrete housekeeping pad, is the pad adequately anchored into the structural slab?
							Do roof-mounted HVAC units that are mounted on vibration isolators have adequate lateral restraint provided by snubbers, bumpers, or restrained vibration isolators?
							For roof-mounted units, are the curbs supporting the vibration isolators securely attached to the structural roof framing?
	HVAC equipment without vibration isolation	Sliding, overturning, broken gas/fuel or exhaust lines, leaking fluids, loss of function	6.4.1.4				Is equipment (e.g. gas-fired boiler, commercial water heater, chiller, etc.) securely mounted to the floor, wall, or roof with adequately sized bolts?
							If large equipment is mounted on a concrete housekeeping pad, is the pad adequately anchored into the structural slab?
							Does the gas or fuel line have a flexible connection that is able to accommodate movement?
							For roof-mounted units, are the curbs supporting the vibration isolators securely attached to the structural roof framing?
							Are wall- or window-mounted window air conditioning units securely mounted to the wall or shelf?
	HVAC equipment	Falling or swinging	6.4.1.5				Is suspended equipment braced or anchored independently from the ductwork?

Item No.	Component Name	Principal Concerns	Example	C	NC	NA	Checklist Questions (Yes=Compliance; No or Unknown=Noncompliance; NA=Not Applicable)
	suspended in-line with ductwork	hazard, separate from ductwork, loss of function					Does the equipment have flexible connections to gas, fuel, or electrical lines?
	Suspended equipment	Gas leak, falling hazard	6.4.1.6				Are the suspended room heaters, especially gas-fired ones, laterally supported?
							Are gas-fired heaters fitted with flexible gas connections?
6.4.2	**Storage Tanks and Water Heaters**						
	Structurally supported tanks and vessels	Tank or vessel rupture, pipe break	6.4.2.1				Is the tank securely attached to the supports?
							Are the tank supports braced in both directions?
							Are the tank supports attached with anchor bolts to concrete walls or foundation pad?
							Is the foundation large enough to keep the tank from sliding or tipping over?
							Is the wall strong enough to support the tank?
	Flat bottom tanks and vessels	Tank or vessel rupture, pipe break	6.4.2.2				Is the tank securely anchored to a concrete slab or foundation?
							Is the foundation large enough to keep the tank from sliding or tipping over?
	Compressed gas cylinders	Gas leak	6.4.2.3				Are all gas cylinders tightly secured with a chain near the top and bottom or otherwise restrained from movement in each direction?
							Are the chains or restraints securely anchored to a wall or counter with screws or bolts rather than clamps?
							If the gas cylinders are attached to piping, are the restraints adequate to prevent damage at the piping connections?

Item No.	Component Name	Principal Concerns	Example	C	NC	NA	Checklist Questions (Yes=Compliance; No or Unknown=Noncompliance; NA=Not Applicable)
	Water heaters	Gas leak, water leak, loss of function	6.4.2.4				Are the water heaters securely anchored to the floor or wall?
							Do the gas lines or electrical conduit and water lines have flexible connections to the water heater that are able to accommodate movement?
							Does the water heater meet the limitations for use of prescriptive restraints? Is the capacity less than 100 gallons and is there a structural wall within 12 inches?
							Does the wall have adequate strength to restrain the water heater?
6.4.3	**Pressure Piping**						
	Suspended pressure piping	Breaks, leaks, loss of function	6.4.3.1				Are the pipes laterally restrained at reasonable intervals in each direction?
							Are the restraints securely attached to the structure?
							Are the pipes free of asbestos insulation that could be damaged by movement in an earthquake?
							Are the pipes free of asbestos that would need to be abated before any retrofit work?
	In-line valves and pumps	Loss of function, leaks	6.4.3.2				Are the distribution pumps anchored, or are they mounted on vibration isolation springs with additional seismic lateral restraints?
							Are suspended valves and pumps adequately braced and anchored to structural elements?
	Flexible connections, expansion joints, seismic separations	Breaks, leaks, loss of function	6.4.3.3				Are flexible connections provided where piping connects to rigidly mounted equipment?
							Are flexible connections provided where pipes cross expansion joints or seismic separations between buildings?

Item No.	Component Name	Principal Concerns	Example	C	NC	NA	Checklist Questions (Yes=Compliance; No or Unknown=Noncompliance; NA=Not Applicable)
							Are pipe penetrations through structural walls or framing members large enough to allow for some seismic movement?
	Pipe Risers	Breaks, leaks, loss of function	6.4.3.4				Are risers (vertical runs of piping) laterally restrained at each floor level or roughly at 20 foot intervals?
							For risers subject to thermal expansion and contraction, have the seismic supports been designed to allow ample thermal movement?
	Floor-mounted pipe supports	Breaks, leaks, loss of function	6.4.3.5				Are the pipes laterally restrained at reasonable intervals in each direction?
							Are the restraints securely attached to the structure?
	Roof-mounted pipe supports	Breaks, leaks, loss of function	6.4.3.6				Are the pipes laterally restrained at reasonable intervals in each direction and do the restraints appear adequate for the roof level? [Accelerations at the roof level are typically higher than at lower levels of a building.]
							Are the curbs and restraints securely attached to the structure and protected from weathering and corrosion?
	Wall-mounted pipe supports	Breaks, leaks, loss of function	6.4.3.7				Are the pipes laterally restrained at reasonable intervals in each direction?
							Are the restraints securely attached to the structure?
	Pipe penetrations	Breaks, leaks, loss of function	6.4.3.8				Are pipe penetrations through structural walls or framing members large enough to allow for some seismic movement or are the pipes restrained to prevent impact with the structural element?
6.4.4	**Fire Protection Piping**						
	Suspended fire protection	Damage to sprinkler	6.4.4.1				Are the fire sprinkler piping components laterally restrained in each direction?

Item No.	Component Name	Principal Concerns	Example	C	NC	NA	Checklist Questions (Yes=Compliance; No or Unknown=Noncompliance; NA=Not Applicable)
	piping	heads, leaks, loss of function					Is the ceiling restrained so the ceilings won't break the sprinkler heads?
6.4.5	**Fluid Piping, not Fire Protection**						
	Hazardous materials	Breaks, leaks, hazardous materials release	6.4.5.1				Is the hazardous material piping laterally restrained at reasonable intervals in each direction?
							Are the restraints securely attached to the structure?
							Where required, does the hazardous material piping have double walls, secondary containment, leak detection systems or monitoring and are these systems designed for seismic loading?
							Do the pipes have flexible connections that are able to accommodate relative movement at locations where they are attached to rigidly mounted equipment or where they cross seismic separations?
							Does piping containing fuel or other hazardous materials have a seismic shut-off valve or excess flow valve?
							If the shut-off for the line is manual, is a wrench stored within easy reach?
	Nonhazardous materials	Breaks, leaks, loss of function	6.4.5.2				Is the piping laterally restrained at reasonable intervals in each direction?
							Are the restraints securely attached to the structure?
							Do the pipes have flexible connections that are able to accommodate relative movement at locations where they are attached to rigidly mounted equipment or where they cross seismic separations?
6.4.6	**Ductwork**						

Item No.	Component Name	Principal Concerns	Example	C	NC	NA	Checklist Questions (Yes=Compliance; No or Unknown=Noncompliance; NA=Not Applicable)
	Suspended ductwork	Collapse, separation, leaking, fumes	6.4.6.1				Are the rectangular distribution ducts larger than 6 sq ft in cross sectional area laterally supported in each direction?
							Are circular ducts larger than 28 inches diameter laterally supported in each direction?
							Are the supports and hangers securely attached to the structure?
							Are the distribution ducts able to accommodate movement at locations where they cross separations between buildings?
	Air diffusers	Drop out of ceiling grid	6.4.6.2				Are the air distribution grills or diffusers anchored to adequately supported sheet-metal ducts or to the ceiling grid or wall?
							Do the diffusers have positive restraint, independent of the ceiling grid, such as at least two vertical hanger wires per diffuser?
6.4.7	**Electrical and Communications Equipment**						*Caution: Only qualified personnel should open access panels on electrical equipment.*
	Control panels, motor control centers, switchgear, etc.	Sliding or overturning, broken or damaged conduit or electrical bus	6.4.7.1				Are the control panels, motor control centers, switchgear and similar items all properly anchored to the floor or laterally supported by a structural wall?
							Do the walls used to support these electrical cabinets have adequate strength to restrain these items?
	Emergency generator	Failed vibration isolation mounts; broken fuel, signal, power and exhaust lines; loss of function	6.4.7.2				Is the emergency generator adequately secured, especially if mounted on motor vibration isolation springs?
							Is the concrete housekeeping pad adequately anchored to the structural slab?
							Is the diesel fuel tank adequately braced and anchored? (Refer to additional questions for structurally supported tanks and vessels).

Item No.	Component Name	Principal Concerns	Example	C	NC	NA	Checklist Questions (Yes=Compliance; No or Unknown=Noncompliance; NA=Not Applicable)
							Are the fuel lines, cooling water lines, and exhaust flues for the emergency generator attached with flexible connections that are able to accommodate relative movement at junctions to spring-mounted equipment, at building entry and exit points, and at expansion joints within the building?
							Have all the components of the emergency power generating system and the electrical distribution system been checked as part of this survey?
	Transformers	Sliding, oil leakage, bushing failure, loss of function	6.4.7.3				Are transformers properly anchored to the floor or wall?
	Batteries and battery rack	Batteries fall, rack tips; loss of emergency power	6.4.7.4				Are the batteries securely attached to the battery rack?
							Is the battery rack cross-braced in both directions?
							Does the battery rack have anchor bolts secured to a concrete foundation pad?
							Is the foundation large enough to keep the battery rack from sliding or tipping?
	Photovoltaic power systems	Falling hazard for roof mounted panels	6.4.7.5				Are the solar panels securely anchored to the roof?
							Is the piping laterally restrained?
	Communica-tions equipment	Sliding, overturning, or toppling leading to loss of function	6.4.7.6				Is the microwave communications equipment (antennae, receiver, transmitter, etc.) securely supported and/or anchored?
							Are the components of the public address system and phone system secured?
6.4.8	**Electrical and Communications Distribution Equipment**						

Item No.	Component Name	Principal Concerns	Example	C	NC	NA	Checklist Questions (Yes=Compliance; No or Unknown=Noncompliance; NA=Not Applicable)
	Electrical raceways, conduit, cable trays	Electrical hazards, loss of function	6.4.8.1				Are the raceways, bus ducts, and cable trays all laterally braced, including both transverse and longitudinal braces at reasonable spacing?
							Are electrical cables or conduit able to distort at the connections with the equipment or where they cross seismic joints between buildings?
	Distribution panels	Electrical hazards, loss of function	6.4.8.2				Are the electrical distribution panels securely anchored to the floor or wall?
6.4.9	**Light Fixtures**						
	Recessed	Falling hazards	6.4.9.1				Are recessed lights securely attached to the ceiling grid to resist seismic shaking and is the ceiling grid adequately braced?
							Do the lay-in fluorescent light fixtures have positive support, independent of the ceiling grid, such as at least two diagonally opposite hanger wires per light fixture?
							Do lay-in fixtures weighing more than 50 pounds have independent lateral support?
							Are lens covers attached or supplied with safety devices?
	Surface-mounted	Falling hazards	6.4.9.2				Are spot lights or track lights securely attached to resist seismic shaking?
							Are exterior light fixtures properly supported or securely attached to the structure?
							Are emergency lights and exit lights mounted to protect them from falling off the wall or off shelf supports?
	Pendant light fixtures	Falling hazard, light fixture or	6.4.9.3				Do chandeliers or other hanging fixtures have safety cables to prevent them from impacting each other or a window?

Item No.	Component Name	Principal Concerns	Example	C	NC	NA	Checklist Questions (Yes=Compliance; No or Unknown=Noncompliance; NA=Not Applicable)
		unrestrained bulbs					Are lens covers attached or supplied with safety devices?
							Do pendant or stem light fixtures have safety cables so they will not fall if the fixture sways and breaks the stem connection, or are they braced to prevent swaying?
	Heavy light-fixtures	Falling hazards	6.4.9.4				Are heavy light fixtures, such as operating room lights, adequately braced and anchored to the structure independent of the ceiling system?
6.4.10	**Elevators and escalators**						*Caution: The moving parts or components of these systems need to be evaluated by qualified personnel. Inappropriate seismic restraints may compromise the safe operation of these systems.*
	Hydraulic elevator	Loss of function	6.4.10.1				Are the components of the hydraulic system properly anchored?
	Traction elevator	Loss of function, counter-weights out of guide rails, cables out of sheaves, dislodged equipment	6.4.10.2				Are the cables installed in such a way that they are protected against misalignment during an earthquake?
							Is the elevator cab properly attached to the guide rails?
							Are the counterweights properly attached to the guide rails?
							Are the guide rails securely attached to the building?
							Are the motor and motor control cabinets properly anchored?
							Is the elevator equipped with a seismic switch?
	Escalators	Loss of function	6.4.10.3				Is the escalator control equipment securely anchored?

Item No.	Component Name	Principal Concerns	Example	C	NC	NA	Checklist Questions (Yes=Compliance; No or Unknown=Noncompliance; NA=Not Applicable)
							Is it known if the escalator was designed by an engineer to accommodate relative movement between floors during an earthquake?
							Is the control equipment for the moving walkway properly anchored?
6.4.11	**Conveyors, material handling**						
	Conveyors	Loss of function, falling hazard if elevated, contents fall	6.4.11.1				Are supports for the conveyors properly anchored to the floor or wall?
							Is the conveyor control equipment properly anchored?

6.5 Furniture, Fixtures & Equipment and Contents

Item No.	Component Name	Principal Concerns	Example	C	NC	NA	Checklist Questions (Yes=Compliance; No or Unknown=Noncompliance; NA=Not Applicable)
6.5.1	**Storage racks**						
	Light duty shelving	Contents fall, shelves damaged	6.5.1.1				Are tall shelving units securely anchored to the floor or walls?
							If walls are used for lateral support, has the capacity of the walls been checked for adequacy to restrain the shelving?
							Are heavily loaded shelving units supported in both directions?
							For shelving units significantly taller than wide, are large anchor bolts used to anchor each leg to a concrete slab?
							Are breakable items secured to the shelves, or are they stored in stable units (e.g., are they shelved in the original packing boxes, or are small items shrink-wrapped together)?

Item No.	Component Name	Principal Concerns	Example	C	NC	NA	Checklist Questions (Yes=Compliance; No or Unknown=Noncompliance; NA=Not Applicable)
	Industrial storage racks	Contents fall, racks damaged	6.5.1.2				Are industrial storage racks braced and anchored to a concrete floor slab or concrete walls?
							If walls are used for lateral support, has the capacity of the walls been checked for adequacy to restrain the shelving?
							Has the capacity of the concrete floor slab been checked for adequacy to resist uplift of the storage racks?
							Are the racks equipped with dampers, base isolation, or other specialized seismic restraint systems?
6.5.2	**Bookcases, Shelving**						
	Bookshelves	Contents fall, shelving damaged	6.5.2.1				Are bookshelves 5' or taller properly anchored with brackets to a solid wall or studs, or anchored to the floor, particularly if they are located next to a bed or desk or where they could block an exit?
							Does the wall or partition used to anchor the book shelves have adequate strength to support seismic loading from the shelving?
							Are bookshelves fitted with edge restraints or elastic cords to keep books from falling?
							Are large and heavy books located on the lowest shelves?
	Library and other shelving	Contents fall, shelving damaged	6.5.2.2				Is it known if the lateral supports for the library stacks and shelving have been designed by an architect or engineer?
							Are library shelving and stacks properly braced and anchored to the floor and walls, including bracing to the floor above if shelving is tall and slender that tie the shelving units together?

Item No.	Component Name	Principal Concerns	Example	C	NC	NA	Checklist Questions (Yes=Compliance; No or Unknown=Noncompliance; NA=Not Applicable)
							If all shelving units are not independently braced or anchored, are adjacent units fastened together with bolts or other mechanical fasteners?
							Do walls or partitions used to anchor library stacks have adequate strength for the imposed lateral loads?
							Are bookshelves fitted with edge restraints or elastic cords to keep books from falling?
							Are large and heavy books located on the lowest shelves?
							Are rare or fragile books given extra protection to prevent falling and water damage?
6.5.3	**Computer and Communications Equipment**						
	Computer access floors and equipment	Collapse, separation between modules, loss of function	6.5.3.1				Are the support pedestals for computer access floors anchored to the floor and braced with diagonal steel members, or is it verified that the vertical pedestals are a seismically qualified model, installed in accordance with the manufacturer's recommendations?
							Do cable openings in the access floor have edge guards to prevent equipment legs from sliding into the openings
							Are computers, tape racks, and associated equipment that are about twice as tall as wide, anchored, tethered, and/or laterally supported?
							Does heavy computer equipment have supports which are braced and anchored to the structural floor slab independently of the computer access floors?
							Is computer cabling long enough to accommodate lateral movement within the building?

Item No.	Component Name	Principal Concerns	Example	C	NC	NA	Checklist Questions (Yes=Compliance; No or Unknown=Noncompliance; NA=Not Applicable)
	Computer and communication racks	Lost data or damaged equipment may cause downtime	6.5.3.2				Is computer information vital to operations backed up and stored off-site?
							Is critical computer and communications equipment securely anchored to the rack?
							Are computer and communication racks securely anchored to the floor or wall?
							Is sensitive computer or communications equipment located out of range of fire sprinkler heads or joints in the sprinkler pipes where they are less prone to water damage if the sprinkler lines break?
	Desktop computers and accessories	Falling hazard, lost data or damaged equipment may cause downtime	6.5.3.3				Are computers and monitors anchored to desktops?
							Are desktop or countertop computers and printers mounted with positive restraint, resting on high-friction rubber pads, or located far enough from the edges of desks and tables to prevent them from sliding and falling in an earthquake?
	Televisions and video monitors, wall-mounted	Falling hazard	6.5.3.4				Are wall- or overhead-mounted television sets, video monitors, surveillance cameras or sound system speakers securely braced and anchored to the wall or ceiling or equipped with safety cables?
6.5.4	**Hazardous materials storage**						
	Hazardous materials storage	Hazardous material release, mixing of incompatible substances	6.5.4.1				Are chemical supplies secured with shelf lips several inches high, or are they stored in "egg crate" containers in drawers, so that the containers will not overturn or fall and spill?
							Are chemicals stored in accordance with manufacturers' recommendations?
							Are incompatible chemicals stored at an appropriate distance from one another so that they will not mix if the containers are broken?

Item No.	Component Name	Principal Concerns	Example	C	NC	NA	Checklist Questions (Yes=Compliance; No or Unknown=Noncompliance; NA=Not Applicable)
							Are the chemicals in each cabinet catalogued properly and marked clearly?
							Are Material Safety Data Sheets (MSDSs) stored in a location separate from the chemicals?
							Are cabinets for hazardous materials securely attached to the floor or to a sturdy wall?
							Has asbestos insulation been removed, or has it been encapsulated to reduce the possibility of damage in an earthquake?
							Is the facility free of asbestos that would need to be abated before any retrofit work?
6.5.5	**Miscellaneous FF&E**						
	File cabinets	Cabinets fall, may block exits, contents spill	6.5.5.1				Do the file cabinet drawers or doors latch securely?
							Are tall file cabinets anchored with wall brackets to a solid wall or studs, anchored to the floor, or bolted to one or more adjacent cabinets to form a more stable configuration, i.e., a larger "footprint"?
							Are unanchored cabinets located so that they will not fall or slide and block a door or exit?
	Demountable partitions	Collapse, block exit path	6.5.5.2				Are demountable partitions attached to each other and arranged in a stable layout with many perpendicular wall segments?
							Are partial-height partitions anchored to the floor?
							If tall shelving or cabinets are located next to the partitions, can these items be moved or independently anchored to the floor or structure?
	Miscellaneous furniture and fixtures	Falling hazard	6.5.5.3				Are tall items located near beds or desks securely anchored to a wall with adequate capacity?

Item No.	Component Name	Principal Concerns	Example	C	NC	NA	Checklist Questions (Yes=Compliance; No or Unknown=Noncompliance; NA=Not Applicable)
							Are large kitchen and laundry equipment all securely anchored to the floor, wall, or countertop with adequate capacity?
							Are vending machines tethered a column or wall to prevent tipping and sliding?
							Are unanchored furnishings located where they cannot slide or overturn to block corridors or doors?
							Are heavy wall pictures and other wall hangings well anchored to the studs or structural framing?
							Are heavy hanging plants secured to prevent falling or impact with windows?
							Are personal or storage lockers and vending machines anchored and laterally supported, or are they clear of exits?
6.5.6	**Miscellaneous Contents**						
	Shelf-mounted items	Contents fall, items broken or mixed	6.5.6.1				Are valuable or fragile items protected against tipping or falling off shelving?
							Are the drawers and cabinet doors latched securely, e.g., with special latches or baby-proof hardware that will not fly open in an earthquake?
							Are rare or valuable items (rare books, museum collections, medical records) given extra protection against falling and water damage?
							Are heavy potted plants on file cabinets or tall shelves restrained to prevent falling?
	Desktop, countertop items		6.5.6.2				Is radio equipment restrained to keep it from sliding off shelving or tabletops?
							Is important equipment restrained to keep it from sliding off shelving or tabletops?

Item No.	Component Name	Principal Concerns	Example	C	NC	NA	Checklist Questions (Yes=Compliance; No or Unknown=Noncompliance; NA=Not Applicable)
							Are fax machines restrained or placed far enough from the edge that they will not slide and fall off?
							Is the public address system restrained to prevent the equipment from sliding and falling off the shelving?
	Fragile artwork	Loss of rare or expensive art objects, falling hazards	6.5.6.3				Are heavy sculptures anchored to prevent overturning during an earthquake?
							Are heavy wall-mounted paintings, mirrors, or other wall hangings well anchored to structural studs or framing?
							Do hanging sculptures or mobiles have a safety cable to prevent them from swinging excessively, impacting windows or other artwork, or falling?
							Are fragile items restrained by mono-filament lines, hook and loop material, Plexiglas display cases, or some other seismic safety device?
	Fire extinguisher and cabinet		6.5.6.4				Are the fire extinguisher cabinets and/or hose cabinets securely mounted?

	Emergency Systems						
Item No.	**Component Name**	**Principal Concerns**	**Example**	**C**	**NC**	**NA**	**Checklist Questions (Yes=Compliance; No or Unknown=Noncompliance; NA=Not Applicable)**
	Emergency Egress						*Emergency system components were not covered in the body of the document but are an important consideration for providing earthquake safety.*
	Emergency Egress	Exit doors jammed, corridors blocked, no emergency lighting, falling hazards	6.6.1.1				If primary exit doors are heavy metal fire doors that might jam if the building racks during an earthquake, is there a crowbar or sledgehammer located near the exit to facilitate emergency exiting?
							Do automatic doors with optical or floor sensors and mechanized roll-up doors have a manual override in case of a power outage after an earthquake?
							Are the building utilities and architectural finishes along egress routes (piping, ducts, ceilings, lights, partitions, etc.) braced or anchored adequately to prevent falling obstructions and to keep the egress routes clear after an earthquake?
							Are the furniture and contents along egress routes (desks, supply cabinets, shelving, etc.) braced or anchored adequately to prevent falling obstructions and keep the egress routes clear after an earthquake?
							Are unanchored furniture and contents along egress routes kept far enough from the exits so they will not fall or slide and obstruct the doors?
							Have any unreinforced masonry walls in stairwells, corridors, and elevator enclosures been removed, strengthened, or encapsulated to prevent collapse during an earthquake?

Item No.	Component Name	Principal Concerns	Example	C	NC	NA	Checklist Questions (Yes=Compliance; No or Unknown=Noncompliance; NA=Not Applicable)
							Are parapets, canopies, veneers, cornices and any other ornamentation above building exits braced and anchored to prevent collapse?
							Are emergency lights and exit lights securely mounted to protect them from falling off walls or shelf supports during an earthquake?
							Are transoms, skylights, corridor glazing or glazing above exits made of safety glass or covered with shatter-resistant film?
							If the building has elevators, does the elevator have a seismic switch?
	Emergency Power Generation and Distribution System	Loss of function					Is the emergency generator adequately secured, especially if mounted on motor vibration isolation springs?
							Is the concrete housekeeping pad adequately anchored to the structural slab?
							Is the diesel fuel tank adequately braced and anchored?
							Are the batteries and battery racks adequately braced and anchored?
							Are the fuel lines, cooling water lines, and exhaust flues for the emergency generator attached with flexible connections that are able to accommodate relative movement at junctions to spring-mounted equipment, at building entry and exit points, and at expansion joints within the building?
							Have the transformer, MCC, switchgear and bus ducts been checked?
							Have all the components of the emergency power generating system and the electrical distribution system been checked as part of this survey?

Item No.	Component Name	Principal Concerns	Example	C	NC	NA	Checklist Questions (Yes=Compliance; No or Unknown=Noncompliance; NA=Not Applicable)
	Fire Detection and Protection System	Loss of function					Are fire and smoke detectors properly mounted?
							Is the control equipment for the fire alarm system and automatic fire doors securely anchored?
							Are the fire extinguisher cabinets and/or hose cabinets securely mounted?
							Are the fire extinguishers secured with quick-release straps?
							Are the fire sprinkler piping components laterally restrained in each direction?
							Is the ceiling restrained so the ceilings won't break the sprinkler heads?
							Are the distribution lines able to accommodate movement where they cross between buildings?
							Is the fire water pump anchored, or is it mounted on vibration isolation springs with additional seismic restraints?
							Is the emergency water tank or reservoir securely attached to its supports?
							Are the tank supports anchored to the floor and braced in both directions?
							Are the supports or braces properly anchored to the foundation?
							Are the smoke control fans properly supported and/or anchored?
							Are the fan control centers securely anchored?
	Emergency Supply Cabinet	Supplies inaccessible in emergency					Is the cabinet properly braced and anchored to the floor and/or walls?