Wood Light Frames, Small Residential W1

These buildings are detached one- or two-family dwellings one to three stories high with plan areas on each level less than or equal to 3,000 ft^2 (280 m^2) and a total plan area less than or equal to 6,000 ft^2 (560 m^2). Floor and roof framing consists of wood joists or rafters on wood studs spaced no more than 24 in. (61 cm) apart or wood post-and-beam construction. The first-floor framing is supported directly on an at-grade foundation or slab-on-grade or directly on concrete or masonry basement walls or is raised up on cripple studs and post-and-beam supports. Seismic forces are resisted by wood framed and sheathed diaphragms and shear walls. Floor and roof diaphragms consist of straight or diagonal lumber sheathing, tongue-and-groove planks, oriented strand board, plywood, or other materials. Shear walls consist of straight or diagonal wood sheathing, plank siding, oriented strand board, plywood, stucco, gypsum board, particleboard, fiberboard, or similarly performing materials.

Wood Frames, Large Residential, Commercial, Industrial, and Institutional W2

These buildings are one- and two-family dwellings that exceed the criteria for W1 buildings; multiunit residential buildings or commercial, industrial, or institutional buildings. Elevated floor and roof framing consists of wood or steel trusses, glulam or steel beams, and wood posts or steel columns. Ground or basement floors generally consist of concrete slab-on-grade. Seismic forces are resisted by flexible diaphragms and exterior walls sheathed with plywood, oriented strand board, stucco, plaster, or straight or diagonal wood sheathing; or walls are braced with various forms of wood bracing, such as knee-braced or cantilevered columns. Bracing with materials other than wood is considered a mixed system and is subject to the requirements in Section 3.5.1.2.2. Wall openings for storefronts and garages, where present, are framed by post-and-beam framing. In some cases, these building may be located over a podium level structure with concrete or masonry shear walls and can be evaluated as a mixed system subject to the requirements in Section 3.5.1.2.2.2.

Steel Moment Frames S1 (with Stiff Diaphragms)

These buildings consist of a frame assembly of steel beams, joists, open web joists, and/or trusses, and steel columns. Floor and roof diaphragms consist of cast-in-place concrete slabs or steel deck with reinforced structural concrete fill supported on the steel framing and are stiff relative to the moment frames. Seismic forces are resisted by steel moment frames that develop their stiffness through fully restrained or partially restrained beam–column connections.

S1a (with Flexible Diaphragms)

These buildings are similar to S1 buildings, except that diaphragms are bare steel deck or steel deck with fill other than reinforced structural concrete and are flexible relative to the frames.

Steel Braced Frames S2 (with Stiff Diaphragms)

These buildings consist of a frame assembly of steel beams, joists, open-web joists, and/or trusses, and steel columns. Floor and roof diaphragms consist of cast-in-place concrete slabs or steel deck with reinforced structural concrete fill supported on the steel framing and are stiff relative to the braced frames. Seismic forces are resisted by steel braced frames that develop their stiffness through bracing action of the diagonal members resisting axial loads. Three variations in the configuration and design of braced frames exist. These variations are as follows:

- Concentrically braced frames: Component work lines intersect at a single point or at multiple points such that the distance between intersecting work lines (or eccentricity) is less than or equal to the width of the smallest component connected at the joint.
- Eccentrically braced frames: Component work lines do not intersect at a single point, and the distance between the intersecting work lines (or eccentricity) exceeds the width of the smallest component connecting at the joint. Some of the members are subjected to shear and flexural stresses because of that eccentricity.
- Buckling-restrained braced frames: Special types of concentrically braced frames where the steel bracing members are encased within a rigid casing that is intended to prevent buckling of the steel brace.

S2a (with Flexible Diaphragms)	These buildings are similar to S2 buildings, except that diaphragms consist of wood or cold-formed steel framing, bare steel deck, or steel deck with fill other than reinforced structural concrete, and they are flexible relative to the braced frames.
Metal Building Frames S3	These buildings use transverse steel moment frames and sometimes contain wall panel shear elements or braced frames at the ends of the building. Lateral forces in the longitudinal direction typically rely on wall panel shear elements or rod bracing. The buildings are one story high, but they sometimes have mezzanines. The transverse moment frames typically consist of beams and columns that are either web-tapered or prismatic built-up sections with thin plates. The frames are built in segments and assembled in the field with bolted or welded joints. The roof and walls consist of lightweight metal, fiberglass, or cementitious panels. Diaphragm forces are resisted by bare steel deck, roof panel shear elements, or a system of tension-only rod bracing located in the plane of the roof framing.
Dual Frame Systems with Backup Steel Moment Frames and Stiff Diaphragms S4	These buildings consist of a gravity frame assembly of steel beams, joists, open-web joists, and/or trusses, and steel columns. The floor and roof diaphragms consist of cast-in-place concrete slabs or steel deck with reinforced structural concrete fill and are stiff relative to the vertical elements of the lateral system. Seismic forces are resisted primarily by either steel braced frames or cast-in-place concrete shear walls in combination with backup steel moment frames. The steel moment frames interact with the steel braced frames or concrete shear walls and resist seismic forces in proportion to their relative rigidity.
Steel Frames with Infill Masonry Shear Walls S5 (with Stiff Diaphragms)	These buildings consist of a gravity frame assembly of steel beams, joists, open-web joists, and/or trusses, and steel columns. The floor and roof diaphragms consist of cast-in-place concrete slabs or steel deck with reinforced structural concrete fill and are stiff relative to the walls. Walls consist of solid or perforated infill panels constructed of solid clay brick, concrete block, or hollow clay tile masonry which are in-plane with and infill within the structural frames.
S5a (with Flexible Diaphragms)	These buildings are similar to S5 buildings, except that diaphragms consist of wood sheathing or bare steel deck, or steel deck with fill other than reinforced structural concrete and are flexible relative to the walls.
Steel Plate Shear Walls S6	These buildings consist of a gravity frame assembly of steel beams, joists, open-web joists, and/or trusses, and steel columns. Floor and roof diaphragms consist of cast-in-place concrete slabs or steel deck with reinforced structural concrete fill supported on the steel framing and are stiff relative to the shear walls. Shear walls are constructed with steel plates with horizontal and vertical boundary elements adjacent to the webs.
Cold-Formed Steel Light-Frame Construction CFS1 (Shear Wall System)	These buildings have cold-formed steel light-frame walls supporting the majority of the lateral loads. Floor and roof framing consists of cold-formed steel joists or rafters on cold-formed steel studs spaced no more than 24 in. (61 cm) apart, wood or cold-formed steel trusses, structural steel or cold-formed steel beams, and structural steel or cold-formed steel columns. Seismic forces are resisted by wood structural panel or bare steel deck diaphragms, and wood structural panel sheathed shear walls or steel sheet sheathed shear walls. Cold-formed steel light-frame buildings that have precast concrete plank diaphragms shall not be permitted to be classified as this common building type.
Cold-Formed Steel Light-Frame Construction CFS2 (Strap-Braced Wall System)	These buildings have cold-formed steel light-frame strap walls supporting the majority of the lateral loads. Floor and roof framing consists of cold-formed steel joists or rafters on cold-formed steel studs spaced no more than 24 in. (61 cm) apart, wood or cold-formed steel trusses, structural steel or cold-formed steel beams, and structural steel or cold-formed steel columns. Seismic forces are resisted by diaphragms with wood structural panels or bare steel deck, and steel light-frame stud walls with diagonal flat strap bracing. Cold-formed steel light-frame buildings that have precast concrete plank diaphragms shall not be permitted to be classified as this common building type.
Concrete Moment Frames C1	These buildings consist of a frame assembly of cast-in-place reinforced concrete beams and columns. Floor and roof framing consists of cast-in-place concrete slabs, concrete beams, one-way joists, two-way waffle joists, or flat slabs. Seismic forces are resisted by concrete moment frames that develop their stiffness through monolithic beam–column connections. In some conditions the moment frames consist of slab-column frames in two-way flat slab systems.
Concrete Shear Walls C2 (with Stiff Diaphragms)	These buildings have floor and roof framing that consists of cast-in-place concrete slabs, concrete beams, one-way joists, two-way waffle joists, or flat slabs. Buildings may also have floor and roof framing consisting of steel beams, joists, open-web joists, trusses, and/or cold-formed steel light-frame construction that support diaphragms consisting of steel deck with reinforced structural concrete fill. Floor and roof framing is supported on concrete or steel columns and/or concrete bearing walls. Seismic forces are resisted by cast-in-place concrete shear walls.
C2a (with Flexible Diaphragms)	These buildings are similar to C2 buildings, except that diaphragms consist of wood sheathing or bare steel decking and are flexible relative to the walls.

Concrete Frames with Infill Masonry Shear Walls C3 (with Stiff Diaphragms)	These buildings consist of a gravity frame assembly of cast-in-place concrete beams and columns. The floor and roof diaphragms consist of cast-in-place concrete slabs with concret joists and beams and are stiff relative to the walls. Walls consist of solid or perforated infill panels constructed of solid clay brick, concrete block, or hollow clay tile masonry which are in-plane with and infill within the structural frames.
C3a (with Flexible Diaphragms)	These buildings are similar to C3 buildings, except that diaphragms consist of wood sheathing or bare steel deck or steel deck with fill other than reinforced structural concrete and are flexible relative to the walls.
Precast or Tilt-Up Concrete Shear Walls PC1 (with Flexible Diaphragms)	These buildings have precast concrete perimeter wall panels and, in some conditions, interior walls, that are typically cast on site and tilted into place. The panels are interconnected by weldments, cast-in-place concrete pilasters, or collector elements. Floor and roof framing consists of wood purlins, joists, and girders; open-web wood or steel joists; or steel beams, girders, and/or trusses. Framing is supported on interior steel or wood columns and perimeter concrete bearing walls. Seismic forces are resisted by precast concrete shear walls. Diaphragms consist of wood sheathing, bare steel deck, or steel deck with fill other than reinforced structural concrete and are flexible relative to the walls.
PC1a (with Stiff Diaphragms)	These buildings are similar to PC1 buildings, except that diaphragms consist of precast elements, cast-in-place concrete, or steel deck with reinforced structural concrete fill and are stiff relative to the walls.
Precast Concrete Frames PC2 (with Shear Walls)	These buildings consist of a frame assembly of precast concrete beams, girders, and columns with the presence of concrete shear walls. Floor and roof framing consists of cast-in-place concrete slabs, precast concrete planks, tees, or double-tees supported on precast concrete girders, some or all of which could be pre- or post-tensioned. Seismic forces are resisted by precast or cast-in-place concrete shear walls, which also support gravity loads. Diaphragms consist of precast elements interconnected with welded inserts, cast-in-place closure strips, or reinforced concrete slabs or topping slabs.
PC2a (without Shear Walls)	These buildings are similar to PC2 buildings, except that concrete shear walls are not present. Seismic forces are resisted by precast concrete moment frames that develop their stiffness through beam–column joints rigidly connected by welded inserts or cast-in-place concrete closures. Diaphragms consist of precast elements interconnected with welded inserts, cast-in-place closure strips, or reinforced concrete slabs or topping slabs.
Reinforced Masonry Bearing Walls RM1 (with Flexible Diaphragms)	These buildings have bearing walls that consist of reinforced brick or concrete block masonry. Floor and roof framing consists of wood purlins, joists, and girders; open-web wood or steel joists; or steel beams, girders, and/or trusses. Framing is supported by reinforced masonry bearing walls, wood stud walls, cold-formed steel light-frame construction, or by steel, wood or masonry columns. Seismic forces are resisted by reinforced masonry shear walls. Diaphragms consist of wood sheathing, bare steel deck, or steel deck with fill other than reinforced structural concrete and are flexible relative to the walls.
Reinforced Masonry Bearing Walls RM2 (with Stiff Diaphragms)	These building are similar to RM1 buildings, except that the diaphragms consist of steel deck with reinforced structural concrete fill, precast concrete planks, tees, or double-tees, with or without a cast-in-place concrete topping slab, and are stiff relative to the walls. The floor and roof framing is supported on interior steel or concrete frames or interior reinforced masonry walls.
Unreinforced Masonry Bearing Walls URM (with Flexible Diaphragms)	These buildings have perimeter bearing walls that consist of unreinforced clay brick, stone, or concrete masonry. Interior bearing walls, where present, also consist of unreinforced clay brick, stone, or concrete masonry. Floor and roof framing consists of wood joists and beams, which are supported by wood, steel, or cast iron columns. Seismic forces are resisted by unreinforced masonry shear walls. The diaphragms consist of wood sheathing and are flexible relative to the masonry shear walls. Where they exist, ties between the walls and diaphragms consist of anchors or bent steel plates embedded in the mortar joints and attached to framing. Previously retrofitted buildings have wall anchors that consist of post-installed adhesive anchors or post-installed thru-bolts. Buildings with bearing and/or shear walls comprised of adobe shall not be permitted to be classified as this common building type.
URMa (with Stiff Diaphragms)	These buildings are similar to URM buildings, except that the diaphragms are stiff relative to the unreinforced masonry walls. Floor and roof framing consists of cast-in-place concrete slabs supported by concrete or concrete encased steel beams and columns; arched or flat brick or tile floors, with or without concrete topping slabs; or steel deck with reinforced structural concrete fill on steel framing and are stiff relative to the masonry shear walls. Buildings with bearing and/or shear walls comprised of adobe shall not be permitted to be classified as this common building type.

Table 17-1. Very Low Seismicity Checklist.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Structural Components			
C NC N/A U	LOAD PATH: The structure contains a complete, well-defined load path, including structural elements and connections, that serves to transfer the inertial forces associated with the mass of all elements of the building to the foundation.	5.4.1.1	A.2.1.1
C NC N/A U	WALL ANCHORAGE: Exterior concrete or masonry walls that are dependent on the diaphragm for lateral support are anchored for out-of-plane forces at each diaphragm level with steel anchors, reinforcing dowels, or straps that are developed into the diaphragm. Connections have adequate strength to resist the connection force calculated in the Quick Check procedure of Section 4.4.3.7.	5.7.1.1	A.5.1.1

Note: C = Compliant, NC = Noncompliant, N/A = Not Applicable, and U = Unknown.

Table 17-2. Collapse Prevention Basic Configuration Checklist.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Low Seismicity			
Building System—General			
C NC N/A U	LOAD PATH: The structure contains a complete, well-defined load path, including structural elements and connections, that serves to transfer the inertial forces associated with the mass of all elements of the building to the foundation.	5.4.1.1	A.2.1.1
C NC N/A U	ADJACENT BUILDINGS: The clear distance between the building being evaluated and any adjacent building is greater than 0.25% of the height of the shorter building in low seismicity, 0.5% in moderate seismicity, and 1.5% in high seismicity.	5.4.1.2	A.2.1.2
C NC N/A U	MEZZANINES: Interior mezzanine levels are braced independently from the main structure or are anchored to the seismic-force-resisting elements of the main structure.	5.4.1.3	A.2.1.3
Building System—Building Configuration			
C NC N/A U	WEAK STORY: The sum of the shear strengths of the seismic-force-resisting system in any story in each direction is not less than 80% of the strength in the adjacent story above.	5.4.2.1	A.2.2.2
C NC N/A U	SOFT STORY: The stiffness of the seismic-force-resisting system in any story is not less than 70% of the seismic-force-resisting system stiffness in an adjacent story above or less than 80% of the average seismic-force-resisting system stiffness of the three stories above.	5.4.2.2	A.2.2.3
C NC N/A U	VERTICAL IRREGULARITIES: All vertical elements in the seismic-force-resisting system are continuous to the foundation.	5.4.2.3	A.2.2.4
C NC N/A U	GEOMETRY: There are no changes in the net horizontal dimension of the seismic-force-resisting system of more than 30% in a story relative to adjacent stories, excluding 1-story penthouses and mezzanines.	5.4.2.4	A.2.2.5
C NC N/A U	MASS: There is no change in effective mass of more than 50% from one story to the next. Light roofs, penthouses, and mezzanines need not be considered.	5.4.2.5	A.2.2.6
C NC N/A U	TORSION: The estimated distance between the story center of mass and the story center of rigidity is less than 20% of the building width in either plan dimension. This statement does not apply to buildings with flexible diaphragms.	5.4.2.6	A.2.2.7
Moderate Seismicity (Complete the Following Items in Addition to the Items for Low Seismicity)			
Geologic Site Hazards			
C NC N/A U	LIQUEFACTION: Liquefaction-susceptible, saturated, loose granular soils that could jeopardize the building's seismic performance do not exist in the foundation soils at depths within 50 ft (15.2 m) under the building.	5.4.3.1	A.6.1.1

continues

Table 17-2 *(Continued)*. Collapse Prevention Basic Configuration Checklist.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
C NC N/A U	SLOPE FAILURE: The building site is located away from potential earthquake-induced slope failures or rockfalls so that it is unaffected by such failures or is capable of accommodating any predicted movements without failure.	5.4.3.1	A.6.1.2
C NC N/A U	SURFACE FAULT RUPTURE: Surface fault rupture and surface displacement at the building site are not anticipated.	5.4.3.1	A.6.1.3
High Seismicity (Complete the Following Items in Addition to the Items for Moderate Seismicity)			
Foundation Configuration			
C NC N/A U	TIES BETWEEN FOUNDATION ELEMENTS: For buildings supported on soils classified as Site Class D, DE, E, or F, the individual pile caps, piles, and piers are restrained by concrete beams or slabs adequate to resist seismic forces. For buildings supported on soils classified as Site Class E or F, individual spread footings are restrained by concrete beams or slabs adequate to resist seismic forces.	5.4.3.4	A.6.2.2

Note: C = Compliant, NC = Noncompliant, N/A = Not Applicable, and U = Unknown.

Table 17-3. Immediate Occupancy Basic Configuration Checklist.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Very Low Seismicity			
Building System—General			
C NC N/A U	LOAD PATH: The structure contains a complete, well-defined load path, including structural elements and connections, that serves to transfer the inertial forces associated with the mass of all elements of the building to the foundation.	5.4.1.1	A.2.1.1
C NC N/A U	ADJACENT BUILDINGS: The clear distance between the building being evaluated and any adjacent building is greater than 0.5% of the height of the shorter building in low seismicity, 1.0% in moderate seismicity, and 3.0% in high seismicity.	5.4.1.2	A.2.1.2
C NC N/A U	MEZZANINES: Interior mezzanine levels are braced independently from the main structure or are anchored to the seismic-force-resisting elements of the main structure.	5.4.1.3	A.2.1.3
Building System—Building Configuration			
C NC N/A U	WEAK STORY: The sum of the shear strengths of the seismic-force-resisting system in any story in each direction is not less than 80% of the strength in the adjacent story above.	5.4.2.1	A.2.2.2
C NC N/A U	SOFT STORY: The stiffness of the seismic-force-resisting system in any story is not less than 70% of the seismic-force-resisting system stiffness in an adjacent story above or less than 80% of the average seismic-force-resisting system stiffness of the three stories above.	5.4.2.2	A.2.2.3
C NC N/A U	VERTICAL IRREGULARITIES: All vertical elements in the seismic-force-resisting system are continuous to the foundation.	5.4.2.3	A.2.2.4
C NC N/A U	GEOMETRY: There are no changes in the net horizontal dimension of the seismic-force-resisting system of more than 30% in a story relative to adjacent stories, excluding 1-story penthouses and mezzanines.	5.4.2.4	A.2.2.5
C NC N/A U	MASS: There is no change in effective mass of more than 50% from one story to the next. Light roofs, penthouses, and mezzanines need not be considered.	5.4.2.5	A.2.2.6
C NC N/A U	TORSION: The estimated distance between the story center of mass and the story center of rigidity is less than 20% of the building width in either plan dimension. This statement does not apply to buildings with flexible diaphragms.	5.4.2.6	A.2.2.7

continues

Table 17-3 *(Continued)*. Immediate Occupancy Basic Configuration Checklist.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Low Seismicity (Complete the Following Items in Addition to the Items for Very Low Seismicity)			
Geologic Site Hazards			
C NC N/A U	LIQUEFACTION: Liquefaction-susceptible, saturated, loose granular soils that could jeopardize the building's seismic performance do not exist in the foundation soils at depths within 50 ft (15.2 m) under the building.	5.4.3.1	A.6.1.1
C NC N/A U	SLOPE FAILURE: The building site is located away from potential earthquake-induced slope failures or rockfalls so that it is unaffected by such failures or is capable of accommodating any predicted movements without failure.	5.4.3.1	A.6.1.2
C NC N/A U	SURFACE FAULT RUPTURE: Surface fault rupture and surface displacement at the building site are not anticipated.	5.4.3.1	A.6.1.3
Tsunami Hazards			
C NC N/A U	TSUNAMI: The building is not located within a Tsunami Design Zone as defined by ASCE 7 Chapter 6 or is located in a Tsunami Design Zone where the inundation depth per ASCE 7 Chapter 6 is less than 3 ft (0.9 m).	5.4.3.1	A.6.1.4
Moderate and High Seismicity (Complete the Following Items in Addition to the Items for Low Seismicity)			
Foundation Configuration			
C NC N/A U	TIES BETWEEN FOUNDATION ELEMENTS: For buildings supported on soils classified as Site Class D, DE, E, or F, the individual pile caps, piles, and piers are restrained by concrete beams or slabs adequate to resist seismic forces. For buildings supported on soils classified as Site Class E or F, individual spread footings are restrained by concrete beams or slabs adequate to resist seismic forces.	5.4.3.4	A.6.2.2
C NC N/A U	DEEP FOUNDATIONS: Piles that are required to transfer lateral and/or overturning forces between the structure and the soil shall have a positive connection between the piles and the pile cap, foundation mat, grade beam, or other element of the building foundation system. Cast-in-place and precast non-prestressed piles shall have a minimum longitudinal reinforcement ratio of 0.0025 and transverse reinforcing spaced at no more than 6 in (152.4 mm) within a distance of three times the pile diameter from the bottom of the pile cap. Precast prestressesd piles shall have a minimum effective prestress of 400 psi and transverse reinforcing spaced at no more than 6 in. (152.4 mm) within a distance of 20 ft (6 m) from the top of the pile.		A.6.2.3
C NC N/A U	SLOPING SITES: The exterior grade difference from one side of the building to another does not exceed one story in height.		A.6.2.4

Note: C = Compliant, NC = Noncompliant, N/A = Not Applicable, and U = Unknown.

Table 17-4. Collapse Prevention Structural Checklist for Building Type W1.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Low and Moderate Seismicity			
Seismic-Force-Resisting System			
C NC N/A U	REDUNDANCY: The number of lines of shear walls in each principal direction is greater than or equal to 2.	5.5.1.1	A.3.2.1.1
C NC N/A U	SHEAR STRESS CHECK: The shear stress in the shear walls, calculated using the Quick Check procedure of Section 4.4.3.3, is less than the following values: Structural panel sheathing 1,000 lb/ft (14.6 kN/m), Diagonal sheathing 700 lb/ft (10.2 kN/m), Straight sheathing 100 lb/ft (1.5 kN/m), and All other conditions 100 lb/ft (1.5 kN/m).	5.5.3.1.1	A.3.2.7.1
C NC N/A U	STUCCO (EXTERIOR PLASTER) SHEAR WALLS: Multistory buildings do not rely on exterior stucco walls as the primary seismic-force-resisting system.	5.5.3.6.1	A.3.2.7.2

continues

Table 17-4 *(Continued)*. Collapse Prevention Structural Checklist for Building Type W1.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
C NC N/A U	GYPSUM WALLBOARD OR PLASTER SHEAR WALLS: Interior plaster or gypsum wallboard is not used for shear walls on buildings more than one story high with the exception of the uppermost level of a multistory building.	5.5.3.6.1	A.3.2.7.3
C NC N/A U	NARROW WOOD SHEAR WALLS: Narrow wood shear walls with an aspect ratio greater than 2-to-1 are not used to resist seismic forces.	5.5.3.6.1	A.3.2.7.4
C NC N/A U	WALLS CONNECTED THROUGH FLOORS: Shear walls have an interconnection between stories to transfer overturning and shear forces through the floor.	5.5.3.6.2	A.3.2.7.5
C NC N/A U	HILLSIDE SITE: For structures that are taller on at least one side by more than one-half story because of a sloping site, all shear walls on the downhill slope have an aspect ratio less than 1-to-1.	5.5.3.6.3	A.3.2.7.6
C NC N/A U	CRIPPLE WALLS: Cripple walls below first-floor-level shear walls are braced to the foundation with wood structural panels.	5.5.3.6.4	A.3.2.7.7
C NC N/A U	OPENINGS: Walls with openings greater than 80% of the length are braced with wood structural panel shear walls with aspect ratios of not more than 1.5-to-1 or are supported by adjacent construction through positive ties capable of transferring the seismic forces.	5.5.3.6.5	A.3.2.7.8
Connections			
C NC N/A U	WOOD POSTS: There is a positive connection of wood posts to the foundation.	5.7.3.3	A.5.3.3
C NC N/A U	WOOD SILLS: All wood sills are bolted to the foundation.	5.7.3.3	A.5.3.4
C NC N/A U	GIRDER–COLUMN CONNECTION: There is a positive connection using plates, connection hardware, or straps between the girder and the column support.	5.7.4.1	A.5.4.1
High Seismicity (Complete the Following Items in Addition to the Items for Low and Moderate Seismicity)			
Connections			
C NC N/A U	WOOD SILL BOLTS: Sill bolts are spaced at 6 ft (1.8 m) or less with acceptable edge and end distance provided for wood and concrete.	5.7.3.3	A.5.3.7
Diaphragms			
C NC N/A U	DIAPHRAGM CONTINUITY: Floor and roof diaphragms do not have expansion joints or vertical offsets, such as split levels, sawtooth, or clerestory configurations.	5.6.1.1	A.4.1.1
C NC N/A U	ROOF CHORD CONTINUITY: All chord elements are continuous, regardless of changes in roof elevation.	5.6.1.1	A.4.1.3
C NC N/A U	STRAIGHT SHEATHING: All straight-sheathed diaphragms have horizontal spans less than 24 ft (7.3 m) and aspect ratios less than 2-to-1 in the direction being considered.	5.6.2	A.4.2.1
C NC N/A U	DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 40 ft (12.2 m) and have aspect ratios less than or equal to 4-to-1.	5.6.2	A.4.2.2
C NC N/A U	OTHER DIAPHRAGMS: The diaphragms do not consist of a system other than wood, steel deck, concrete, or horizontal bracing.	5.6.5	A.4.7.1

Note: C = Compliant, NC = Noncompliant, N/A = Not Applicable, and U = Unknown.

Table 17-5. Immediate Occupancy Checklist for Building Type W1.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Very Low Seismicity			
Seismic-Force-Resisting System			
C NC N/A U	REDUNDANCY: The number of nonlines of shear walls in each principal direction is greater than or equal to 2.	5.5.1.1	A.3.2.1.1

continues

Table 17-5 *(Continued)*. Immediate Occupancy Checklist for Building Type W1.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
C NC N/A U	SHEAR STRESS CHECK: The shear stress in the shear walls, calculated using the Quick Check procedure of Section 4.4.3.3, is less than the following values: Structural panel sheathing 1,000 lb/ft (14.5 kN/m), Diagonal sheathing 700 lb/ft (10.2 kN/m), Straight sheathing 100 lb/ft (1.45 kN/m), and All other conditions 100 lb/ft (1.45 kN/m).	5.5.3.1.1	A.3.2.7.1
C NC N/A U	STUCCO (EXTERIOR PLASTER) SHEAR WALLS: Multistory buildings do not rely on exterior stucco walls as the primary seismic-force-resisting system.	5.5.3.6.1	A.3.2.7.2
C NC N/A U	GYPSUM WALLBOARD OR PLASTER SHEAR WALLS: Interior plaster or gypsum wallboard is not used for shear walls on buildings more than one story high with the exception of the uppermost level of a multistory building.	5.5.3.6.1	A.3.2.7.3
C NC N/A U	NARROW WOOD SHEAR WALLS: Narrow wood shear walls with an aspect ratio greater than 2-to-1 are not used to resist seismic forces.	5.5.3.6.1	A.3.2.7.4
C NC N/A U	WALLS CONNECTED THROUGH FLOORS: Shear walls have an interconnection between stories to transfer overturning and shear forces through the floor.	5.5.3.6.2	A.3.2.7.5
C NC N/A U	HILLSIDE SITE: For structures that are taller on at least one side by more than one-half story because of a sloping site, all shear walls on the downhill slope have an aspect ratio less than 1-to-2.	5.5.3.6.3	A.3.2.7.6
C NC N/A U	CRIPPLE WALLS: Cripple walls below first-floor-level shear walls are braced to the foundation with wood structural panels.	5.5.3.6.4	A.3.2.7.7
C NC N/A U	OPENINGS: Walls with openings greater than 80% of the length are braced with wood structural panel shear walls with aspect ratios of not more than 1.5-to-1 or are supported by adjacent construction through positive ties capable of transferring the seismic forces.	5.5.3.6.5	A.3.2.7.8
Connections			
C NC N/A U	WOOD POSTS: There is a positive connection of wood posts to the foundation.	5.7.3.3	A.5.3.3
C NC N/A U	WOOD SILLS: All wood sills are bolted to the foundation.	5.7.3.3	A.5.3.4
C NC N/A U	GIRDER–COLUMN CONNECTION: There is a positive connection using plates, connection hardware, or straps between the girder and the column support.	5.7.4.1	A.5.4.1
Low, Moderate, and High Seismicity (Complete the Following Items in Addition to the Items for Very Low Seismicity)			
Seismic-Force-Resisting System			
C NC N/A U	HOLD-DOWN ANCHORS: All shear walls have hold-down anchors attached to the end studs constructed in accordance with acceptable construction practices.	5.5.3.6.6	A.3.2.7.9
C NC N/A U	NARROW WOOD SHEAR WALLS: Narrow wood shear walls with an aspect ratio greater than 1.5-to-1 are not used to resist seismic forces.	5.5.3.6.1	A.3.2.7.4
Diaphragms			
C NC N/A U	DIAPHRAGM CONTINUITY: Floor and roof diaphragms do not have expansion joints or vertical offsets, such as split levels, sawtooth, or clerestory configurations.	5.6.1.1	A.4.1.1
C NC N/A U	ROOF CHORD CONTINUITY: All chord elements are continuous, regardless of changes in roof elevation.	5.6.1.1	A.4.1.3
C NC N/A U	PLAN IRREGULARITIES: There is tensile capacity to develop the strength of the diaphragm at reentrant corners or other locations of plan irregularities.	5.6.1.4	A.4.1.7
C NC N/A U	DIAPHRAGM REINFORCEMENT AT OPENINGS: There is reinforcing around all diaphragm openings larger than 50% of the building width in either major plan dimension.	5.6.1.5	A.4.1.8
C NC N/A U	STRAIGHT SHEATHING: All straight-sheathed diaphragms have horizontal spans less than 12 ft (3.65 m) and aspect ratios less than 1-to-1 in the direction being considered.	5.6.2	A.4.2.1
C NC N/A U	DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 30 ft (9.1 m) and aspect ratios less than or equal to 3-to-1.	5.6.2	A.4.2.2

continues

Table 17-5 *(Continued)*. Immediate Occupancy Checklist for Building Type W1.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
C NC N/A U	OTHER DIAPHRAGMS: The diaphragms do not consist of a system other than wood, steel deck, concrete, or horizontal bracing.	5.6.5	A.4.7.1
Connections			
C NC N/A U	WOOD SILL BOLTS: Sill bolts are spaced at 4 ft (1.2 m) or less, with acceptable edge and end distance provided for wood and concrete.	5.7.3.3	A.5.3.7

Note: C = Compliant, NC = Noncompliant, N/A = Not Applicable, and U = Unknown.

Table 17-6. Collapse Prevention Structural Checklist for Building Type W2.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Low and Moderate Seismicity			
Seismic-Force-Resisting System			
C NC N/A U	REDUNDANCY: The number of lines of shear walls in each principal direction is greater than or equal to 2.	5.5.1.1	A.3.2.1.1
C NC N/A U	SHEAR STRESS CHECK: The shear stress in the shear walls, calculated using the Quick Check procedure of Section 4.4.3.3, is less than the following values: Structural panel sheathing 1,000 lb/ft (14.6 kN/m), Diagonal sheathing 700 lb/ft (10.2 kN/m), Straight sheathing 100 lb/ft (1.45 kN/m), and All other conditions 100 lb/ft (1.45 kN/m).	5.5.3.1.1	A.3.2.7.1
C NC N/A U	STUCCO (EXTERIOR PLASTER) SHEAR WALLS: Multistory buildings do not rely on exterior stucco walls as the primary seismic-force-resisting system.	5.5.3.6.1	A.3.2.7.2
C NC N/A U	GYPSUM WALLBOARD OR PLASTER SHEAR WALLS: Interior plaster or gypsum wallboard is not used for shear walls on buildings more than one story high with the exception of the uppermost level of a multistory building.	5.5.3.6.1	A.3.2.7.3
C NC N/A U	NARROW WOOD SHEAR WALLS: Narrow wood shear walls with an aspect ratio greater than 2-to-1 are not used to resist seismic forces.	5.5.3.6.1	A.3.2.7.4
C NC N/A U	WALLS CONNECTED THROUGH FLOORS: Shear walls have an interconnection between stories to transfer overturning and shear forces through the floor.	5.5.3.6.2	A.3.2.7.5
C NC N/A U	HILLSIDE SITE: For structures that are taller on at least one side by more than one-half story because of a sloping site, all shear walls on the downhill slope have an aspect ratio less than 1-to-1.	5.5.3.6.3	A.3.2.7.6
C NC N/A U	CRIPPLE WALLS: Cripple walls below first-floor-level shear walls are braced to the foundation with wood structural panels.	5.5.3.6.4	A.3.2.7.7
C NC N/A U	OPENINGS: Walls with openings greater than 80% of the length are braced with wood structural panel shear walls with aspect ratios of not more than 1.5-to-1 or are supported by adjacent construction through positive ties capable of transferring the seismic forces.	5.5.3.6.5	A.3.2.7.8
Connections			
C NC N/A U	WOOD POSTS: There is a positive connection of wood posts to the foundation.	5.7.3.3	A.5.3.3
C NC N/A U	WOOD SILLS: All wood sills are bolted to the foundation.	5.7.3.3	A.5.3.4
C NC N/A U	GIRDER–COLUMN CONNECTION: There is a positive connection using plates, connection hardware, or straps between the girder and the column support.	5.7.4.1	A.5.4.1
High Seismicity (Complete the Following Items in Addition to the Items for Low and Moderate Seismicity)			
Connections			
C NC N/A U	WOOD SILL BOLTS: Sill bolts are spaced at 6 ft (1.8 m) or less with acceptable edge and end distance provided for wood and concrete.	5.7.3.3	A.5.3.7

continues

Table 17-6 *(Continued)*. Collapse Prevention Structural Checklist for Building Type W2.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Diaphragms			
C NC N/A U	DIAPHRAGM CONTINUITY: Floor and roof diaphragms do not have expansion joints or vertical offsets, such as split levels, sawtooth, or clerestory configurations.	5.6.1.1	A.4.1.1
C NC N/A U	ROOF CHORD CONTINUITY: All chord elements are continuous, regardless of changes in roof elevation.	5.6.1.1	A.4.1.3
C NC N/A U	DIAPHRAGM REINFORCEMENT AT OPENINGS: There is reinforcing around all diaphragm openings larger than 50% of the building width in either major plan dimension.	5.6.1.5	A.4.1.8
C NC N/A U	STRAIGHT SHEATHING: All straight-sheathed diaphragms have horizontal spans less than 24 ft (7.3 m) and aspect ratios less than 2-to-1 in the direction being considered.	5.6.2	A.4.2.1
C NC N/A U	DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 40 ft (12.2 m) and have aspect ratios less than or equal to 4-to-1.	5.6.2	A.4.2.2
C NC N/A U	OTHER DIAPHRAGMS: The diaphragms do not consist of a system other than wood, steel deck, concrete, or horizontal bracing.	5.6.5	A.4.7.1

Note: C = Compliant, NC = Noncompliant, N/A = Not Applicable, and U = Unknown.

Table 17-7. Immediate Occupancy Checklist for Building Type W2.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Very Low Seismicity			
Seismic-Force-Resisting System			
C NC N/A U	REDUNDANCY: The number of lines of shear walls in each principal direction is greater than or equal to 2.	5.5.1.1	A.3.2.1.1
C NC N/A U	SHEAR STRESS CHECK: The shear stress in the shear walls, calculated using the Quick Check procedure of Section 4.4.3.3, is less than the following values: Structural panel sheathing 1,000 lb/ft (14.6 kN/m), Diagonal sheathing 700 lb/ft (10.2 kN/m), Straight sheathing 100 lb/ft (1.45 kN/m), and All other conditions 100 lb/ft (1.45 kN/m).	5.5.3.1.1	A.3.2.7.1
C NC N/A U	STUCCO (EXTERIOR PLASTER) SHEAR WALLS: Multistory buildings do not rely on exterior stucco walls as the primary seismic-force-resisting system.	5.5.3.6.1	A.3.2.7.2
C NC N/A U	GYPSUM WALLBOARD OR PLASTER SHEAR WALLS: Interior plaster or gypsum wallboard is not used for shear walls on buildings more than one story high with the exception of the uppermost level of a multistory building.	5.5.3.6.1	A.3.2.7.3
C NC N/A U	NARROW WOOD SHEAR WALLS: Narrow wood shear walls with an aspect ratio greater than 2-to-1 are not used to resist seismic forces.	5.5.3.6.1	A.3.2.7.4
C NC N/A U	WALLS CONNECTED THROUGH FLOORS: Shear walls have an interconnection between stories to transfer overturning and shear forces through the floor.	5.5.3.6.2	A.3.2.7.5
C NC N/A U	HILLSIDE SITE: For structures that are taller on at least one side by more than one-half story because of a sloping site, all shear walls on the downhill slope have an aspect ratio less than 1-to-2.	5.5.3.6.3	A.3.2.7.6
C NC N/A U	CRIPPLE WALLS: Cripple walls below first-floor-level shear walls are braced to the foundation with wood structural panels.	5.5.3.6.4	A.3.2.7.7

continues

Table 17-7 *(Continued)*. Immediate Occupancy Checklist for Building Type W2.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
C NC N/A U	OPENINGS: Walls with openings greater than 80% of the length are braced with wood structural panel shear walls with aspect ratios of not more than 1.5-to-1 or are supported by adjacent construction through positive ties capable of transferring the seismic forces.	5.5.3.6.5	A.3.2.7.8
C NC N/A U	HOLD-DOWN ANCHORS: All shear walls have hold-down anchors attached to the end studs constructed in accordance with acceptable construction practices.	5.5.3.6.6	A.3.2.7.9
Connections			
C NC N/A U	WOOD POSTS: There is a positive connection of wood posts to the foundation.	5.7.3.3	A.5.3.3
C NC N/A U	WOOD SILLS: All wood sills are bolted to the foundation.	5.7.3.3	A.5.3.4
C NC N/A U	GIRDER–COLUMN CONNECTION: There is a positive connection using plates, connection hardware, or straps between the girder and the column support.	5.7.4.1	A.5.4.1
Low, Moderate, and High Seismicity (Complete the Following Items in Addition to the Items for Very Low Seismicity)			
Seismic-Force-Resisting System			
C NC N/A U	NARROW WOOD SHEAR WALLS: Narrow wood shear walls with an aspect ratio greater than 1.5-to-1 are not used to resist seismic forces.	5.5.3.6.1	A.3.2.7.4
Diaphragms			
C NC N/A U	DIAPHRAGM CONTINUITY: Floor and roof diaphragms do not have expansion joints or vertical offsets, such as split levels, sawtooth, or clerestory configurations.	5.6.1.1	A.4.1.1
C NC N/A U	ROOF CHORD CONTINUITY: All chord elements are continuous, regardless of changes in roof elevation.	5.6.1.1	A.4.1.3
C NC N/A U	DIAPHRAGM REINFORCEMENT AT OPENINGS: There is reinforcing around all diaphragm openings larger than 50% of the building width in either major plan dimension.	5.6.1.5	A.4.1.8
C NC N/A U	STRAIGHT SHEATHING: All straight-sheathed diaphragms have horizontal spans less than 12 ft (3.6 m) and aspect ratios less than 1-to-1 in the direction being considered.	5.6.2	A.4.2.1
C NC N/A U	DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 30 ft (9.2 m) and have aspect ratios less than or equal to 3-to-1.	5.6.2	A.4.2.2
C NC N/A U	OTHER DIAPHRAGMS: The diaphragms do not consist of a system other than wood, steel deck, concrete, or horizontal bracing.	5.6.5	A.4.7.1
Connections			
C NC N/A U	WOOD SILL BOLTS: Sill bolts are spaced at 4 ft (1.2 m) or less with acceptable edge and end distance provided for wood and concrete.	5.7.3.3	A.5.3.7

Note: C = Compliant, NC = Noncompliant, N/A = Not Applicable, and U = Unknown.

classified as Noncompliant or Unknown, the design professional is permitted to choose to conduct further investigation using the corresponding Tier 2 evaluation procedure listed next to each evaluation statement.

17.4 STRUCTURAL CHECKLISTS FOR BUILDING TYPES S1: STEEL MOMENT FRAMES WITH STIFF DIAPHRAGMS, AND S1A: STEEL MOMENT FRAMES WITH FLEXIBLE DIAPHRAGMS

For building systems and configurations that comply with the S1 or S1a building type description in Table 3-1 the Collapse Prevention Structural Checklist in Table 17-8 shall be completed where required by Table 4-6 for Collapse Prevention Structural Performance, and the Immediate Occupancy Structural Checklist in Table 17-9 shall be completed where required by Table 4-6 for Immediate Occupancy Structural Performance. Tier 1 screening shall include on-site investigation and condition assessment as required by Section 4.2.1.

Where applicable, each of the evaluation statements listed in this checklist shall be marked Compliant (C), Noncompliant (NC), Not Applicable (N/A), or Unknown (U) for a Tier 1 screening. Items that are deemed acceptable to the design professional in accordance with the evaluation statement shall be categorized as Compliant, whereas items that are determined by the design professional to require further investigation shall be categorized as Noncompliant or Unknown. For evaluation statements classified as Noncompliant or Unknown, the design professional is permitted to choose to conduct further investigation using the corresponding Tier 2 evaluation procedure listed next to each evaluation statement.

Table 17-8. Collapse Prevention Structural Checklist for Building Types S1 and S1a.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Low Seismicity			
Seismic-Force-Resisting System			
C NC N/A U	REDUNDANCY: The number of lines of moment frames in each principal direction is greater than or equal to 2.	5.5.1.1	A.3.1.1.1
C NC N/A U	DRIFT CHECK: The drift ratio of the steel moment frames, calculated using the Quick Check procedure of Section 4.4.3.1 is less than 0.030.	5.5.2.1.2	A.3.1.3.1
C NC N/A U	COLUMN AXIAL STRESS CHECK: The axial stress caused by gravity loads in columns subjected to overturning forces is less than $0.10F_y$. Alternatively, the axial stress caused by overturning forces alone, calculated using the Quick Check procedure of Section 4.4.3.6 is less than $0.30F_y$.	5.5.2.1.3	A.3.1.3.2
C NC N/A U	FLEXURAL STRESS CHECK: The average flexural stress in the moment-frame columns and beams, calculated using the Quick Check procedure of Section 4.4.3.9, is less than F_y. Columns need not be checked if the strong column–weak beam checklist item is compliant.	5.5.2.2.2	A.3.1.3.3
Connections			
C NC N/A U	TRANSFER TO STEEL FRAMES: Diaphragms are connected for transfer of seismic forces to the steel frames.	5.7.2	A.5.2.2
C NC N/A U	STEEL COLUMNS: The columns in seismic-force-resisting frames are anchored to the building foundation with a minimum of two anchor rods and with the base plates bearing on concrete or a grout pad.	5.7.3.1	A.5.3.1
Moderate Seismicity (Complete the Following Items in Addition to the Items for Low Seismicity)			
Seismic-Force-Resisting System			
C NC N/A U	REDUNDANCY: The number of bays of moment frames in each line is greater than or equal to 2.	5.5.1.1	A.3.1.1.1
C NC N/A U	INTERFERING WALLS: All concrete and masonry infill walls placed in moment frames are isolated from structural elements.	5.5.2.1.1	A.3.1.2.1
C NC N/A U	MOMENT-RESISTING CONNECTIONS: All moment connections can develop the strength of the adjoining members based on the specified minimum yield stress of steel.	5.5.2.2.1	A.3.1.3.4
High Seismicity (Complete the Following Items in Addition to the Items for Low and Moderate Seismicity)			
Seismic-Force-Resisting System			
C NC N/A U	MOMENT-RESISTING CONNECTIONS: All moment connections are able to develop the strength of the adjoining members or panel zones based on 110% of the expected yield stress of the steel in accordance with AISC 341, Section A3.2.	5.5.2.2.1	A.3.1.3.4
C NC N/A U	PANEL ZONES: All panel zones have the shear capacity to resist the shear demand required to develop 0.8 times the sum of the flexural strengths of the girders framing in at the face of the column.	5.5.2.2.3	A.3.1.3.5
C NC N/A U	COLUMN SPLICES: At all column splice details located in moment-resisting frames, the web and flanges of I-shaped members, or all walls of tube/box members are connected to each other with the partial penetration welds with effective throat of at least 85% of the smaller member thickness or with plates that have been bolted or welded to the columns capable of developing $A_g F_{ye}$ of the thinner flange, web, or tube/box wall.	5.5.2.2.4	A.3.1.3.6
C NC N/A U	STRONG COLUMN—WEAK BEAM: The percentage of strong column–weak beam joints in each story of each line of moment frames is greater than 50%.	5.5.2.1.5	A.3.1.3.7
C NC N/A U	COMPACT MEMBERS: All frame elements meet section requirements in accordance with AISC 341, Table D1.1a, for moderately ductile members.	5.5.2.2.5	A.3.1.3.8
Diaphragms (Stiff or Flexible)			
C NC N/A U	OPENINGS AT FRAMES: Diaphragm openings immediately adjacent to the moment frames extend less than 25% of the total frame length.	5.6.1.3	A.4.1.5
Flexible Diaphragms			
C NC N/A U	CROSSTIES: There are continuous crossties between diaphragm chords.	5.6.1.2	A.4.1.2
C NC N/A U	STRAIGHT SHEATHING: All straight-sheathed diaphragms have horizontal spans less than 24 ft (7.3 m) and aspect ratios less than 2-to-1 in the direction being considered.	5.6.2	A.4.2.1

continues

Table 17-8 *(Continued)*. Collapse Prevention Structural Checklist for Building Types S1 and S1a.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
C NC N/A U	DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 40 ft (12.2 m) and aspect ratios less than or equal to 4-to-1.	5.6.2	A.4.2.2
C NC N/A U	OTHER DIAPHRAGMS: Diaphragms do not consist of a system other than wood, steel deck, concrete, or horizontal bracing.	5.6.5	A.4.7.1

Note: C = Compliant, NC = Noncompliant, N/A = Not Applicable, and U = Unknown.

Table 17-9. Immediate Occupancy Checklist for Building Types S1 and S1a.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Very Low Seismicity			
Seismic-Force-Resisting System			
C NC N/A U	DRIFT CHECK: The drift ratio of the steel moment frames, calculated using the Quick Check procedure of Section 4.4.3.1 is less than 0.015.	5.5.2.1.2	A.3.1.3.1
C NC N/A U	COLUMN AXIAL STRESS CHECK: The axial stress caused by gravity loads in columns subjected to overturning forces is less than $0.10F_y$. Alternatively, the axial stress caused by overturning forces alone, calculated using the Quick Check procedure of Section 4.4.3.6 is less than $0.30F_y$.	5.5.2.1.3	A.3.1.3.2
C NC N/A U	FLEXURAL STRESS CHECK: The average flexural stress in the moment-frame columns and beams, calculated using the Quick Check procedure of Section 4.4.3.9, is less than F_y. Columns need not be checked if the strong column–weak beam checklist item is compliant.	5.5.2.2.2	A.3.1.3.3
Connections			
C NC N/A U	STEEL COLUMNS: The columns in seismic-force-resisting frames are anchored to the building foundation with a minimum of two anchor rods and with the base plates bearing on concrete or a grout pad. The anchor rods are capable of resisting the overturning force using the Quick Check procedure of Section 4.4.3.6.	5.7.3.1	A.5.3.1
Low Seismicity (Complete the Following Items in Addition to the Items for Very Low Seismicity)			
Seismic-Force-Resisting System			
C NC N/A U	REDUNDANCY: The number of lines of moment frames in each principal direction is greater than or equal to 2. The number of bays of moment frames in each line is greater than or equal to 3.	5.5.1.1	A.3.1.1.1
C NC N/A U	INTERFERING WALLS: All concrete and masonry infill walls placed in moment frames are isolated from structural elements.	5.5.2.1.1	A.3.1.2.1
Connections			
C NC N/A U	TRANSFER TO STEEL FRAMES: Diaphragms are connected for transfer of seismic forces to the steel frames, and the connections are able to develop the lesser of the strength of the frames or the diaphragms.	5.7.2	A.5.2.2
C NC N/A U	STEEL COLUMNS: The columns in seismic-force-resisting frames are anchored to the building foundation, and the anchorage is able to develop the least of the following: the tensile capacity of the column, the tensile capacity of the lowest-level column splice (if any), or the uplift capacity of the foundation.	5.7.3.1	A.5.3.1
Moderate Seismicity (Complete the Following Items in Addition to the Items for Very Low and Low Seismicity)			
Seismic-Force-Resisting System			
C NC N/A U	MOMENT-RESISTING CONNECTIONS: All moment connections are able to develop the expected strength of the adjoining members based on the specified minimum yield stress of the steel.	5.5.2.2.1	A.3.1.3.4
C NC N/A U	PANEL ZONES: All panel zones have the shear capacity to resist the shear demand required to develop 0.8 times the sum of the flexural strengths of the girders framing in at the face of the column.	5.5.2.2.3	A.3.1.3.5

continues

Table 17-9 *(Continued)*. Immediate Occupancy Checklist for Building Types S1 and S1a.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
C NC N/A U	COLUMN SPLICES: All column splice details located in moment frames include connection of both flanges and the web, and the splice develops the strength of the column.	5.5.2.2.4	A.3.1.3.6
C NC N/A U	STRONG COLUMN—WEAK BEAM: The percentage of strong column–weak beam joints in each story of each line of moment-resisting frames is greater than 50%.	5.5.2.1.5	A.3.1.3.7
C NC N/A U	COMPACT MEMBERS: All frame elements meet section requirements in accordance with AISC 341, Table D1.1a, for highly ductile members.	5.5.2.2.5	A.3.1.3.8
C NC N/A U	BEAM PENETRATIONS: All openings in frame-beam webs are less than one-quarter of the beam depth and are located in the center half of the beams.	5.5.2.2.6	A.3.1.3.9
C NC N/A U	GIRDER FLANGE CONTINUITY PLATES: There are girder flange continuity plates at all moment-frame joints.	5.5.2.2.7	A.3.1.3.10
C NC N/A U	OUT-OF-PLANE BRACING: Beam–column joints are braced out of plane.	5.5.2.2.8	A.3.1.3.11
C NC N/A U	BOTTOM FLANGE BRACING: The bottom flanges of beams are braced out of plane.	5.5.2.2.9	A.3.1.3.12
Diaphragms (Stiff or Flexible)			
C NC N/A U	PLAN IRREGULARITIES: There is tensile capacity to develop the strength of the diaphragm at reentrant corners or other locations of plan irregularities.	5.6.1.4	A.4.1.7
C NC N/A U	DIAPHRAGM REINFORCEMENT AT OPENINGS: There is reinforcing around all diaphragm openings larger than 50% of the building width in either major plan dimension.	5.6.1.5	A.4.1.8
C NC N/A U	OPENINGS AT FRAMES: Diaphragm openings immediately adjacent to the moment frames extend less than 15% of the total frame length.	5.6.1.3	A.4.1.5
Flexible Diaphragms			
C NC N/A U	CROSSTIES: There are continuous crossties between diaphragm chords.	5.6.1.2	A.4.1.2
C NC N/A U	STRAIGHT SHEATHING: All straight-sheathed diaphragms have horizontal spans less than 12 ft (3.6 m) and aspect ratios less than 1-to-1 in the direction being considered.	5.6.2	A.4.2.1
C NC N/A U	DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 30 ft (9.2 m) and aspect ratios less than or equal to 3-to-1.	5.6.2	A.4.2.2
C NC N/A U	NON-CONCRETE-FILLED DIAPHRAGMS: Bare steel deck diaphragms or steel deck diaphragms with fill other than reinforced concrete consist of horizontal spans of less than 40 ft (12.2 m) and have aspect ratios less than 4-to-1.	5.6.3	A.4.3.1
C NC N/A U	OTHER DIAPHRAGMS: Diaphragms do not consist of a system other than wood, steel deck, concrete, or horizontal bracing.	5.6.5	A.4.7.1
Foundation System			
C NC N/A U	OVERTURNING: The ratio of the least horizontal dimension of the seismic-force-resisting system at the foundation level to the building height (base/height) is greater than $0.6S_a$.	5.4.3.3	A.6.2.1
High Seismicity (Complete the Following Items in Addition to the Items for Very Low, Low, and Moderate Seismicity)			
Seismic-Force-Resisting System			
C NC N/A U	MOMENT-RESISTING CONNECTIONS: All moment connections are able to develop the strength of the adjoining members or panel zones based on 110% of the expected yield stress of the steel in accordance with AISC 341, Section A3.2.	5.5.2.2.1	A.3.1.3.4

Note: C = Compliant, NC = Noncompliant, N/A = Not Applicable, and U = Unknown.

17.5 STRUCTURAL CHECKLIST FOR BUILDING TYPES S2: STEEL BRACED FRAMES WITH STIFF DIAPHRAGMS, AND S2A: STEEL BRACED FRAMES WITH FLEXIBLE DIAPHRAGMS

For building systems and configurations that comply with the S2 or S2a building type description in Table 3-1, the Collapse Prevention Structural Checklist in Table 17-10 shall be completed where required by Table 4-6 for Collapse Prevention Structural Performance, and the Immediate Occupancy Structural Checklist in Table 17-11 shall be completed where required by Table 4-6 for Immediate Occupancy Structural Performance. Tier 1 screening shall include on-site investigation and condition assessment as required by Section 4.2.1.

Table 17-10. Collapse Prevention Structural Checklist for Building Types S2 and S2a.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Low Seismicity			
Seismic-Force-Resisting System			
C NC N/A U	REDUNDANCY: The number of lines of braced frames in each principal direction is greater than or equal to 2.	5.5.1.1	A.3.3.1.1
C NC N/A U	COLUMN AXIAL STRESS CHECK: The axial stress caused by gravity loads in columns subjected to overturning forces is less than $0.10F_y$. Alternatively, the axial stress caused by overturning forces alone, calculated using the Quick Check procedure of Section 4.4.3.6 is less than $0.30F_y$.	5.5.2.1.3	A.3.1.3.2
C NC N/A U	BRACE AXIAL STRESS CHECK: The axial stress in the diagonals, calculated using the Quick Check procedure of Section 4.4.3.4 is less than $0.50F_y$.	5.5.4.1	A.3.3.1.2
Connections			
C NC N/A U	TRANSFER TO STEEL FRAMES: Diaphragms are connected for transfer of seismic forces to the steel frames.	5.7.2	A.5.2.2
C NC N/A U	STEEL COLUMNS: The columns in seismic-force-resisting frames are anchored to the building foundation with a minimum of two anchor rods and with the base plates bearing on concrete or a grout pad.	5.7.3.1	A.5.3.1
Moderate Seismicity (Complete the Following Items in Addition to the Items for Low Seismicity)			
Seismic-Force-Resisting System			
C NC N/A U	REDUNDANCY: The number of braced bays in each line is greater than 2.	5.5.1.1	A.3.3.1.1
C NC N/A U	CONNECTION STRENGTH: All the brace connections develop the buckling capacity of the diagonals.	5.5.4.4	A.3.3.1.5
C NC N/A U	COMPACT MEMBERS: All brace elements meet compact section requirements in accordance with AISC 360, Table B4.1a.	5.5.4.3	A.3.3.1.7
C NC N/A U	K-BRACING: The bracing system does not include K-braced bays.	5.5.4.6	A.3.3.2.1
High Seismicity (Complete the Following Items in Addition to the Items for Low and Moderate Seismicity)			
Seismic-Force-Resisting System			
C NC N/A U	COLUMN SPLICES: All column splice details located in braced frames develop 50% of the tensile strength of the column.	5.5.4.2	A.3.3.1.3
C NC N/A U	SLENDERNESS OF DIAGONALS: All diagonal elements required to carry compression have *Kl/r* ratios less than 200.	5.5.4.3	A.3.3.1.4
C NC N/A U	CONNECTION STRENGTH: All the brace connections develop the yield capacity of the diagonals.	5.5.4.4	A.3.3.1.5
C NC N/A U	COMPACT MEMBERS: All brace elements meet section requirements in accordance with AISC 341, Table D1.1a, for moderately ductile members.	5.5.4.3	A.3.3.1.7
C NC N/A U	CHEVRON BRACING: Beams in chevron, or V-braced, bays are capable of resisting the vertical load resulting from the simultaneous yielding and buckling of the brace pairs.	5.5.4.6	A.3.3.2.3
C NC N/A U	CONCENTRICALLY BRACED FRAME JOINTS: All the diagonal braces frame into the beam–column joints concentrically.	5.5.4.8	A.3.3.2.4
Diaphragms (Stiff or Flexible)			
C NC N/A U	OPENINGS AT FRAMES: Diaphragm openings immediately adjacent to the braced frames extend less than 25% of the frame length.	5.6.1.3	A.4.1.5
Flexible Diaphragms			
C NC N/A U	CROSSTIES: There are continuous crossties between diaphragm chords.	5.6.1.2	A.4.1.2
C NC N/A U	STRAIGHT SHEATHING: All straight-sheathed diaphragms have horizontal spans less than 24 ft (7.3 m) and aspect ratios less than 2-to-1 in the direction being considered.	5.6.2	A.4.2.1
C NC N/A U	DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 40 ft (12.2 m) and aspect ratios less than or equal to 4-to-1.	5.6.2	A.4.2.2
C NC N/A U	OTHER DIAPHRAGMS: Diaphragms do not consist of a system other than wood, steel deck, concrete, or horizontal bracing.	5.6.5	A.4.7.1

Note: C = Compliant, NC = Noncompliant, N/A = Not Applicable, and U = Unknown.

Table 17-11. Immediate Occupancy Structural Checklists for Building Types S2 and S2a.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Very Low Seismicity			
Seismic-Force-Resisting System			
C NC N/A U	COLUMN AXIAL STRESS CHECK: The axial stress caused by gravity loads in columns subjected to overturning forces is less than $0.10F_y$. Alternatively, the axial stress caused by overturning forces alone, calculated using the Quick Check procedure of Section 4.4.3.6 is less than $0.30F_y$.	5.5.2.1.3	A.3.1.3.2
C NC N/A U	BRACE AXIAL STRESS CHECK: The axial stress in the diagonals, calculated using the Quick Check procedure of Section 4.4.3.4 is less than $0.50F_y$.	5.5.4.1	A.3.3.1.2
Connections			
C NC N/A U	STEEL COLUMNS: The columns in seismic-force-resisting frames are anchored to the building foundation with a minimum of two anchor rods and with the base plates bearing on concrete or a grout pad. The anchor rods are capable of resisting the overturning force using the Quick Check procedure of Section 4.4.3.6.	5.7.3.1	A.5.3.1
Low Seismicity (Complete the Following Items in Addition to the Items for Very Low Seismicity)			
Connections			
C NC N/A U	TRANSFER TO STEEL FRAMES: Diaphragms are connected for transfer of seismic forces to the steel frames, and the connections are able to develop the lesser of the strength of the frames or the diaphragms.	5.7.2	A.5.2.2
Moderate Seismicity (Complete the Following Items in Addition to the Items for Very Low and Low Seismicity)			
Seismic-Force-Resisting System			
C NC N/A U	REDUNDANCY: The number of lines of braced frames in each principal direction is greater than or equal to 2. The number of braced bays in each line is greater than 3.	5.5.1.1	A.3.1.1.1
C NC N/A U	COLUMN SPLICES: All column splice details located in braced frames develop 100% of the tensile strength of the column.	5.5.4.2	A.3.3.1.3
C NC N/A U	SLENDERNESS OF DIAGONALS: All diagonal elements required to carry compression have Kl/r ratios less than 200.	5.5.4.3	A.3.3.1.4
C NC N/A U	CONNECTION STRENGTH: All the brace connections develop the buckling capacity of the diagonals.	5.5.4.4	A.3.3.1.5
C NC N/A U	OUT-OF-PLANE BRACING: Braced frame connections that are attached to beam bottom flanges located away from beam–column joints are braced out of plane at the bottom flange of the beams.	5.5.4.5	A.3.3.1.6
C NC N/A U	COMPACT MEMBERS: All brace elements meet compact section requirements in accordance with AISC 341, Table B4.1a.	5.5.4.3	A.3.3.1.7
C NC N/A U	K-BRACING: The bracing system does not include K-braced bays.	5.5.4.6	A.3.3.2.1
C NC N/A U	TENSION-ONLY BRACES: Tension-only braces do not comprise more than 70% of the total seismic-force-resisting capacity in structures more than two stories high.	5.5.4.7	A.3.3.2.2
C NC N/A U	CHEVRON BRACING: Beams in chevron, or V-braced, bays are capable of resisting the vertical load resulting from the simultaneous yielding and buckling of the brace pairs.	5.5.4.6	A.3.3.2.3
C NC N/A U	CONCENTRICALLY BRACED FRAME JOINTS: All the diagonal braces frame into the beam–column joints concentrically.	5.5.4.8	A.3.3.2.4
Diaphragms (Stiff or Flexible)			
C NC N/A U	OPENINGS AT FRAMES: Diaphragm openings immediately adjacent to the braced frames extend less than 15% of the frame length.	5.6.1.3	A.4.1.5
C NC N/A U	PLAN IRREGULARITIES: There is tensile capacity to develop the strength of the diaphragm at reentrant corners or other locations of plan irregularities.	5.6.1.4	A.4.1.7
C NC N/A U	DIAPHRAGM REINFORCEMENT AT OPENINGS: There is reinforcing around all diaphragm openings larger than 50% of the building width in either major plan dimension.	5.6.1.5	A.4.1.8

continues

Table 17-11 *(Continued)*. Immediate Occupancy Structural Checklists for Building Types S2 and S2a.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Flexible Diaphragms			
C NC N/A U	CROSSTIES: There are continuous crossties between diaphragm chords.	5.6.1.2	A.4.1.2
C NC N/A U	STRAIGHT SHEATHING: All straight-sheathed diaphragms have horizontal spans less than 12 ft (3.6 m) and aspect ratios less than 1-to-1 in the direction being considered.	5.6.2	A.4.2.1
C NC N/A U	DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 30 ft (9.2 m) and aspect ratios less than or equal to 3-to-1.	5.6.2	A.4.2.2
C NC N/A U	NON-CONCRETE-FILLED DIAPHRAGMS: Bare steel deck diaphragms or steel deck diaphragms with fill other than reinforced concrete consist of horizontal spans of less than 40 ft (12.2 m) and have aspect ratios less than 4-to-1.	5.6.3	A.4.3.1
C NC N/A U	OTHER DIAPHRAGMS: Diaphragms do not consist of a system other than wood, steel deck, concrete, or horizontal bracing.	5.6.5	A.4.7.1
Foundation System			
C NC N/A U	OVERTURNING: The ratio of the least horizontal dimension of the seismic-force-resisting system at the foundation level to the building height (base/height) is greater than $0.6S_a$.	5.4.3.3	A.6.2.1
High Seismicity (Complete the Following Items in Addition to the Items for Very Low, Low, and Moderate Seismicity)			
Seismic-Force-Resisting System			
C NC N/A U	CONNECTION STRENGTH: All the brace connections develop the yield capacity of the diagonals.	5.5.4.4	A.3.3.1.5
C NC N/A U	COMPACT MEMBERS: All column and brace elements meet section requirements in accordance with AISC 341, Table D1.1a, for highly ductile members. Braced frame beams meet the requirements for moderately ductile members.	5.5.4.3	A.3.3.1.7
C NC N/A U	NET AREA: The brace effective net area is not less than the brace gross area for hollow structural section (HSS) tube and pipe sections.	5.5.4.1	A.3.3.1.8
Connections			
C NC N/A U	STEEL COLUMNS: The columns in seismic-force-resisting frames are anchored to the building foundation, and the anchorage is able to develop the least of the following: the tensile capacity of the column, the tensile capacity of the lowest-level column splice (if any), or the uplift capacity of the foundation.	5.7.3.1	A.5.3.1

Note: C = Compliant, NC = Noncompliant, N/A = Not Applicable, and U = Unknown.

Where applicable, each of the evaluation statements listed in this checklist shall be marked Compliant (C), Noncompliant (NC), Not Applicable (N/A), or Unknown (U) for a Tier 1 screening. Items that are deemed acceptable to the design professional in accordance with the evaluation statement shall be categorized as Compliant, whereas items that are determined by the design professional to require further investigation shall be categorized as Noncompliant or Unknown. For evaluation statements classified as Noncompliant or Unknown, the design professional is permitted to choose to conduct further investigation using the corresponding Tier 2 evaluation procedure listed next to each evaluation statement.

17.6 STRUCTURAL CHECKLISTS FOR BUILDING TYPE S3: METAL BUILDING FRAMES

For building systems and configurations that comply with the S3 building type description in Table 3-1, the Collapse Prevention Structural Checklist in Table 17-12 shall be completed where required by Table 4-6 for Collapse Prevention Structural Performance, and the Immediate Occupancy Structural Checklist in Table 17-13 shall be completed where required by Table 4-6, for Immediate Occupancy Structural Performance. The Structural Checklist for Metal Building Frames shall not be used for a structure with a roof and wall dead load greater than 25 lb/ft^2 (1.2 kN/m^2) or a building area greater than 20,000 ft^2 (1,858 m^2). Where either limit is exceeded, the Structural Checklists for Steel Moment Frames (Type S1 or S1a) shall be used. Tier 1 screening shall include on-site investigation and condition assessment as required by Section 4.2.1.

Where applicable, each of the evaluation statements listed in this checklist shall be marked Compliant (C), Noncompliant (NC), Not Applicable (N/A), or Unknown (U) for a Tier 1 screening. Items that are deemed acceptable to the design professional in accordance with the evaluation statement shall be categorized as Compliant, whereas items that are determined by the design professional to require further investigation shall be categorized as Noncompliant or Unknown. For evaluation statements classified as Noncompliant or Unknown, the design professional is permitted to choose to conduct further investigation using the corresponding Tier 2 evaluation procedure listed next to each evaluation statement.

Table 17-12. Collapse Prevention Structural Checklist for Building Type S3.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Low and Moderate Seismicity			
Seismic-Force-Resisting System			
C NC N/A U	BRACE AXIAL STRESS CHECK: The axial stress in the diagonals, calculated using the Quick Check procedure of Section 4.4.3.4 is less than $0.50F_y$.	5.5.4.1	A.3.3.1.2
Connections			
C NC N/A U	TRANSFER TO STEEL FRAMES: Diaphragms are connected for transfer of seismic forces to the steel moment frames.	5.7.2	A.5.2.2
C NC N/A U	STEEL COLUMNS: The columns in seismic-force-resisting frames are anchored to the building foundation with a minimum of two anchor rods and with the base plates bearing on concrete or a grout pad.	5.7.3.1	A.5.3.1
High Seismicity (Complete the Following Items in Addition to the Items for Low and Moderate Seismicity)			
Seismic-Force-Resisting System			
C NC N/A U	MOMENT-RESISTING CONNECTIONS: All moment connections are able to develop the elastic moment (F_yS) of the adjoining members.	5.5.2.2.1	A.3.1.3.4
C NC N/A U	COMPACT MEMBERS: All frame elements meet compact section requirements in accordance with AISC 360, Table B4.1a.	5.5.2.2.5	A.3.1.3.8
Diaphragms			
C NC N/A U	OTHER DIAPHRAGMS: Diaphragms do not consist of a system other than wood, steel deck, concrete, or horizontal bracing.	5.6.5	A.4.7.1
Connections			
C NC N/A U	ROOF PANELS: Where considered as diaphragm elements for lateral resistance, metal, plastic, or cementitious roof panels are positively attached to the roof framing to resist seismic forces.	5.7.5	A.5.5.1
C NC N/A U	WALL PANELS: Where considered as shear elements for lateral resistance, metal, fiberglass, or cementitious wall panels are positively attached to the framing and foundation to resist seismic forces.	5.7.5	A.5.5.2

Note: C = Compliant, NC = Noncompliant, N/A = Not Applicable, and U = Unknown.

Table 17-13. Immediate Occupancy Checklist for Building Type S3.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Very Low and Low Seismicity			
Seismic-Force-Resisting System			
C NC N/A U	BRACE AXIAL STRESS CHECK: The axial stress in the diagonals, calculated using the Quick Check procedure of Section 4.4.3.4 is less than $0.50F_y$.	5.5.4.1	A.3.3.1.2
C NC N/A U	FLEXURAL STRESS CHECK: The average flexural stress in the moment-frame columns and beams, calculated using the Quick Check procedure of Section 4.4.3.9 is less than F_y.	5.5.2.2.2	A.3.1.3.3
Connections			
C NC N/A U	TRANSFER TO STEEL FRAMES: Diaphragms are connected for transfer of seismic forces to the steel moment frames.	5.7.2	A.5.2.2
C NC N/A U	STEEL COLUMNS: The columns in seismic-force-resisting frames are anchored to the building foundation with a minimum of two anchor rods and with the base plates bearing on concrete or a grout pad. The anchor rods are capable of resisting the overturning force using the Quick Check procedure of Section 4.4.3.6.	5.7.3.1	A.5.3.1
Moderate Seismicity (Complete the Following Items in Addition to the Items for Very Low and Low Seismicity)			
Seismic-Force-Resisting System			
C NC N/A U	MOMENT-RESISTING CONNECTIONS: All moment connections are able to develop the elastic moment (F_yS) of the adjoining members.	5.5.2.2.1	A.3.1.3.4

continues

Table 17-13 *(Continued)*. Immediate Occupancy Checklist for Building Type S3.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Diaphragms			
C NC N/A U	PLAN IRREGULARITIES: There is tensile capacity to develop the strength of the diaphragm at reentrant corners or other locations of plan irregularities.	5.6.1.4	A.4.1.7
C NC N/A U	DIAPHRAGM REINFORCEMENT AT OPENINGS: There is reinforcing around all diaphragm openings larger than 50% of the building width in either major plan dimension.	5.6.1.5	A.4.1.8
C NC N/A U	OTHER DIAPHRAGMS: Diaphragms do not consist of a system other than wood, steel deck, concrete, or horizontal bracing.	5.6.5	A.4.7.1
Connections			
C NC N/A U	ROOF PANELS: Where considered as diaphragm elements for lateral resistance, metal, plastic, or cementitious roof panels are positively attached to the roof framing to resist seismic forces.	5.7.5	A.5.5.1
C NC N/A U	WALL PANELS: Where considered as shear elements for lateral resistance, metal, fiberglass, or cementitious wall panels are positively attached to the framing and foundation to resist seismic forces.	5.7.5	A.5.5.2
High Seismicity (Complete the Following Items in Addition to the Items for Low and Moderate Seismicity)			
Seismic-Force-Resisting System			
C NC N/A U	MOMENT-RESISTING CONNECTIONS: All moment connections are able to develop the strength of the adjoining members or panel zones.	5.5.2.2.1	A.3.1.3.4
C NC N/A U	COMPACT MEMBERS: All frame elements meet compact section requirements in accordance with AISC 360, Table B4.1a.	5.5.2.2.5	A.3.1.3.8
C NC N/A U	BEAM PENETRATIONS: All openings in frame-beam webs are less than one-quarter of the beam depth and are located in the center half of the beams.	5.5.2.2.6	A.3.1.3.9
C NC N/A U	OUT-OF-PLANE BRACING: Beam–column joints are braced out of plane.	5.5.2.2.8	A.3.1.3.11
C NC N/A U	BOTTOM FLANGE BRACING: The bottom flanges of beams are braced out of plane.	5.5.2.2.9	A.3.1.3.12
Connections			
C NC N/A U	TRANSFER TO STEEL FRAMES: Diaphragms are connected for transfer of seismic forces to the steel moment frames, and the connections are able to develop the lesser of the strength of the frames or the diaphragms.	5.7.2	A.5.2.2
C NC N/A U	STEEL COLUMNS: The columns in seismic-force-resisting frames are anchored to the building foundation, and the anchorage is able to develop the least of the following: the tensile capacity of the column, the tensile capacity of the lowest-level column splice (if any), or the uplift capacity of the foundation.	5.7.3.1	A.5.3.1

Note: C = Compliant, NC = Noncompliant, N/A = Not Applicable, and U = Unknown.

17.7 STRUCTURAL CHECKLISTS FOR BUILDING TYPE S4: DUAL SYSTEMS WITH BACKUP STEEL MOMENT FRAMES AND STIFF DIAPHRAGMS

For building systems and configurations that comply with the S4 building type description in Table 3-1, the Collapse Prevention Structural Checklist in Table 17-14 shall be completed where required by Table 4-6 for Collapse Prevention Structural Performance, and the Immediate Occupancy Structural Checklist in Table 17-15 shall be completed where required by Table 4-6 for Immediate Occupancy Structural Performance. Tier 1 screening shall include on-site investigation and condition assessment as required by Section 4.2.1.

Where applicable, each of the evaluation statements listed in this checklist shall be marked Compliant (C), Noncompliant (NC), Not Applicable (N/A), or Unknown (U) for a Tier 1 screening. Items that are deemed acceptable to the design professional in accordance with the evaluation statement shall be categorized as Compliant, whereas items that are determined by the design professional to require further investigation shall be categorized as Noncompliant or Unknown. For evaluation statements classified as Noncompliant or Unknown, the design professional is permitted to choose to conduct further investigation using the corresponding Tier 2 evaluation procedure listed next to each evaluation statement.

17.8 STRUCTURAL CHECKLISTS FOR BUILDING TYPES S5: STEEL FRAMES WITH INFILL MASONRY SHEAR WALLS AND STIFF DIAPHRAGMS, AND S5A: STEEL FRAMES WITH INFILL MASONRY SHEAR WALLS AND FLEXIBLE DIAPHRAGMS

For building systems and configurations that comply with the S5 or S5a building type description in Table 3-1, the Collapse Prevention Structural Checklist in Table 17-16 shall be completed where required by Table 4-6 for Collapse Prevention Structural Performance, and the Immediate Occupancy Structural Checklist in Table 17-17 shall be completed where required by

Table 17-14. Collapse Prevention Structural Checklist for Building Type S4.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Low Seismicity			
Seismic-Force-Resisting System			
C NC N/A U	REDUNDANCY: The number of lines of braced frames or shear walls in each principal direction is greater than or equal to 2.	5.5.1.1	A.3.2.1.1 A.3.3.1.1
C NC N/A U	DRIFT CHECK: The drift ratio of the steel moment frames acting alone, calculated using the Quick Check procedure of Section 4.4.3.1 using 25% of V_c, is less than 0.025.	5.5.2.1.2	A.3.1.3.1
C NC N/A U	COLUMN AXIAL STRESS CHECK: The axial stress caused by gravity loads in frame columns subjected to overturning forces is less than $0.10F_y$. Alternatively, the axial stress caused by overturning forces alone, calculated using the Quick Check procedure of Section 4.4.3.6 is less than $0.30F_y$.	5.5.2.1.3	A.3.1.3.2
C NC N/A U	BRACE AXIAL STRESS CHECK: The axial stress in the diagonal braces, calculated using the Quick Check procedure of Section 4.4.3.4 and neglecting the steel moment frame is less than $0.50F_y$.	5.5.4.1	A.3.3.1.2
C NC N/A U	CONCRETE BEARING WALLS: Floor and roof girders and trusses are not supported at the ends of concrete walls that are less than 10 in. (254 mm) thick. This statement only applies to framing supports located less than two times the wall thickness away from the wall end.	5.5.2.5.1	A.3.1.6.1
C NC N/A U	SHEAR STRESS CHECK: The shear stress in the concrete shear walls, calculated using the Quick Check procedure of Section 4.4.3.3, and neglecting the steel moment frame, is less than the greater of 100 lb/in.^{2} (0.69 MPa) or $2\sqrt{f'_c}$.	5.5.3.1.1	A.3.2.2.1
C NC N/A U	REINFORCING STEEL: The ratio of reinforcing steel area to gross concrete area is not less than 0.0012 in the vertical direction and 0.0020 in the horizontal direction.	5.5.3.1.3	A.3.2.2.2
Connections			
C NC N/A U	STEEL COLUMNS: The columns in seismic-force-resisting frames are anchored to the building foundation with a minimum of two anchor rods and with the base plates bearing on concrete or a grout pad.	5.7.3.1	A.5.3.1
C NC N/A U	TRANSFER TO SHEAR WALLS: Diaphragms are connected for transfer of seismic forces to the shear walls.	5.7.2	A.5.2.1
C NC N/A U	TRANSFER TO STEEL FRAMES: Diaphragms are connected for transfer of seismic forces to the steel frames.	5.7.2	A.5.2.2
C NC N/A U	FOUNDATION DOWELS: Wall reinforcement is doweled into the foundation.	5.7.3.4	A.5.3.5
Moderate Seismicity (Complete the Following Items in Addition to the Items for Low Seismicity)			
Seismic-Force-Resisting System			
C NC N/A U	REDUNDANCY: For braced frames, the number of braced bays in each line is greater than 2.	5.5.1.1	A.3.3.1.1
C NC N/A U	MOMENT-RESISTING CONNECTIONS: All moment connections are able to develop the strength of the adjoining members based on the specified minimum yield stress of the steel.	5.5.2.2.1	A.3.1.3.4
C NC N/A U	COMPACT MEMBERS: All moment frame and brace elements meet section requirements in accordance with AISC 360, Table B4.1a.	5.5.2.2.5	A.3.1.3.8
C NC N/A U	CONNECTION STRENGTH: All the brace connections develop the buckling capacity of the diagonals.	5.5.4.4	A.3.3.1.5
C NC N/A U	K-BRACING: The bracing system does not include K-braced bays.	5.5.4.6	A.3.3.2.1
High Seismicity (Complete the Following Items in Addition to the Items for Low and Moderate Seismicity)			
Seismic-Force-Resisting System			
C NC N/A U	MOMENT-RESISTING CONNECTIONS: All moment connections are able to develop the strength of the adjoining members or panel zones based on 110% of the expected yield stress of the steel per AISC 341, Section A3.2.	5.5.2.2.1	A.3.1.3.4

continues

Table 17-14 *(Continued)*. Collapse Prevention Structural Checklist for Building Type S4.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
C NC N/A U	COLUMN SPLICES: At all column splice details located in moment frames, the web and flanges of I-shaped members, or all walls of tube/box members are connected to each other with the partial penetration welds with effective throat of at least 85% of the smaller member thickness or with plates that have been bolted or welded to the columns capable of developing A_gF_{ye} of the thinner flange, web or tube/box wall.	5.5.2.2.4	A.3.1.3.6
C NC N/A U	STRONG COLUMN—WEAK BEAM: The percentage of strong column–weak beam joints in each story of each line of moment frames is greater than 50%.	5.5.2.1.5	A.3.1.3.7
C NC N/A U	COMPACT MEMBERS: All moment-frame and brace elements meet section requirements in accordance with AISC 341, Table D1.1a, for moderately ductile members.	5.5.2.2.5 5.5.4.3	A.3.1.3.8
C NC N/A U	COLUMN SPLICES: All column splice details located in braced frames develop 50% of the tensile strength of the column.	5.5.4.2	A.3.3.1.3
C NC N/A U	SLENDERNESS OF DIAGONALS: All diagonal elements required to carry compression have Kl/r ratios less than 200.	5.5.4.3	A.3.3.1.4
C NC N/A U	CONNECTION STRENGTH: All the brace connections develop the yield capacity of the diagonals.	5.5.4.4	A.3.3.1.5
C NC N/A U	CHEVRON BRACING: Beams in chevron, or V-braced, bays are capable of resisting the vertical load resulting from the simultaneous yielding and buckling of the brace pairs.	5.5.4.6	A.3.3.2.3
C NC N/A U	CONCENTRICALLY BRACED FRAME JOINTS: All the diagonal braces frame into the beam–column joints concentrically.	5.5.4.8	A.3.3.2.4
C NC N/A U	COUPLING BEAMS: Coupling beams have stirrups spaced at or less than d/2, and each wall or wall segment connected to the coupling beam is supported such that it can resist shear and overturning forces in the absence of the coupling beam. This statement only applies to coupling beams with span-to-depth ratios exceeding 2-to-1.	5.5.3.2.1	A.3.2.2.3
Flexible Diaphragms			
C NC N/A U	DIAPHRAGM CONTINUITY: Floor and roof diaphragms do not have expansion joints or vertical offsets, such as split levels, sawtooth, or clerestory configurations.	5.6.1.1	A.4.1.1
C NC N/A U	OPENINGS AT SHEAR WALLS: Diaphragm openings immediately adjacent to the shear walls are less than 15% of the wall length.	5.6.1.3	A.4.1.4
C NC N/A U	OPENINGS AT FRAMES: Diaphragm openings immediately adjacent to the braced frames or moment frames extend less than 25% of the frame length.	5.6.1.3	A.4.1.5

Note: C = Compliant, NC = Noncompliant, N/A = Not Applicable, and U = Unknown.

Table 17-15. Immediate Occupancy Structural Checklist for Building Type S4.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Very Low Seismicity			
Seismic-Force-Resisting System			
C NC N/A U	COLUMN AXIAL STRESS CHECK: The axial stress caused by gravity loads in frame columns subjected to overturning forces is less than $0.10F_y$. Alternatively, the axial stress caused by overturning forces alone, calculated using the Quick Check procedure of Section 4.4.3.6 is less than $0.30F_y$.	5.5.2.1.3	A.3.1.3.2
C NC N/A U	BRACE AXIAL STRESS CHECK: The axial stress in the diagonal braces, calculated using the Quick Check procedure of Section 4.4.3.4 and neglecting the steel moment frame, is less than $0.50F_y$.	5.5.4.1	A.3.3.1.2

continues

Table 17-15 *(Continued)*. Immediate Occupancy Structural Checklist for Building Type S4.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
C NC N/A U	CONCRETE BEARING WALLS: Floor and roof girders and trusses are not supported at the ends of concrete walls that are less than 10 in. (254 mm) thick. This statement only applies to framing supports located less than two times the wall thickness away from the wall end.	5.5.2.5.1	A.3.1.6.1
C NC N/A U	SHEAR STRESS CHECK: The shear stress in the concrete shear walls, calculated using the Quick Check procedure of Section 4.4.3.3 and neglecting the steel moment frame, is less than the greater of 100 lb/in.^{2} (0.69 MPa) or $2\sqrt{f'_c}$.	5.5.3.1.1	A.3.2.2.1
C NC N/A U	REINFORCING STEEL: The ratio of shear wall reinforcing steel area to gross concrete area is not less than 0.0012 in the vertical direction and 0.0020 in the horizontal direction. The spacing of reinforcing steel is equal to or less than 18 in. (457 mm).	5.5.3.1.3	A.3.2.2.2
Connections			
C NC N/A U	STEEL COLUMNS: The columns in seismic-force-resisting frames are anchored to the building foundation with a minimum of two anchor rods and with the base plates bearing on concrete or a grout pad. The anchor rods are capable of resisting the overturning force using the Quick Check procedure of Section 4.4.3.6.	5.7.3.1	A.5.3.1
C NC N/A U	TRANSFER TO SHEAR WALLS: Diaphragms are connected for transfer of seismic forces to the shear walls.	5.7.2	A.5.2.1
C NC N/A U	FOUNDATION DOWELS: Wall reinforcement is doweled into the foundation, and the dowels are able to develop the lesser of the strength of the walls or the uplift capacity of the foundation.	5.7.3.4	A.5.3.5
Low Seismicity (Complete the Following Items in Addition to the Items for Very Low Seismicity)			
Seismic-Force-Resisting System			
C NC N/A U	DRIFT CHECK: The drift ratio of the steel moment frames acting alone, calculated using the Quick Check procedure of Section 4.4.3.1 using 25% of V_c, is less than 0.015.	5.5.2.1.2	A.3.1.3.1
C NC N/A U	REDUNDANCY: The number of lines of braced frames or shear walls in each principal direction is greater than or equal to 2. The number of braced bays in each line is greater than 3.	5.5.1.1	A.3.2.1.1 A.3.1.1.1
C NC N/A U	INTERFERING WALLS: All concrete and masonry infill walls placed in moment frames are isolated from structural elements.	5.5.2.1.1	A.3.1.2.1
Connections			
C NC N/A U	TRANSFER TO STEEL FRAMES: Diaphragms are connected for transfer of seismic forces to the steel frames, and the connections are able to develop the lesser of the strength of the frames or the diaphragms.	5.7.2	A.5.2.2
Moderate Seismicity (Complete the Following Items in Addition to the Items for Very Low and Low Seismicity)			
Seismic-Force-Resisting System			
C NC N/A U	MOMENT-RESISTING CONNECTIONS: All moment connections are able to develop the strength of the adjoining members based on the specified minimum yield stress of the steel.	5.5.2.2.1	A.3.1.3.4
C NC N/A U	PANEL ZONES: All panel zones have the shear capacity to resist the shear demand required to develop 0.8 times the sum of the flexural strengths of the girders framing in at the face of the column.	5.5.2.2.3	A.3.1.3.5
C NC N/A U	COLUMN SPLICES: All column splice details located in moment frames include connection of both flanges and the web, and the splice develops the strength of the column.	5.5.2.2.4	A.3.1.3.6
C NC N/A U	STRONG COLUMN–WEAK BEAM: The percentage of strong column–weak beam joints in each story of each line of moment frames is greater than 50%.	5.5.2.1.5	A.3.1.3.7
C NC N/A U	BEAM PENETRATIONS: All openings in frame-beam webs are less than one-quarter of the beam depth and are located in the center half of the beams.	5.5.2.2.6	A.3.1.3.9
C NC N/A U	GIRDER FLANGE CONTINUITY PLATES: There are girder flange continuity plates at all moment-resisting frame joints.	5.5.2.2.7	A.3.1.3.10
C NC N/A U	OUT-OF-PLANE BRACING: Beam–column joints are braced out of plane.	5.5.2.2.8	A.3.1.3.11

continues

Table 17-15 *(Continued)*. Immediate Occupancy Structural Checklist for Building Type S4.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
C NC N/A U	BOTTOM FLANGE BRACING: The bottom flanges of beams are braced out of plane.	5.5.2.2.9	A.3.1.3.12
C NC N/A U	COMPACT MEMBERS: All brace elements meet section requirements in accordance with AISC 360, Table B4.1a.	5.5.4.3	A.3.3.1.7
C NC N/A U	COLUMN SPLICES: All column splice details located in braced frames develop 100% of the tensile strength of the column.	5.5.4.2	A.3.3.1.3
C NC N/A U	SLENDERNESS OF DIAGONALS: All diagonal elements required to carry compression have Kl/r ratios less than 200.	5.5.4.3	A.3.3.1.4
C NC N/A U	CONNECTION STRENGTH: All the brace connections develop the buckling capacity of the diagonals.	5.5.4.4	A.3.3.1.5
C NC N/A U	OUT-OF-PLANE BRACING: Braced frame connections that are attached to beam bottom flanges located away from beam–column joints are braced out of plane at the bottom flange of the beams.	5.5.4.5	A.3.3.1.6
C NC N/A U	K-BRACING: The bracing system does not include K-braced bays.	5.5.4.6	A.3.3.2.1
C NC N/A U	TENSION-ONLY BRACES: Tension-only braces do not compose more than 70% of the total seismic-force-resisting capacity in structures more than two stories high.	5.5.4.7	A.3.3.2.2
C NC N/A U	CHEVRON BRACING: Beams in chevron, or V-braced, bays are capable of resisting the vertical load resulting from the simultaneous yielding and buckling of the brace pairs.	5.5.4.6	A.3.3.2.3
C NC N/A U	CONCENTRICALLY BRACED FRAME JOINTS: All the diagonal braces frame into the beam–column joints concentrically.	5.5.4.8	A.3.3.2.4
C NC N/A U	COUPLING BEAMS: Coupling beams have the capacity in shear to develop the uplift capacity of the adjacent wall or to develop the flexural capacity of the coupling beam, whichever is less. This statement only applies to coupling beams with span-to-depth ratios exceeding 2-to-1.	5.5.3.2.1	A.3.2.2.3
C NC N/A U	OVERTURNING: All shear walls have aspect ratios less than 4-to-1. Wall piers need not be considered.	5.5.3.1.4	A.3.2.2.4
C NC N/A U	CONFINEMENT REINFORCING: For shear walls with aspect ratios greater than 2-to-1, the boundary elements are confined with spirals or ties with spacing less than $8d_b$.	5.5.3.2.2	A.3.2.2.5
C NC N/A U	WALL REINFORCING AT OPENINGS: There is added trim reinforcement around all wall openings with a dimension greater than three times the thickness of the wall.	5.5.3.1.5	A.3.2.2.6
C NC N/A U	WALL THICKNESS: Thicknesses of bearing walls are not less than 1/25 the unsupported height or length, whichever is shorter, nor less than 4 in. (101.6 mm).	5.5.3.1.2	A.3.2.2.7
Diaphragms (Stiff or Flexible)			
C NC N/A U	OPENINGS AT SHEAR WALLS: Diaphragm openings immediately adjacent to the shear walls are less than 15% of the wall length.	5.6.1.3	A.4.1.4
C NC N/A U	OPENINGS AT FRAMES: Diaphragm openings immediately adjacent to the braced frames or moment frames extend less than 15% of the frame length.	5.6.1.3	A.4.1.5
C NC N/A U	PLAN IRREGULARITIES: There is tensile capacity to develop the strength of the diaphragm at reentrant corners or other locations of plan irregularities.	5.6.1.4	A.4.1.7
C NC N/A U	DIAPHRAGM REINFORCEMENT AT OPENINGS: There is reinforcing around all diaphragm openings larger than 50% of the building width in either major plan dimension.	5.6.1.5	A.4.1.8
C NC N/A U	DIAPHRAGM CONTINUITY: Floor and roof diaphragms do not have expansion joints or vertical offsets, such as split levels, sawtooth, or clerestory configurations.	5.6.1.1	A.4.1.1
Foundation System			
C NC N/A U	OVERTURNING: The ratio of the least horizontal dimension of the seismic-force-resisting system at the foundation level to the building height (base/height) is greater than $0.6S_a$.	5.4.3.3	A.6.2.1

continues

Table 17-15 *(Continued)*. Immediate Occupancy Structural Checklist for Building Type S4.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
High Seismicity (Complete the Following Items in Addition to the Items for Very Low, Low, and Moderate Seismicity)			
Seismic-Force-Resisting System			
C NC N/A U	MOMENT-RESISTING CONNECTIONS: All moment connections are able to develop the strength of the adjoining members or panel zones based on 110% of the expected yield stress of the steel per AISC 341, Section A3.2.	5.5.2.2.1	A.3.1.3.4.
C NC N/A U	COMPACT MEMBERS: All moment and braced frame columns and beams meet section requirements in accordance with AISC 341, Table D1.1a, for highly ductile members. Braced frame beams meet section requirements for moderately ductile members.	5.5.2.2.5 5.5.4.3	A.3.3.1.8
C NC N/A U	CONNECTION STRENGTH: All the brace connections develop the yield capacity of the diagonals.	5.5.4.4	A.3.3.1.5
Connections			
C NC N/A U	STEEL COLUMNS: The columns in seismic-force-resisting frames are anchored to the building foundation, and the anchorage is able to develop the least of the following: the tensile capacity of the column, the tensile capacity of the lowest-level column splice (if any), or the uplift capacity of the foundation.	5.7.3.1	A.5.3.1

Note: C = Compliant, NC = Noncompliant, N/A = Not Applicable, and U = Unknown.

Table 17-16. Collapse Prevention Structural Checklist for Building Types S5 and S5a.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Low Seismicity			
Seismic-Force-Resisting System			
C NC N/A U	REDUNDANCY: The number of lines of shear walls in each principal direction is greater than or equal to 2.	5.5.1.1	A.3.2.1.1
C NC N/A U	SHEAR STRESS CHECK: The shear stress in the reinforced masonry shear walls, calculated using the Quick Check procedure of Section 4.4.3.3 is less than 70 lb/in.^{2} (0.48 MPa)	5.5.3.1.1	A.3.2.4.1
C NC N/A U	SHEAR STRESS CHECK: The shear stress in the unreinforced masonry shear walls, calculated using the Quick Check procedure of Section 4.4.3.3 is less than 30 lb/in.^{2} (0.21 MPa) for clay units and 70 lb/in.^{2} (0.48 MPa) for concrete units. Bays with openings greater than 25% of the wall area shall not be included in A_w of Equation (4-8).	5.5.3.1.1	A.3.2.5.1
C NC N/A U	INFILL WALL CONNECTIONS: Masonry is in full contact with frame.	5.5.3.5.1 5.5.3.5.3	A.3.2.6.1
Connections			
C NC N/A U	STEEL COLUMNS: The columns in seismic-force-resisting frames are anchored to the building foundation with a minimum of two anchor rods and with the base plates bearing on concrete or a grout pad.	5.7.3.1	A.5.3.1
Moderate Seismicity (Complete the Following Items in Addition to the Items for Low Seismicity)			
Seismic-Force-Resisting System			
C NC N/A U	INFILL WALL ECCENTRICITY: The centerline of the infill masonry wall is not offset from the centerline of the steel framing by more than 25% of the wall thickness.	5.5.3.5.3	A.3.2.6.5
Connections			
C NC N/A U	TRANSFER TO INFILL WALLS: Diaphragms are connected for transfer of loads to the infill walls.	5.7.2	A.5.2.1
High Seismicity (Complete the Following Items in Addition to the Items for Low and Moderate Seismicity)			
Seismic-Force-Resisting System			
C NC N/A U	PROPORTIONS: The height-to-thickness ratio of the unreinforced infill walls at each story is less than 9.	5.5.3.1.2	A.3.2.6.2

continues

Table 17-16 *(Continued)*. Collapse Prevention Structural Checklist for Building Types S5 and S5a.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
C NC N/A U	CAVITY WALLS: The infill walls are not of cavity construction.	5.5.3.5.2	A.3.2.6.3
Flexible Diaphragms			
C NC N/A U	CROSSTIES: There are continuous crossties between diaphragm chords.	5.6.1.2	A.4.1.2
C NC N/A U	STRAIGHT SHEATHING: All straight-sheathed diaphragms have horizontal spans less than 24 ft (7.3 m) and aspect ratios less than 2-to-1 in the direction being considered.	5.6.2	A.4.2.1
C NC N/A U	DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 40 ft (12.2 m) and aspect ratios less than or equal to 4-to-1.	5.6.2	A.4.2.2
C NC N/A U	BLOCKED DIAPHRAGMS: All blocked wood structural panel diaphragms have horizontal spans less than 120 ft (36.5 m) and have aspect ratios less than or equal to 4-to-1.	5.6.2	A.4.2.3
C NC N/A U	CANTILEVERED WOOD DIAPHRAGMS: All cantilevered wood diaphragms that provide lateral support for concrete or masonry walls consist of wood structural panels and have a maximum cantilever length of 20 ft (6.1 m) if unblocked or 35 ft (10.7 m) if blocked, and a maximum ratio of cantilever length to diaphragm width of 1:2 if unblocked and 1:1 if blocked. In addition, the cantilevered diaphragm has a back-span length equal to or greater than the cantilevered portion.	5.6.2	A.4.2.4
C NC N/A U	NON-CONCRETE-FILLED DIAPHRAGMS: Bare steel deck diaphragms or steel deck diaphragms with fill other than reinforced structural concrete consist of horizontal spans of less than 120 ft (36.5 m) and have aspect ratios less than 4-to-1.	5.6.3	A.4.3.1
C NC N/A U	OTHER DIAPHRAGMS: Diaphragms do not consist of a system other than wood, steel deck, concrete, or horizontal bracing.	5.6.5	A.4.7.1
Connections			
C NC N/A U	STIFFNESS OF WALL ANCHORS: Anchors of concrete or masonry walls to wood structural elements are installed taut and are stiff enough to limit the relative movement between the wall and the diaphragm to no greater than 1/8 in. (3.1 mm) before engagement of the anchors.	5.7.1.2	A.5.1.4

Note: C = Compliant, NC = Noncompliant, N/A = Not Applicable, and U = Unknown.

Table 17-17. Immediate Occupancy Structural Checklist for Building Types S5 and S5a.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Very Low Seismicity			
Seismic-Force-Resisting System			
C NC N/A U	SHEAR STRESS CHECK: The shear stress in the reinforced masonry shear walls, calculated using the Quick Check procedure of Section 4.4.3.3, is less than 70 lb/in.^{2} (0.48 MPa).	5.5.3.1.1	A.3.2.4.1
C NC N/A U	SHEAR STRESS CHECK: The shear stress in the unreinforced masonry shear walls, calculated using the Quick Check procedure of Section 4.4.3.3, is less than 30 lb/in.^{2} (0.21 MPa) for clay units and 70 lb/in.^{2} (0.48 MPa) for concrete units. Bays with openings greater than 25% of the wall area shall not be included in A_w of Equation (4-8).	5.5.3.1.1	A.3.2.5.1
C NC N/A U	INFILL WALL CONNECTIONS: Masonry is in full contact with frame.	5.5.3.5.1 5.5.3.5.3	A.3.2.6.1

continues

Table 17-17 *(Continued)*. Immediate Occupancy Structural Checklist for Building Types S5 and S5a.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Connections			
C NC N/A U	STEEL COLUMNS: The columns in seismic-force-resisting frames are anchored to the building foundation with a minimum of two anchor rods and with the base plates bearing on concrete or a grout pad. The anchor rods are capable of resisting the overturning force using the Quick Check procedure of Section 4.4.3.6.	5.7.3.1	A.5.3.1
Low Seismicity (Complete the Following Items in Addition to the Items for Very Low Seismicity)			
C NC N/A U	STRAIGHT SHEATHING: All straight-sheathed diaphragms have horizontal spans less than 12 ft (3.6 m) and aspect ratios less than 1-to-1 in the direction being considered.	5.6.2	A.4.2.1
C NC N/A U	DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 30 ft (9.2 m) and aspect ratios less than or equal to 3-to-1.	5.6.2	A.4.2.2
C NC N/A U	BLOCKED DIAPHRAGMS: All blocked wood structural panel diaphragms have horizontal spans less than 90 ft (27.4 m) and have aspect ratios less than or equal to 4-to-1.	5.6.2	A.4.2.3
C NC N/A U	CANTILEVERED WOOD DIAPHRAGMS: All cantilevered wood diaphragms that provide lateral support for concrete or masonry walls consist of wood structural panels and have a maximum cantilever length of 15 ft (4.6 m) if unblocked or 25 ft (7.6 m) if blocked, and a maximum ratio of cantilever length to diaphragm width of 1:2.5 if unblocked and 1:1.5 if blocked. In addition, the cantilevered diaphragm has a back-span length equal to or greater than the cantilevered portion.	5.6.2	A.4.2.4
Moderate Seismicity (Complete the Following Items in Addition to the Items for Low Seismicity)			
Seismic-Force-Resisting System			
C NC N/A U	REDUNDANCY: The number of lines of shear walls in each principal direction is greater than or equal to 2.	5.5.1.1	A.3.2.1.1
C NC N/A U	REINFORCING AT WALL OPENINGS: All wall openings that interrupt rebar have trim reinforcing on all sides or are checked as unreinforced infill frames.	5.5.3.1.5	A.3.2.4.3
C NC N/A U	PROPORTIONS: The height-to-thickness ratio of the unreinforced infill walls at each story is less than 13.	5.5.3.1.2	A.3.2.6.2
C NC N/A U	CAVITY WALLS: The infill walls are not of cavity construction.	5.5.3.5.2	A.3.2.6.3
C NC N/A U	INFILL WALL ECCENTRICITY: The centerline of the infill masonry wall is not offset from the centerline of the steel framing by more than 25% of the wall thickness.	5.5.3.5.3	A.3.2.6.5
Connections			
C NC N/A U	TRANSFER TO SHEAR WALLS: Diaphragms are connected for transfer of loads to the shear walls, and the connections are able to develop the lesser of the shear strength of the walls or diaphragms.	5.7.2	A.5.2.1
Diaphragms (Stiff or Flexible)			
C NC N/A U	OPENINGS AT FRAMES: Diaphragm openings immediately adjacent to the braced frames extend less than 15% of the frame length.	5.6.1.3	A.4.1.5
C NC N/A U	PLAN IRREGULARITIES: There is tensile capacity to develop the strength of the diaphragm at reentrant corners or other locations of plan irregularities.	5.6.1.4	A.4.1.7
C NC N/A U	DIAPHRAGM REINFORCEMENT AT OPENINGS: There is reinforcing around all diaphragm openings larger than 50% of the building width in either major plan dimension.	5.6.1.5	A.4.1.8
Flexible Diaphragms			
C NC N/A U	CROSSTIES: There are continuous crossties between diaphragm chords.	5.6.1.2	A.4.1.2
C NC N/A U	NON-CONCRETE-FILLED DIAPHRAGMS: Bare steel deck diaphragms or steel deck diaphragms with fill other than reinforced concrete consist of horizontal spans of less than 40 ft (12.2 m) and have aspect ratios less than 4-to-1.	5.6.3	A.4.3.1

continues

Table 17-17 *(Continued)*. Immediate Occupancy Structural Checklist for Building Types S5 and S5a.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
C NC N/A U	OTHER DIAPHRAGMS: Diaphragms do not consist of a system other than wood, steel deck, concrete, or horizontal bracing.	5.6.5	A.4.7.1
Connections			
C NC N/A U	STIFFNESS OF WALL ANCHORS: Anchors of concrete or masonry walls to wood structural elements are installed taut and are stiff enough to limit the relative movement between the wall and the diaphragm to no greater than 1/8 in. (3.1 mm) before engagement of the anchors.	5.7.1.2	A.5.1.4
Foundation System			
C NC N/A U	OVERTURNING: The ratio of the least horizontal dimension of the seismic-force-resisting system at the foundation level to the building height (base/height) is greater than $0.6S_a$.	5.4.3.3	A.6.2.1
High Seismicity (Complete the Following Items in Addition to the Items for Low and Moderate Seismicity)			
Seismic-Force-Resisting System			
C NC N/A U	PROPORTIONS: The height-to-thickness ratio of the unreinforced infill walls at each story is less than 8.	5.5.3.1.2	A.3.2.6.2
Connections			
C NC N/A U	STEEL COLUMNS: The columns in seismic-force-resisting frames are anchored to the building foundation, and the anchorage is able to develop the least of the following: the tensile capacity of the column, the tensile capacity of the lowest-level column splice (if any), or the uplift capacity of the foundation.	5.7.3.1	A.5.3.1

Note: C = Compliant, NC = Noncompliant, N/A = Not Applicable, and U = Unknown.

Table 4-6 for Immediate Occupancy Structural Performance. Tier 1 screening shall include on-site investigation and condition assessment as required by Section 4.2.1.

Where applicable, each of the evaluation statements listed in this checklist shall be marked Compliant (C), Noncompliant (NC), Not Applicable (N/A), or Unknown (U) for a Tier 1 screening. Items that are deemed acceptable to the design professional in accordance with the evaluation statement shall be categorized as Compliant, whereas items that are determined by the design professional to require further investigation shall be categorized as Noncompliant or Unknown. For evaluation statements classified as Noncompliant or Unknown, the design professional is permitted to choose to conduct further investigation using the corresponding Tier 2 evaluation procedure listed next to each evaluation statement.

17.9 STRUCTURAL CHECKLISTS FOR BUILDING TYPE CFS1: COLD-FORMED STEEL LIGHT-FRAME BEARING WALL CONSTRUCTION, SHEAR WALL LATERAL SYSTEM

For building systems and configurations that comply with the CFS1 building type description in Table 3-1, the Collapse Prevention Structural Checklist in Table 17-18 shall be completed where required by Table 4-6 for Collapse Prevention Structural Performance, and the Immediate Occupancy Structural Checklist in Table 17-19 shall be completed where required by Table 4-6 for Immediate Occupancy Structural Performance. Tier 1 screening shall include on-site investigation and condition assessment as required by Section 4.2.1.

Where applicable, each of the evaluation statements listed in this checklist shall be marked Compliant (C), Noncompliant (NC), Not Applicable (N/A), or Unknown (U) for a Tier 1 screening. Items that are deemed acceptable to the design professional in accordance with the evaluation statement shall be categorized as Compliant, whereas items that are determined by the design professional to require further investigation shall be categorized as Noncompliant or Unknown. For evaluation statements classified as Noncompliant or Unknown, the design professional is permitted to choose to conduct further investigation using the corresponding Tier 2 evaluation procedure listed next to each evaluation statement.

17.10 STRUCTURAL CHECKLISTS FOR BUILDING TYPE CFS2: COLD-FORMED STEEL LIGHT-FRAME BEARING WALL CONSTRUCTION, STRAP-BRACED LATERAL WALL SYSTEM

For building systems and configurations that comply with the CFS2 building type description in Table 3-1, the Collapse Prevention Structural Checklist in Table 17-20 shall be completed where required by Table 4-6 for Collapse Prevention Structural Performance, and the Immediate Occupancy Structural Checklist in Table 17-21 shall be completed where required by Table 4-6 for Immediate Occupancy Structural Performance. Tier 1 screening shall include on-site investigation and condition assessment as required by Section 4.2.1.

Where applicable, each of the evaluation statements listed in this checklist shall be marked Compliant (C), Noncompliant (NC), Not Applicable (N/A), or Unknown (U) for a Tier 1 screening. Items that are deemed acceptable to the design professional in accordance with the evaluation statement shall be categorized as Compliant, whereas items that are determined by the design professional to require further investigation shall be categorized as Noncompliant or Unknown. For evaluation statements classified as Noncompliant or Unknown, the design professional is permitted to choose to conduct further investigation using the corresponding Tier 2 evaluation procedure listed next to each evaluation statement.

Table 17-18. Collapse Prevention Structural Checklist for Building Type CFS1.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Low and Moderate Seismicity			
Seismic-Force-Resisting System			
C NC N/A U	REDUNDANCY: The number of lines of shear walls in each principal direction is greater than or equal to 2.	5.5.1.1	A.3.2.1.1
C NC N/A U	SHEAR STRESS CHECK: The shear stress in the shear walls, calculated using the Quick Check procedure of Section 4.4.3.3 is less than the following values: Wood structural panel sheathing 1,000 lb/ft (14.6 kN/m), Steel sheet sheathing 700 lb/ft (10.2 kN/m), and All other conditions 100 lb/ft (1.5 kN/m).	5.5.3.1.1	A.3.2.8.1
C NC N/A U	STUCCO (EXTERIOR PLASTER) SHEAR WALLS: Multistory buildings do not rely on exterior stucco walls as the primary seismic-force-resisting system.	5.5.3.7.1	A.3.2.8.2
C NC N/A U	GYPSUM WALLBOARD OR PLASTER SHEAR WALLS: Interior plaster or gypsum wallboard is not used for shear walls on buildings more than one story high with the exception of the uppermost level of a multistory building.	5.5.3.7.1	A.3.2.8.3
C NC N/A U	NARROW SHEAR WALLS: Narrow shear walls with an aspect ratio greater than 2-to-1 are not used to resist seismic forces.	5.5.3.7.1	A.3.2.8.4
C NC N/A U	WALLS CONNECTED THROUGH FLOORS: Shear walls have an interconnection between stories to transfer overturning and shear forces through the floor.	5.5.3.7.2	A.3.2.8.5
C NC N/A U	HILLSIDE SITE: For structures that are taller on at least one side by more than one-half story because of a sloping site, all shear walls on the downhill slope have an aspect ratio less than 1-to-1.	5.5.3.7.3	A.3.2.8.6
C NC N/A U	OPENINGS: Walls with openings greater than 80% of the length are braced with wood structural panel or steel sheet shear walls with aspect ratios of not more than 1.5-to-1 or are supported by adjacent construction through positive ties capable of transferring the seismic forces.	5.5.3.7.5	A.3.2.8.8
Connections			
C NC N/A U	POSTS: There is a positive connection of posts to the foundation.	5.7.3.3	A.5.3.3
C NC N/A U	SILLS (BASE TRACK): All sills or base tracks are bolted to the foundation.	5.7.3.3	A.5.3.4
C NC N/A U	GIRDER–COLUMN CONNECTION: There is a positive connection using plates, connection hardware, or straps between the girder and the column support.	5.7.4.1	A.5.4.1
High Seismicity (Complete the Following Items in Addition to the Items for Low and Moderate Seismicity)			
Connections			
C NC N/A U	SILL (BASE TRACK) BOLTS: Bolts are spaced at 6 ft (1.8 m) or less with acceptable edge and end distance provided for steel and concrete.	5.7.3.3	A.5.3.7
Diaphragms			
C NC N/A U	DIAPHRAGM CONTINUITY: Floor and roof diaphragms do not have expansion joints or vertical offsets, such as split levels, sawtooth, or clerestory configurations.	5.6.1.1	A.4.1.1
C NC N/A U	ROOF CHORD CONTINUITY: All chord elements are continuous, regardless of changes in roof elevation.	5.6.1.1	A.4.1.3
C NC N/A U	SPANS: All diaphragms with spans greater than 24 ft (7.3 m) consist of wood structural panels.	5.6.2	A.4.2.2
C NC N/A U	UNBLOCKED DIAPHRAGMS: All unblocked wood structural panel diaphragms have horizontal spans less than 40 ft (12.2 m) and have aspect ratios less than or equal to 4-to-1.	5.6.2	A.4.2.2
C NC N/A U	OTHER DIAPHRAGMS: The diaphragms do not consist of a system other than wood, steel deck, concrete, or horizontal bracing.	5.6.5	A.4.7.1

Note: C = Compliant, NC = Noncompliant, N/A = Not Applicable, and U = Unknown.

Table 17-19. Immediate Occupancy Structural Checklist for Building Type CFS1.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Very Low Seismicity			
Seismic-Force-Resisting System			
C NC N/A U	REDUNDANCY: The number of lines of shear walls in each principal direction is greater than or equal to 2.	5.5.1.1	A.3.2.1.1
C NC N/A U	SHEAR STRESS CHECK: The shear stress in the shear walls, calculated using the Quick Check procedure of Section 4.4.3.3 is less than the following values: Wood structural panel sheathing 1,000 lb/ft (14.6 kN/m), Steel sheet sheathing 700 lb/ft (10.2 kN/m), and All other conditions 100 lb/ft (1.5 kN/m).	5.5.3.1.1	A.3.2.8.1
C NC N/A U	STUCCO (EXTERIOR PLASTER) SHEAR WALLS: Multistory buildings do not rely on exterior stucco walls as the primary seismic-force-resisting system.	5.5.3.7.1	A.3.2.8.2
C NC N/A U	GYPSUM WALLBOARD OR PLASTER SHEAR WALLS: Interior plaster or gypsum wallboard is not used for shear walls on buildings more than one story high with the exception of the uppermost level of a multistory building.	5.5.3.7.1	A.3.2.8.3
C NC N/A U	NARROW SHEAR WALLS: Narrow shear walls with an aspect ratio greater than 2-to-1 are not used to resist seismic forces.	5.5.3.7.1	A.3.2.8.4
C NC N/A U	WALLS CONNECTED THROUGH FLOORS: Shear walls have an interconnection between stories to transfer overturning and shear forces through the floor.	5.5.3.7.2	A.3.2.8.5
C NC N/A U	HILLSIDE SITE: For structures that are taller on at least one side by more than one-half story because of a sloping site, all shear walls on the downhill slope have an aspect ratio less than 1-to-2.	5.5.3.7.3	A.3.2.8.6
C NC N/A U	OPENINGS: Walls with openings greater than 80% of the length are braced with wood structural panel or steel sheet shear walls with aspect ratios of not more than 1.5-to-1 or are supported by adjacent construction through positive ties capable of transferring the seismic forces.	5.5.3.7.5	A.3.2.8.8
Connections			
C NC N/A U	POSTS: There is a positive connection of posts to the foundation.	5.7.3.3	A.5.3.3
C NC N/A U	SILLS (BASE TRACK): All sills or base tracks are bolted to the foundation.	5.7.3.3	A.5.3.4
C NC N/A U	GIRDER–COLUMN CONNECTION: There is a positive connection using plates, connection hardware, or straps between the girder and the column support.	5.7.4.1	A.5.4.1
Low, Moderate, and High Seismicity (Complete the Following Items in Addition to the Items for Very Low Seismicity)			
Seismic-Force-Resisting System			
C NC N/A U	HOLD-DOWN ANCHORS: All shear walls have hold-down anchors attached to the end studs, constructed in accordance with acceptable construction practices.	5.5.3.7.6	A.3.2.8.9
C NC N/A U	NARROW SHEAR WALLS: Narrow shear walls with an aspect ratio greater than 1.5-to-1 are not used to resist seismic forces.	5.5.3.7.1	A.3.2.8.4
Diaphragms			
C NC N/A U	DIAPHRAGM CONTINUITY: Floor and roof diaphragms do not have expansion joints or vertical offsets, such as split levels, sawtooth, or clerestory configurations.	5.6.1.1	A.4.1.1
C NC N/A U	ROOF CHORD CONTINUITY: All chord elements are continuous, regardless of changes in roof elevation.	5.6.1.1	A.4.1.3
C NC N/A U	PLAN IRREGULARITIES: There is tensile capacity to develop the strength of the diaphragm at reentrant corners or other locations of plan irregularities.	5.6.1.4	A.4.1.7
C NC N/A U	DIAPHRAGM REINFORCEMENT AT OPENINGS: There is reinforcing around all diaphragm openings larger than 50% of the building width in either major plan dimension.	5.6.1.5	A.4.1.8
C NC N/A U	SPANS: All diaphragms with spans greater than 12 ft (3.6 m) consist of wood structural panels.	5.6.2	A.4.2.2
C NC N/A U	UNBLOCKED DIAPHRAGMS: All unblocked wood structural panel diaphragms have horizontal spans less than 30 ft (9.1 m) and aspect ratios less than or equal to 3-to-1.	5.6.2	A.4.2.2

continues

Table 17-19 *(Continued)*. Immediate Occupancy Structural Checklist for Building Type CFS1.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
C NC N/A U	OTHER DIAPHRAGMS: Diaphragm do not consist of a system other than wood, steel deck, concrete, or horizontal bracing.	5.6.5	A.4.7.1
Connections			
C NC N/A U	SILL (BASE TRACK) BOLTS: Sill or base track bolts are spaced at 4 ft (1.2 m) or less, with acceptable edge and end distance provided for steel and concrete.	5.7.3.3	A.5.3.7

Note: C = Compliant, NC = Noncompliant, N/A = Not Applicable, and U = Unknown.

Table 17-20. Collapse Prevention Structural Checklist for Building Type CFS2.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Low and Moderate Seismicity			
Seismic-Force-Resisting System			
C NC N/A U	REDUNDANCY: The number of lines of strap-braced walls in each principal direction is greater than or equal to 2.	5.5.1.1	A.3.2.1.1
C NC N/A U	STRAP-BRACED WALLS—BRACE AXIAL STRESS CHECK: The axial stress in the diagonal straps, calculated using the Quick Check procedure of Section 4.4.3.4 is less than $0.50F_y$.	5.5.4.1	A.3.3.1.2
C NC N/A U	STRAP-BRACED WALLS—CHORD STUD AXIAL CHECK: The axial force caused by overturning plus the gravity load on the end stud is less than the nominal strength of the end stud calculated in accordance with AISI S100.	5.5.4.9.5	A.3.3.2.9
C NC N/A U	NARROW STRAP-BRACED WALLS: Narrow strap-braced walls with an aspect ratio greater than 2-to-1 are not used to resist seismic forces.	5.5.4.9.1	A.3.3.2.5
C NC N/A U	WALLS CONNECTED THROUGH FLOORS: Strap-braced walls have an interconnection between stories to transfer overturning and shear forces through the floor.	5.5.4.9.2	A.3.3.2.6
C NC N/A U	HILLSIDE SITE: For structures that are taller on at least one side by more than one-half story because of a sloping site, all strap-braced walls on the downhill slope have an aspect ratio less than 1-to-1.	5.5.4.9.3	A.3.3.2.7
Connections			
C NC N/A U	POSTS: There is a positive connection of posts to the foundation.	5.7.3.3	A.5.3.3
C NC N/A U	SILLS (BASE TRACK): All sills or base tracks are bolted to the foundation.	5.7.3.3	A.5.3.4
C NC N/A U	GIRDER–COLUMN CONNECTION: There is a positive connection using plates, connection hardware, or straps between the girder and the column support.	5.7.4.1	A.5.4.1
High Seismicity (Complete the Following Items in Addition to the Items for Low and Moderate Seismicity)			
Connections			
C NC N/A U	SILL (BASE TRACK) BOLTS: Bolts are spaced at 6 ft (1.8 m) or less with acceptable edge and end distance provided for steel and concrete.	5.7.3.3	A.5.3.7
C NC N/A U	STRAP-BRACE CONNECTIONS: Strap connections develop the yield capacity of the straps.	5.5.4.4	A.3.3.1.5
Diaphragms			
C NC N/A U	DIAPHRAGM CONTINUITY: Floor and roof diaphragms do not have expansion joints or vertical offsets, such as split levels, sawtooth, or clerestory configurations.	5.6.1.1	A.4.1.1
C NC N/A U	ROOF CHORD CONTINUITY: All chord elements are continuous, regardless of changes in roof elevation.	5.6.1.1	A.4.1.3

continues

Table 17-20 *(Continued)*. Collapse Prevention Structural Checklist for Building Type CFS2.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
C NC N/A U	SPANS: All diaphragms with spans greater than 24 ft (7.3 m) consist of wood structural panels.	5.6.2	A.4.2.2
C NC N/A U	UNBLOCKED DIAPHRAGMS: All unblocked wood structural panel diaphragms have horizontal spans less than 40 ft (12.2 m) and have aspect ratios less than or equal to 4-to-1.	5.6.2	A.4.2.2
C NC N/A U	OTHER DIAPHRAGMS: Diaphragms do not consist of a system other than wood, steel deck, concrete, or horizontal bracing.	5.6.5	A.4.7.1

Note: C = Compliant, NC = Noncompliant, N/A = Not Applicable, and U = Unknown.

Table 17-21. Immediate Occupancy Structural Checklist for Building Type CFS2.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Very Low Seismicity			
Seismic-Force-Resisting System			
C NC N/A U	REDUNDANCY: The number of lines of strap-braced walls in each principal direction is greater than or equal to 2.	5.5.1.1	A.3.2.1.1
C NC N/A U	STRAP-BRACED WALLS—BRACE AXIAL STRESS CHECK: The axial stress in the diagonal straps, calculated using the Quick Check procedure of Section 4.4.3.4 is less than $0.50F_y$.	5.5.4.1	A.3.3.1.2
C NC N/A U	STRAP-BRACED WALLS—CHORD STUD AXIAL CHECK: The axial force caused by overturning plus the gravity load on the end stud is less than the nominal strength of the end stud calculated in accordance with AISI S100.	5.5.4.9.5	A.3.3.2.9
C NC N/A U	NARROW STRAP-BRACED WALLS: Narrow strap-braced walls with an aspect ratio greater than 2-to-1 are not used to resist seismic forces.	5.5.4.9.1	A.3.3.2.5
C NC N/A U	WALLS CONNECTED THROUGH FLOORS: Strap-braced walls have an interconnection between stories to transfer overturning and shear forces through the floor.	5.5.4.9.2	A.3.3.2.6
C NC N/A U	HILLSIDE SITE: For structures that are taller on at least one side by more than one-half story because of a sloping site, all strap-braced walls on the downhill slope have an aspect ratio less than 1-to-2.	5.5.4.9.3	A.3.3.2.7
Connections			
C NC N/A U	POSTS: There is a positive connection of posts to the foundation.	5.7.3.3	A.5.3.3
C NC N/A U	SILLS (BASE TRACK): All sills or base tracks are bolted to the foundation.	5.7.3.3	A.5.3.4
C NC N/A U	GIRDER–COLUMN CONNECTION: There is a positive connection using plates, connection hardware, or straps between the girder and the column support.	5.7.4.1	A.5.4.1
Low, Moderate, and High Seismicity (Complete the Following Items in Addition to the Items for Very Low Seismicity)			
Seismic-Force-Resisting System			
C NC N/A U	HOLD-DOWN ANCHORS: All strap-braced walls have hold-down anchors attached to the end studs, constructed in accordance with acceptable construction practices.	5.5.3.6.6	A.3.3.2.8
Diaphragms			
C NC N/A U	DIAPHRAGM CONTINUITY: Floor and roof diaphragms do not have expansion joints or vertical offsets, such as split levels, sawtooth, or clerestory configurations.	5.6.1.1	A.4.1.1
C NC N/A U	ROOF CHORD CONTINUITY: All chord elements are continuous, regardless of changes in roof elevation.	5.6.1.1	A.4.1.3
C NC N/A U	PLAN IRREGULARITIES: There is tensile capacity to develop the strength of the diaphragm at reentrant corners or other locations of plan irregularities.	5.6.1.4	A.4.1.7

continues

Table 17-21 *(Continued)*. Immediate Occupancy Structural Checklist for Building Type CFS2.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
C NC N/A U	DIAPHRAGM REINFORCEMENT AT OPENINGS: There is reinforcing around all diaphragm openings larger than 50% of the building width in either major plan dimension.	5.6.1.5	A.4.1.8
C NC N/A U	SPANS: All diaphragms with spans greater than 12 ft (3.6 m) consist of wood structural panels.	5.6.2	A.4.2.2
C NC N/A U	UNBLOCKED DIAPHRAGMS: All unblocked wood structural panel diaphragms have horizontal spans less than 30 ft (9.1 m) and aspect ratios less than or equal to 3-to-1.	5.6.2	A.4.2.2
C NC N/A U	OTHER DIAPHRAGMS: Diaphragms do not consist of a system other than wood, steel deck, concrete, or horizontal bracing.	5.6.5	A.4.7.1
Connections			
C NC N/A U	SILL (BASE TRACK) BOLTS: Sill or base track bolts are spaced at 4 ft (1.2 m) or less, with acceptable edge and end distance provided for steel and concrete.	5.7.3.3	A.5.3.7
C NC N/A U	STRAP-BRACE CONNECTIONS: Strap connections develop the yield capacity of the straps.	5.5.4.4	A.3.3.1.5
C NC N/A U	STRAP-BRACE DETAILING: Strap braces are tight to the stud and attached to the intermediate studs in accordance with the requirements of AISI S400.	5.5.4.9.6	A.3.3.2.10

Note: C = Compliant, NC = Noncompliant, N/A = Not Applicable, and U = Unknown.

17.11 STRUCTURAL CHECKLISTS FOR BUILDING TYPE C1: CONCRETE MOMENT FRAMES

For building systems and configurations that comply with the C1 building type description in Table 3-1, the Collapse Prevention Structural Checklist in Table 17-22 shall be completed where required by Table 4-6 for Collapse Prevention Structural Performance, and the Immediate Occupancy Structural Checklist in Table 17-23 shall be completed where required by Table 4-6 for Immediate Occupancy Structural Performance. Tier 1 screening shall include on-site investigation and condition assessment as required by Section 4.2.1.

Where applicable, each of the evaluation statements listed in this checklist shall be marked Compliant (C), Noncompliant (NC), Not Applicable (N/A), or Unknown (U) for a Tier 1 screening. Items that are deemed acceptable to the design professional in accordance with the evaluation statement shall be categorized as Compliant, whereas items that are determined by the design professional to require further investigation shall be categorized as Noncompliant or Unknown. For evaluation statements classified as Noncompliant or Unknown, the design professional is permitted to choose to conduct further investigation using the corresponding Tier 2 evaluation procedure listed next to each evaluation statement.

17.12 STRUCTURAL CHECKLIST FOR BUILDING TYPES C2: CONCRETE SHEAR WALLS WITH STIFF DIAPHRAGMS, AND C2A: CONCRETE SHEAR WALLS WITH FLEXIBLE DIAPHRAGMS

For building systems and configurations that comply with the C2 or C2a building type description in Table 3-1, the Collapse Prevention Structural Checklist in Table 17-24 shall be completed where required by Table 4-6 for Collapse Prevention Structural Performance, and the Immediate Occupancy Structural Checklist in Table 17-25 shall be completed where required by Table 4-6 for Immediate Occupancy Structural Performance. Tier 1 screening shall include on-site investigation and condition assessment as required by Section 4.2.1.

Where applicable, each of the evaluation statements listed in this checklist shall be marked Compliant (C), Noncompliant (NC), Not Applicable (N/A), or Unknown (U) for a Tier 1 screening. Items that are deemed acceptable to the design professional in accordance with the evaluation statement shall be categorized as Compliant, whereas items that are determined by the design professional to require further investigation shall be categorized as Noncompliant or Unknown. For evaluation statements classified as Noncompliant or Unknown, the design professional is permitted to choose to conduct further investigation using the corresponding Tier 2 evaluation procedure listed next to each evaluation statement.

17.13 STRUCTURAL CHECKLISTS FOR BUILDING TYPES C3: CONCRETE FRAMES WITH INFILL MASONRY SHEAR WALLS, AND C3A: CONCRETE FRAMES WITH INFILL MASONRY SHEAR WALLS AND FLEXIBLE DIAPHRAGMS

For building systems and configurations that comply with the C3 or C3a building type description in Table 3-1, the Collapse Prevention Structural Checklist in Table 17-26 shall be completed where required by Table 4-6 for Collapse Prevention Structural Performance, and the Immediate Occupancy Structural Checklist in Table 17-27 shall be completed where required by Table 4-6 for Immediate Occupancy Structural Performance. Tier 1 screening shall include on-site investigation and condition assessment as required by Section 4.2.1.

Where applicable, each of the evaluation statements listed in this checklist shall be marked Compliant (C), Noncompliant

Table 17-22. Collapse Prevention Structural Checklist for Building Type C1.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Low Seismicity			
Seismic-Force-Resisting System			
C NC N/A U	REDUNDANCY: The number of lines of moment frames in each principal direction is greater than or equal to 2.	5.5.1.1	A.3.1.1.1
C NC N/A U	COLUMN AXIAL STRESS CHECK: The axial stress caused by unfactored gravity loads in columns subjected to overturning forces because of seismic demands is less than $0.20f'_c$. Alternatively, the axial stress caused by overturning forces alone, calculated using the Quick Check procedure of Section 4.4.3.6 is less than $0.30f'_c$.	5.5.2.1.3	A.3.1.4.2
Connections			
C NC N/A U	CONCRETE COLUMNS: All concrete columns are doweled into the foundation with a minimum of four bars.	5.7.3.1	A.5.3.2
Moderate Seismicity (Complete the Following Items in Addition to the Items for Low Seismicity)			
Seismic-Force-Resisting System			
C NC N/A U	REDUNDANCY: The number of bays of moment frames in each line is greater than or equal to 2.	5.5.1.1	A.3.1.1.1
C NC N/A U	INTERFERING WALLS: All concrete and masonry infill walls placed in moment frames are isolated from structural elements.	5.5.2.1.1	A.3.1.2.1
C NC N/A U	COLUMN SHEAR STRESS CHECK: The shear stress in the concrete columns, calculated using the Quick Check procedure of Section 4.4.3.2 is less than the greater of 100 lb/in.^{2} (0.69 MPa) or $2\sqrt{f'_c}$.	5.5.2.1.4	A.3.1.4.1
C NC N/A U	FLAT SLAB FRAMES: The seismic-force-resisting system is not a frame consisting of columns and a flat slab or plate without beams.	5.5.2.3.1	A.3.1.4.3
High Seismicity (Complete the Following Items in Addition to the Items for Low and Moderate Seismicity)			
Seismic-Force-Resisting System			
C NC N/A U	PRESTRESSED FRAME ELEMENTS: The seismic-force-resisting frames do not include any prestressed or posttensioned elements where the average prestress exceeds the lesser of 700 lb/in.^{2} (4.83 MPa) or $f'_c/6$ at potential hinge locations. The average prestress is calculated in accordance with the Quick Check procedure of Section 4.4.3.8.	5.5.2.3.2	A.3.1.4.4
C NC N/A U	CAPTIVE COLUMNS: There are no columns at a level with height-to-depth ratios less than 50% of the nominal height-to-depth ratio of the typical columns at that level.	5.5.2.3.3	A.3.1.4.5
C NC N/A U	NO SHEAR FAILURES: The shear capacity of frame members is able to develop the moment capacity at the ends of the members.	5.5.2.3.4	A.3.1.4.6
C NC N/A U	STRONG COLUMN—WEAK BEAM: The sum of the moment capacity of the columns is 20% greater than that of the beams at frame joints.	5.5.2.1.5	A.3.1.4.7
C NC N/A U	BEAM BARS: At least two longitudinal top and two longitudinal bottom bars extend continuously throughout the length of each frame beam. At least 25% of the longitudinal bars provided at the joints for either positive or negative moment are continuous throughout the length of the members.	5.5.2.3.5	A.3.1.4.8
C NC N/A U	COLUMN-BAR SPLICES: All column-bar lap splice lengths are greater than $35d_b$ and are enclosed by ties spaced at or less than $8d_b$. Alternatively, column bars are spliced with mechanical couplers with a capacity of at least 1.25 times the nominal yield strength of the spliced bar.	5.5.2.3.6	A.3.1.4.9
C NC N/A U	BEAM-BAR SPLICES: The lap splices or mechanical couplers for longitudinal beam reinforcing are not located within $l_b/4$ of the joints and are not located in the vicinity of potential plastic hinge locations.	5.5.2.3.6	A.3.1.4.10
C NC N/A U	COLUMN-TIE SPACING: Frame columns have ties spaced at or less than $d/4$ throughout their length and at or less than $8d_b$ at all potential plastic hinge locations.	5.5.2.3.7	A.3.1.4.11
C NC N/A U	STIRRUP SPACING: All beams have stirrups spaced at or less than $d/2$ throughout their length. At potential plastic hinge locations, stirrups are spaced at or less than the minimum of $8d_b$ or $d/4$.	5.5.2.3.7	A.3.1.4.12

continues

Table 17-22 *(Continued)*. Collapse Prevention Structural Checklist for Building Type C1.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
C NC N/A U	JOINT TRANSVERSE REINFORCING: Beam–column joints have ties spaced at or less than $8d_b$.	5.5.2.3.8	A.3.1.4.13
C NC N/A U	DEFLECTION COMPATIBILITY: Secondary components have the shear capacity to develop the flexural strength of the components.	5.5.2.5.2	A.3.1.6.2
C NC N/A U	FLAT SLABS: Flat slabs or plates not part of the seismic-force-resisting system have continuous bottom steel through the column joints.	5.5.2.5.3	A.3.1.6.3
Diaphragms			
C NC N/A U	DIAPHRAGM CONTINUITY: Floor and roof diaphragms do not have expansion joints or vertical offsets, such as split levels, sawtooth, or clerestory configurations.	5.6.1.1	A.4.1.1
Connections			
C NC N/A U	UPLIFT AT PILE CAPS: Pile caps have top reinforcement, and piles are anchored to the pile caps.	5.7.3.5	A.5.3.8

Note: C = Compliant, NC = Noncompliant, N/A = Not Applicable, and U = Unknown.

Table 17-23. Immediate Occupancy Structural Checklist for Building Type C1.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Very Low Seismicity			
Seismic-Force-Resisting System			
C NC N/A U	REDUNDANCY: The number of lines of moment frames in each principal direction is greater than or equal to 2. The number of bays of moment frames in each line is greater than or equal to 3.	5.5.1.1	A.3.1.1.1
C NC N/A U	INTERFERING WALLS: All concrete and masonry infill walls placed in moment frames are isolated from structural elements.	5.5.2.1.1	A.3.1.2.1
C NC N/A U	COLUMN SHEAR STRESS CHECK: The shear stress in the concrete columns, calculated using the Quick Check procedure of Section 4.4.3.2 is less than the greater of 100 lb/in.^{2} (0.69 MPa) or $2\sqrt{f'_c}$.	5.5.2.1.4	A.3.1.4.1
C NC N/A U	COLUMN AXIAL STRESS CHECK: The axial stress caused by unfactored gravity loads in columns subjected to overturning demands is less than $0.13f'_c$. Alternatively, the axial stress caused by overturning forces alone, calculated using the Quick Check procedure of Section 4.4.3.6 is less than $0.30f'_c$.	5.5.2.1.3	A.3.1.4.2
Connections			
C NC N/A U	CONCRETE COLUMNS: All concrete columns are doweled into the foundation, and the dowels are able to develop the tensile capacity of reinforcement in columns of the seismic-force-resisting system.	5.7.3.1	A.5.3.2
Low Seismicity (Complete the Following Items in Addition to the Items for Very Low Seismicity)			
Seismic-Force-Resisting System			
C NC N/A U	FLAT SLAB FRAMES: The seismic-force-resisting system is not a frame consisting of columns and a flat slab or plate without beams.	5.5.2.3.1	A.3.1.4.3
C NC N/A U	PRESTRESSED FRAME ELEMENTS: The seismic-force-resisting frames do not include any prestressed or posttensioned elements where the average prestress exceeds the lesser of 700 lb/in.^{2} (4.83 MPa) or $f'_c/6$ at potential hinge locations. The average prestress is calculated in accordance with the Quick Check procedure of Section 4.4.3.8.	5.5.2.3.2	A.3.1.4.4
C NC N/A U	CAPTIVE COLUMNS: There are no columns at a level with height-to-depth ratios less than 75% of the nominal height-to-depth ratio of the typical columns at that level.	5.5.2.3.3	A.3.1.4.5
C NC N/A U	NO SHEAR FAILURES: The shear capacity of frame members is able to develop the moment capacity at the ends of the members.	5.5.2.3.4	A.3.1.4.6

continues

Table 17-23 *(Continued)*. Immediate Occupancy Structural Checklist for Building Type C1.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
C NC N/A U	STRONG COLUMN—WEAK BEAM: The sum of the moment capacity of the columns is 20% greater than that of the beams at frame joints.	5.5.2.1.5	A.3.1.4.7
C NC N/A U	BEAM BARS: At least two longitudinal top and two longitudinal bottom bars extend continuously throughout the length of each frame beam. At least 25% of the longitudinal bars provided at the joints for either positive or negative moment are continuous throughout the length of the members.	5.5.2.3.5	A.3.1.4.8
C NC N/A U	COLUMN-BAR SPLICES: All column-bar lap splice lengths are greater than $50d_b$ and are enclosed by ties spaced at or less than $8d_b$. Alternatively, column bars are spliced with mechanical couplers with a capacity of at least 1.25 times the nominal yield strength of the spliced bar.	5.5.2.3.6	A.3.1.4.9
C NC N/A U	BEAM-BAR SPLICES: The lap splices or mechanical couplers for longitudinal beam reinforcing are not located within $l_b/4$ of the joints and are not located in the vicinity of potential plastic hinge locations.	5.5.2.3.6	A.3.1.4.10
C NC N/A U	COLUMN-TIE SPACING: Frame columns have ties spaced at or less than $d/4$ throughout their length and at or less than $8d_b$ at all potential plastic hinge locations.	5.5.2.3.7	A.3.1.4.11
C NC N/A U	STIRRUP SPACING: All beams have stirrups spaced at or less than $d/2$ throughout their length. At potential plastic hinge locations, stirrups are spaced at or less than the minimum of $8d_b$ or $d/4$.	5.5.2.3.7	A.3.1.4.12
C NC N/A U	JOINT TRANSVERSE REINFORCING: Beam–column joints have ties spaced at or less than $8d_b$.	5.5.2.3.8	A.3.1.4.13
C NC N/A U	JOINT ECCENTRICITY: There are no eccentricities larger than 20% of the smallest column plan dimension between girder and column centerlines.	5.5.2.3.9	A.3.1.4.14
C NC N/A U	STIRRUP AND TIE HOOKS: The beam stirrups and column ties are anchored into the member cores with hooks of 135 degrees or more.	5.5.2.3.10	A.3.1.4.15
C NC N/A U	DEFLECTION COMPATIBILITY: Secondary components have the shear capacity to develop the flexural strength of the components and are Compliant with the following items in this table: COLUMN-BAR SPLICES, BEAM-BAR SPLICES, COLUMN-TIE SPACING, STIRRUP SPACING, and STIRRUP AND TIE HOOKS.	5.5.2.5.2	A.3.1.6.2
C NC N/A U	FLAT SLABS: Flat slabs or plates not part of the seismic-force-resisting system have continuous bottom steel through the column joints.	5.5.2.5.3	A.3.1.6.3
Diaphragms			
C NC N/A U	DIAPHRAGM CONTINUITY: Floor and roof diaphragms do not have expansion joints or vertical offsets, such as split levels, sawtooth, or clerestory configurations.	5.6.1.1	A.4.1.1
C NC N/A U	PLAN IRREGULARITIES: There is tensile capacity to develop the strength of the diaphragm at reentrant corners or other locations of plan irregularities.	5.6.1.4	A.4.1.7
C NC N/A U	DIAPHRAGM REINFORCEMENT AT OPENINGS: There is reinforcing around all diaphragm openings larger than 50% of the building width in either major plan dimension.	5.6.1.5	A.4.1.8
Connections			
C NC N/A U	UPLIFT AT PILE CAPS: Pile caps have top reinforcement, and piles are anchored to the pile caps; the pile cap reinforcement and pile anchorage are able to develop the tensile capacity of the piles.	5.7.3.5	A.5.3.8
Moderate and High Seismicity (Complete the Following Items in Addition to the Items for Very Low and Low Seismicity)			
Foundation System			
C NC N/A U	OVERTURNING: The ratio of the least horizontal dimension of the seismic-force-resisting system at the foundation level to the building height (base/height) is greater than $0.6S_a$.	5.4.3.3	A.6.2.1

Note: C = Compliant, NC = Noncompliant, N/A = Not Applicable, and U = Unknown.

Table 17-24. Collapse Prevention Structural Checklist for Building Types C2 and C2a.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Low and Moderate Seismicity			
Seismic-Force-Resisting System			
C NC N/A U	CONCRETE BEARING WALLS: Floor and roof girders and trusses are not supported at the ends of concrete walls that are less than 10 in. (254 mm) thick. This statement only applies to framing supports located less than two times the wall thickness away from the wall end.	5.5.2.5.1	A.3.1.6.1
C NC N/A U	REDUNDANCY: The number of lines of shear walls in each principal direction is greater than or equal to 2.	5.5.1.1	A.3.2.1.1
C NC N/A U	SHEAR STRESS CHECK: The shear stress in the concrete shear walls, calculated using the Quick Check procedure of Section 4.4.3.3 is less than the greater of 100 lb/in.^{2} (0.69 MPa) or $2\sqrt{f'_c}$.	5.5.3.1.1	A.3.2.2.1
C NC N/A U	REINFORCING STEEL: The ratio of reinforcing steel area to gross concrete area is not less than 0.0012 in the vertical direction and 0.0020 in the horizontal direction.	5.5.3.1.3	A.3.2.2.2
Connections			
C NC N/A U	WALL ANCHORAGE AT FLEXIBLE DIAPHRAGMS: Exterior concrete or masonry walls that are dependent on flexible diaphragms for lateral support are anchored for out-of-plane forces at each diaphragm level with steel anchors, reinforcing dowels, or straps that are developed into the diaphragm. Connections have strength to resist the connection force calculated in the Quick Check procedure of Section 4.4.3.7.	5.7.1.1	A.5.1.1
C NC N/A U	TRANSFER TO SHEAR WALLS: Diaphragms are connected for transfer of seismic forces to the shear walls.	5.7.2	A.5.2.1
C NC N/A U	FOUNDATION DOWELS: Wall reinforcement is doweled into the foundation with vertical bars equal in size and spacing to the vertical wall reinforcing directly above the foundation.	5.7.3.4	A.5.3.5
High Seismicity (Complete the Following Items in Addition to the Items for Low and Moderate Seismicity)			
Seismic-Force-Resisting System			
C NC N/A U	DEFLECTION COMPATIBILITY: Secondary components have the shear capacity to develop the flexural strength of the components.	5.5.2.5.2	A.3.1.6.2
C NC N/A U	FLAT SLABS: Flat slabs or plates not part of the seismic-force-resisting system have continuous bottom steel through the column joints.	5.5.2.5.3	A.3.1.6.3
C NC N/A U	COUPLING BEAMS: Coupling beams have stirrups spaced at or less than d/2, and each wall or wall segment connected to the coupling beam is supported such that it can resist shear and overturning forces in the absence of the coupling beam. This statement only applies to coupling beams with span-to-depth ratios exceeding 2-to-1.	5.5.3.2.1	A.3.2.2.3
Diaphragms (Stiff or Flexible)			
C NC N/A U	DIAPHRAGM CONTINUITY: Floor and roof diaphragms do not have expansion joints or vertical offsets, such as split levels, sawtooth, or clerestory configurations.	5.6.1.1	A.4.1.1
C NC N/A U	ROOF CHORD CONTINUITY: All chord elements are continuous, regardless of changes in roof elevation.	5.6.1.1	A.4.1.3
C NC N/A U	OPENINGS AT SHEAR WALLS: Diaphragm openings immediately adjacent to the shear walls are less than 25% of the wall length.	5.6.1.3	A.4.1.4
Flexible Diaphragms			
C NC N/A U	CROSSTIES: There are continuous crossties between diaphragm chords.	5.6.1.2	A.4.1.2
C NC N/A U	STRAIGHT SHEATHING: All straight-sheathed diaphragms have horizontal spans less than 24 ft (7.3 m) and aspect ratios less than 2-to-1 in the direction being considered.	5.6.2	A.4.2.1
C NC N/A U	DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 40 ft (12.2 m) and aspect ratios less than or equal to 4-to-1.	5.6.2	A.4.2.2

continues

Table 17-24 *(Continued)*. Collapse Prevention Structural Checklist for Building Types C2 and C2a.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
C NC N/A U	BLOCKED DIAPHRAGMS: All blocked wood structural panel diaphragms have horizontal spans less than 120 ft (36.5 m) and have aspect ratios less than or equal to 4-to-1.	5.6.2	A.4.2.3
C NC N/A U	CANTILEVERED WOOD DIAPHRAGMS: All cantilevered wood diaphragms that provide lateral support for concrete or masonry walls consist of wood structural panels and have a maximum cantilever length of 20 ft (6.1 m) if unblocked or 35 ft (10.7 m) if blocked, and a maximum ratio of cantilever length to diaphragm width of 1:2 if unblocked and 1:1 if blocked. In addition, the cantilevered diaphragm has a back-span length equal to or greater than the cantilevered portion.	5.6.2	A.4.2.4
C NC N/A U	NON-CONCRETE-FILLED DIAPHRAGMS: Bare steel deck diaphragms or steel deck diaphragms with fill other than reinforced structural concrete consist of horizontal spans of less than 120 ft (36.5 m) and have aspect ratios less than 4-to-1.	5.6.3	A.4.3.1
C NC N/A U	OTHER DIAPHRAGMS: Diaphragms do not consist of a system other than wood, steel deck, concrete, or horizontal bracing.	5.6.5	A.4.7.1
Connections			
C NC N/A U	UPLIFT AT PILE CAPS: Pile caps have top reinforcement, and piles are anchored to the pile caps.	5.7.3.5	A.5.3.8

Note: C = Compliant, NC = Noncompliant, N/A = Not Applicable, and U = Unknown.

Table 17-25. Immediate Occupancy Structural Checklist for Building Types C2 and C2a.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Very Low Seismicity			
Seismic-Force-Resisting System			
C NC N/A U	CONCRETE BEARING WALLS: Floor and roof girders and trusses are not supported at the ends of concrete walls that are less than 10 in. (254 mm) thick. This statement only applies to framing supports located less than two times the wall thickness away from the wall end.	5.5.2.5.1	A.3.1.6.1
C NC N/A U	REDUNDANCY: The number of lines of shear walls in each principal direction is greater than or equal to 2.	5.5.1.1	A.3.2.1.1
C NC N/A U	SHEAR STRESS CHECK: The shear stress in the concrete shear walls, calculated using the Quick Check procedure of Section 4.4.3.3 is less than the greater of 100 lb/in.^{2} (0.69 MPa) or $2\sqrt{f'_c}$.	5.5.3.1.1	A.3.2.2.1
C NC N/A U	REINFORCING STEEL: The ratio of reinforcing steel area to gross concrete area is not less than 0.0012 in the vertical direction and 0.0020 in the horizontal direction. The spacing of reinforcing steel is equal to or less than 18 in. (457.2 mm).	5.5.3.1.3	A.3.2.2.2
Connections			
C NC N/A U	WALL ANCHORAGE AT FLEXIBLE DIAPHRAGMS: Exterior concrete or masonry walls that are dependent on flexible diaphragms for lateral support are anchored for out-of-plane forces at each diaphragm level with steel anchors, reinforcing dowels, or straps that are developed into the diaphragm. Connections have strength to resist the connection force calculated in the Quick Check procedure of Section 4.4.3.7.	5.7.1.1	A.5.1.1
C NC N/A U	TRANSFER TO SHEAR WALLS: Diaphragms are connected for transfer of loads to the shear walls, and the connections are able to develop the lesser of the shear strength of the walls or diaphragms.	5.7.2	A.5.2.1

continues

Table 17-25 *(Continued)*. Immediate Occupancy Structural Checklist for Building Types C2 and C2a.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
C NC N/A U	FOUNDATION DOWELS: Wall reinforcement is doweled into the foundation, and the dowels are able to develop the lesser of the strength of the walls or the uplift capacity of the foundation.	5.7.3.4	A.5.3.5
Low Seismicity (Complete the Following Items in Addition to the Items for Very Low Seismicity)			
Seismic-Force-Resisting System			
C NC N/A U	DEFLECTION COMPATIBILITY: Secondary components have the shear capacity to develop the flexural strength of the components and are compliant with the following items in Table 17-23: COLUMN-BAR SPLICES, BEAM-BAR SPLICES, COLUMN-TIE SPACING, STIRRUP SPACING, and STIRRUP AND TIE HOOKS.	5.5.2.5.2	A.3.1.6.2
C NC N/A U	FLAT SLABS: Flat slabs or plates not part of seismic-force-resisting system have continuous bottom steel through the column joints.	5.5.2.5.3	A.3.1.6.3
C NC N/A U	COUPLING BEAMS: Coupling beams have the capacity in shear to develop the uplift capacity of the adjacent wall or to develop the flexural capacity of the coupling beam, whichever is less. This statement only applies to coupling beams with span-to-depth ratios exceeding 2-to-1.	5.5.3.2.1	A.3.2.2.3
C NC N/A U	OVERTURNING: All shear walls have aspect ratios less than 4-to-1. Wall piers need not be considered.	5.5.3.1.4	A.3.2.2.4
C NC N/A U	CONFINEMENT REINFORCING: For shear walls with aspect ratios greater than 2-to-1, the boundary elements are confined with spirals or ties with spacing less than $8d_b$.	5.5.3.2.2	A.3.2.2.5
C NC N/A U	WALL REINFORCING AT OPENINGS: There is added trim reinforcement around all wall openings with a dimension greater than three times the thickness of the wall.	5.5.3.1.5	A.3.2.2.6
C NC N/A U	WALL THICKNESS: Thicknesses of bearing walls are not less than 1/25 the unsupported height or length, whichever is shorter, nor less than 4 in. (101.6 mm).	5.5.3.1.2	A.3.2.2.7
Diaphragms (Stiff or Flexible)			
C NC N/A U	DIAPHRAGM CONTINUITY: Floor and roof diaphragms do not have expansion joints or vertical offsets, such as split levels, sawtooth, or clerestory configurations.	5.6.1.1	A.4.1.1
C NC N/A U	ROOF CHORD CONTINUITY: All chord elements are continuous, regardless of changes in roof elevation.	5.6.1.1	A.4.1.3
C NC N/A U	OPENINGS AT SHEAR WALLS: Diaphragm openings immediately adjacent to the shear walls are less than 15% of the wall length.	5.6.1.3	A.4.1.4
C NC N/A U	PLAN IRREGULARITIES: There is tensile capacity to develop the strength of the diaphragm at reentrant corners or other locations of plan irregularities.	5.6.1.4	A.4.1.7
C NC N/A U	DIAPHRAGM REINFORCEMENT AT OPENINGS: There is reinforcing around all diaphragm openings larger than 50% of the building width in either major plan dimension.	5.6.1.5	A.4.1.8
Flexible Diaphragms			
C NC N/A U	CROSSTIES: There are continuous crossties between diaphragm chords.	5.6.1.2	A.4.1.2
C NC N/A U	STRAIGHT SHEATHING: All straight-sheathed diaphragms have horizontal spans less than 12 ft (3.6 m) and aspect ratios less than 1-to-1 in the direction being considered.	5.6.2	A.4.2.1
C NC N/A U	DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 30 ft (9.2 m) and aspect ratios less than or equal to 3-to-1.	5.6.2	A.4.2.2
C NC N/A U	BLOCKED DIAPHRAGMS: All blocked wood structural panel diaphragms have horizontal spans less than 90 ft (27.4 m) and have aspect ratios less than or equal to 4-to-1.	5.6.2	A.4.2.3

continues

Table 17-25 *(Continued)*. Immediate Occupancy Structural Checklist for Building Types C2 and C2a.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
C NC N/A U	CANTILEVERED WOOD DIAPHRAGMS: All cantilevered wood diaphragms that provide lateral support for concrete or masonry walls consist of wood structural panels and have a maximum cantilever length of 15 ft (4.6 m) if unblocked or 25 ft (7.6 m) if blocked, and a maximum ratio of cantilever length to diaphragm width of 1:2.5 if unblocked and 1:1.5 if blocked. In addition, the cantilevered diaphragm has a back-span length equal to or greater than the cantilevered portion.	5.6.2	A.4.2.4
C NC N/A U	NON-CONCRETE-FILLED DIAPHRAGMS: Bare steel deck diaphragms or steel deck diaphragms with fill other than reinforced concrete consist of horizontal spans of less than 40 ft (12.2 m) and have aspect ratios less than 4-to-1.	5.6.3	A.4.3.1
C NC N/A U	OTHER DIAPHRAGMS: Diaphragms do not consist of a system other than wood, steel deck, concrete, or horizontal bracing.	5.6.5	A.4.7.1
Connections			
C NC N/A U	UPLIFT AT PILE CAPS: Pile caps have top reinforcement, and piles are anchored to the pile caps; the pile cap reinforcement and pile anchorage are able to develop the tensile capacity of the piles.	5.7.3.5	A.5.3.8
Moderate and High Seismicity (Complete the Following Items in Addition to the Items for Very Low and Low Seismicity)			
Foundation System			
C NC N/A U	OVERTURNING: The ratio of the least horizontal dimension of the seismic-force-resisting system at the foundation level to the building height (base/height) is greater than $0.6S_a$.	5.4.3.3	A.6.2.1

Note: C = Compliant, NC = Noncompliant, N/A = Not Applicable, and U = Unknown.

Table 17-26. Collapse Prevention Structural Checklist for Building Types C3 and C3a.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Low and Moderate Seismicity			
Seismic-Force-Resisting System			
C NC N/A U	REDUNDANCY: The number of lines of shear walls in each principal direction is greater than or equal to 2.	5.5.1.1	A.3.2.1.1
C NC N/A U	SHEAR STRESS CHECK: The shear stress in the reinforced masonry shear walls, calculated using the Quick Check procedure of Section 4.4.3.3 is less than 70 lb/in.^{2} (0.48 MPa).	5.5.3.1.1	A.3.2.4.1
C NC N/A U	SHEAR STRESS CHECK: The shear stress in the unreinforced masonry shear walls, calculated using the Quick Check procedure of Section 4.4.3.3 is less than 30 lb/in.^{2} (0.21 MPa) for clay units and 70 lb/in.^{2} (0.48 MPa) for concrete units. Bays with openings greater than 25% of the wall area shall not be included in A_w of Equation (4-8).	5.5.3.1.1	A.3.2.5.1
C NC N/A U	INFILL WALL CONNECTIONS: Masonry is in full contact with frame.	5.5.3.5.1 5.5.3.5.3	A.3.2.6.1
Connections			
C NC N/A U	TRANSFER TO SHEAR WALLS: Diaphragms are connected for transfer of loads to the shear walls.	5.7.2	A.5.2.1
C NC N/A U	CONCRETE COLUMNS: All concrete columns are doweled into the foundation with a minimum of four bars.	5.7.3.1	A.5.3.2
High Seismicity (Complete the Following Items in Addition to the Items for Low and Moderate Seismicity)			
Seismic-Force-Resisting System			
C NC N/A U	DEFLECTION COMPATIBILITY: Secondary components have the shear capacity to develop the flexural strength of the components.	5.5.2.5.2	A.3.1.6.2

continues

Table 17-26 *(Continued)*. Collapse Prevention Structural Checklist for Building Types C3 and C3a.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
C NC N/A U	FLAT SLABS: Flat slabs or plates not part of the seismic-force-resisting system have continuous bottom steel through the column joints.	5.5.2.5.3	A.3.1.6.3
C NC N/A U	PROPORTIONS: The height-to-thickness ratio of the unreinforced infill walls at each story is less than 9.	5.5.3.1.2	A.3.2.6.2
C NC N/A U	CAVITY WALLS: The infill walls are not of cavity construction.	5.5.3.5.2	A.3.2.6.3
C NC N/A U	INFILL WALLS: The infill walls are continuous to the soffits of the frame beams and to the columns to either side.	5.5.3.5.3	A.3.2.6.4
Diaphragms (Stiff or Flexible)			
C NC N/A U	DIAPHRAGM CONTINUITY: Floor and roof diaphragms do not have expansion joints or vertical offsets, such as split levels, sawtooth, or clerestory configurations.	5.6.1.1	A.4.1.1
C NC N/A U	OPENINGS AT SHEAR WALLS: Diaphragm openings immediately adjacent to the shear walls are less than 25% of the wall length.	5.6.1.3	A.4.1.4
C NC N/A U	OPENINGS AT EXTERIOR MASONRY SHEAR WALLS: Diaphragm openings immediately adjacent to exterior masonry shear walls are not greater than 8 ft (2.4 m) long.	5.6.1.3	A.4.1.6
Flexible Diaphragms			
C NC N/A U	CROSSTIES: There are continuous crossties between diaphragm chords.	5.6.1.2	A.4.1.2
C NC N/A U	STRAIGHT SHEATHING: All straight-sheathed diaphragms have horizontal spans less than 24 ft (7.3 m) and aspect ratios less than 2-to-1 in the direction being considered.	5.6.2	A.4.2.1
C NC N/A U	DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 40 ft (12.2 m) and aspect ratios less than or equal to 4-to-1.	5.6.2	A.4.2.2
C NC N/A U	BLOCKED DIAPHRAGMS: All blocked wood structural panel diaphragms have horizontal spans less than 120 ft (36.5 m) and have aspect ratios less than or equal to 4-to-1.	5.6.2	A.4.2.3
C NC N/A U	CANTILEVERED WOOD DIAPHRAGMS: All cantilevered wood diaphragms that provide lateral support for concrete or masonry walls consist of wood structural panels and have a maximum cantilever length of 20 ft (6.1 m) if unblocked or 35 ft (10.7 m) if blocked, and a maximum ratio of cantilever length to diaphragm width of 1:2 if unblocked and 1:1 if blocked. In addition, the cantilevered diaphragm has a back-span length equal to or greater than the cantilevered portion.	5.6.2	A.4.2.4
C NC N/A U	NON-CONCRETE-FILLED DIAPHRAGMS: Bare steel deck diaphragms or steel deck diaphragms with fill other than reinforced structural concrete consist of horizontal spans of less than 120 ft (36.5 m) and have aspect ratios less than 4-to-1.	5.6.3	A.4.3.1
C NC N/A U	OTHER DIAPHRAGMS: Diaphragms do not consist of a system other than wood, steel deck, concrete, or horizontal bracing.	5.6.5	A.4.7.1
Connections			
C NC N/A U	UPLIFT AT PILE CAPS: Pile caps have top reinforcement, and piles are anchored to the pile caps.	5.7.3.5	A.5.3.8
C NC N/A U	STIFFNESS OF WALL ANCHORS: Anchors of concrete or masonry walls to wood structural elements are installed taut and are stiff enough to limit the relative movement between the wall and the diaphragm to no greater than 1/8 in. (3.1 mm) before engagement of the anchors.	5.7.1.2	A.5.1.4

Note: C = Compliant, NC = Noncompliant, N/A = Not Applicable, and U = Unknown.

Table 17-27. Immediate Occupancy Structural Checklists for Building Types C3 and C3a.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Very Low Seismicity			
Seismic-Force-Resisting System			
C NC N/A U	REDUNDANCY: The number of lines of shear walls in each principal direction is greater than or equal to 2.	5.5.1.1	A.3.2.1.1
C NC N/A U	SHEAR STRESS CHECK: The shear stress in the reinforced masonry shear walls, calculated using the Quick Check procedure of Section 4.4.3.3 is less than 70 lb/in.^{2} (0.48 MPa).	5.5.3.1.1	A.3.2.4.1
C NC N/A U	SHEAR STRESS CHECK: The shear stress in the unreinforced masonry shear walls, calculated using the Quick Check procedure of Section 4.4.3.3 is less than 30 lb/in.^{2} (0.21 MPa) for clay units and 70 lb/in.^{2} (0.48 MPa) for concrete units. Bays with openings greater than 25% of the wall area shall not be included in A_w of Equation (4-8).	5.5.3.1.1	A.3.2.5.1
C NC N/A U	INFILL WALL CONNECTIONS: Masonry is in full contact with frame.	5.5.3.5.1 5.5.3.5.3	A.3.2.6.1
Connections			
C NC N/A U	TRANSFER TO SHEAR WALLS: Diaphragms are connected for transfer of loads to the shear walls, and the connections are able to develop the lesser of the shear strength of the walls or diaphragms.	5.7.2	A.5.2.1
C NC N/A U	CONCRETE COLUMNS: All concrete columns are doweled into the foundation with a minimum of four bars, and the dowels are able to develop the tensile capacity of reinforcement in columns of the seismic-force-resisting system.	5.7.3.1	A.5.3.2
Low Seismicity (Complete the Following Items in Addition to the Items for Very Low Seismicity)			
Seismic-Force-Resisting System			
C NC N/A U	DEFLECTION COMPATIBILITY: Secondary components have the shear capacity to develop the flexural strength of the components and are Compliant with the following items in Table 17-23: COLUMN-BAR SPLICES, BEAM-BAR SPLICES, COLUMN-TIE SPACING, STIRRUP SPACING, and STIRRUP AND TIE HOOKS.	5.5.2.5.2	A.3.1.6.2
C NC N/A U	FLAT SLABS: Flat slabs or plates not part of the seismic-force-resisting system have continuous bottom steel through the column joints.	5.5.2.5.3	A.3.1.6.3
C NC N/A U	REINFORCING AT WALL OPENINGS: All wall openings that interrupt rebar have trim reinforcing on all sides.	5.5.3.1.5	A.3.2.4.3
C NC N/A U	PROPORTIONS: The height-to-thickness ratio of the unreinforced infill walls at each story is less than 13.	5.5.3.1.2	A.3.2.6.2
C NC N/A U	CAVITY WALLS: The infill walls are not of cavity construction.	5.5.3.5.2	A.3.2.6.3
C NC N/A U	INFILL WALLS: The infill walls are continuous to the soffits of the frame beams and to the columns to either side.	5.5.3.5.3	A.3.2.6.4
Diaphragms (Stiff or Flexible)			
C NC N/A U	DIAPHRAGM CONTINUITY: Floor and roof diaphragms do not have expansion joints or vertical offsets, such as split levels, sawtooth, or clerestory configurations.	5.6.1.1	A.4.1.1
C NC N/A U	OPENINGS AT SHEAR WALLS: Diaphragm openings immediately adjacent to the shear walls are less than 15% of the wall length.	5.6.1.3	A.4.1.4
C NC N/A U	OPENINGS AT EXTERIOR MASONRY SHEAR WALLS: Diaphragm openings immediately adjacent to exterior masonry shear walls are not greater than 4 ft (1.2 m) long.	5.6.1.3	A.4.1.6
C NC N/A U	PLAN IRREGULARITIES: There is tensile capacity to develop the strength of the diaphragm at reentrant corners or other locations of plan irregularities.	5.6.1.4	A.4.1.7
C NC N/A U	DIAPHRAGM REINFORCEMENT AT OPENINGS: There is reinforcing around all diaphragm openings larger than 50% of the building width in either major plan dimension.	5.6.1.5	A.4.1.8

continues

Table 17-27 *(Continued)*. Immediate Occupancy Structural Checklists for Building Types C3 and C3a.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Flexible Diaphragms			
C NC N/A U	CROSSTIES: There are continuous crossties between diaphragm chords.	5.6.1.2	A.4.1.2
C NC N/A U	STRAIGHT SHEATHING: All straight-sheathed diaphragms have horizontal spans less than 12 ft (3.6 m) and aspect ratios less than 1-to-1 in the direction being considered.	5.6.2	A.4.2.1
C NC N/A U	DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 30 ft (9.1 m) and aspect ratios less than or equal to 3-to-1.	5.6.2	A.4.2.2
C NC N/A U	BLOCKED DIAPHRAGMS: All blocked wood structural panel diaphragms have horizontal spans less than 90 ft (27.4 m) and have aspect ratios less than or equal to 4-to-1.	5.6.2	A.4.2.3
C NC N/A U	CANTILEVERED WOOD DIAPHRAGMS: All cantilevered wood diaphragms that provide lateral support for concrete or masonry walls consist of wood structural panels and have a maximum cantilever length of 15 ft (4.6 m) if unblocked or 25 ft (7.6 m) if blocked, and a maximum ratio of cantilever length to diaphragm width of 1:2.5 if unblocked and 1:1.5 if blocked. In addition, the cantilevered diaphragm has a back-span length equal to or greater than the cantilevered portion.	5.6.2	A.4.2.4
C NC N/A U	NON-CONCRETE-FILLED DIAPHRAGMS: Bare steel deck diaphragms or steel deck diaphragms with fill other than reinforced concrete consist of horizontal spans of less than 40 ft (12.2 m) and have aspect ratios less than 4-to-1.	5.6.3	A.4.3.1
C NC N/A U	OTHER DIAPHRAGMS: Diaphragms do not consist of a system other than wood, steel deck, concrete, or horizontal bracing.	5.6.5	A.4.7.1
Connections			
C NC N/A U	UPLIFT AT PILE CAPS: Pile caps have top reinforcement, and piles are anchored to the pile caps; the pile cap reinforcement and pile anchorage are able to develop the tensile capacity of the piles.	5.7.3.5	A.5.3.8
C NC N/A U	STIFFNESS OF WALL ANCHORS: Anchors of concrete or masonry walls to wood structural elements are installed taut and are stiff enough to limit the relative movement between the wall and the diaphragm to no greater than 1/8 in. (3.1 mm) before engagement of the anchors.	5.7.1.2	A.5.1.4
Moderate Seismicity (Complete the Following Items in Addition to the Items for Very Low and Low Seismicity)			
Foundation System			
C NC N/A U	OVERTURNING: The ratio of the least horizontal dimension of the seismic-force-resisting system at the foundation level to the building height (base/height) is greater than $0.6S_a$.	5.4.3.3	A.6.2.1
High Seismicity (Complete the Following Items in Addition to the Items for Low and Moderate Seismicity)			
Seismic-Force-Resisting System			
C NC N/A U	PROPORTIONS: The height-to-thickness ratio of the unreinforced infill walls at each story is less than 8.	5.5.3.1.2	A.3.2.6.2

Note: C = Compliant, NC = Noncompliant, N/A = Not Applicable, and U = Unknown.

(NC), Not Applicable (N/A), or Unknown (U) for a Tier 1 screening. Items that are deemed acceptable to the design professional in accordance with the evaluation statement shall be categorized as Compliant, whereas items that are determined by the design professional to require further investigation shall be categorized as Noncompliant or Unknown. For evaluation statements classified as Noncompliant or Unknown, the design professional is permitted to choose to conduct further investigation using the corresponding Tier 2 evaluation procedure listed next to each evaluation statement.

17.14 STRUCTURAL CHECKLISTS FOR BUILDING TYPES PC1: PRECAST OR TILT-UP CONCRETE SHEAR WALLS WITH FLEXIBLE DIAPHRAGMS, AND PC1A: PRECAST OR TILT-UP CONCRETE SHEAR WALLS WITH STIFF DIAPHRAGMS

For building systems and configurations that comply with the PC1 or PC1a building type description in Table 3-1, the Collapse Prevention Structural Checklist in Table 17-28 shall be completed where required by Table 4-6 for Collapse Prevention Structural Performance, and the Immediate Occupancy Structural

Table 17-28. Collapse Prevention Structural Checklist for Building Types PC1 and PC1a.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Low Seismicity			
Connections			
C NC N/A U	WALL ANCHORAGE: Exterior concrete or masonry walls that are dependent on the diaphragm for lateral support are anchored for out-of-plane forces at each diaphragm level with steel anchors, reinforcing dowels, or straps that are developed into the diaphragm. Connections have strength to resist the connection force calculated in the Quick Check procedure of Section 4.4.3.7.	5.7.1.1	A.5.1.1
Moderate Seismicity (Complete the Following Items in Addition to the Items for Low Seismicity)			
Seismic-Force-Resisting System			
C NC N/A U	REDUNDANCY: The number of lines of shear walls in each principal direction is greater than or equal to 2.	5.5.1.1	A.3.2.1.1
C NC N/A U	WALL SHEAR STRESS CHECK: The shear stress in the precast panels, calculated using the Quick Check procedure of Section 4.4.3.3 is less than the greater of 100 lb/in.^{2} (0.69 MPa) or $2\sqrt{f'_c}$.	5.5.3.1.1	A.3.2.3.1
C NC N/A U	REINFORCING STEEL: The ratio of reinforcing steel area to gross concrete area is not less than 0.0012 in the vertical direction and 0.0020 in the horizontal direction.	5.5.3.1.3	A.3.2.3.2
C NC N/A U	WALL THICKNESS: Thicknesses of bearing walls are not less than 1/40 the unsupported height or length, whichever is shorter, nor less than 4 in. (101.6 mm).	5.5.3.1.2	A.3.2.3.5
Diaphragms			
C NC N/A U	TOPPING SLAB: Precast concrete diaphragm elements are interconnected by a continuous reinforced concrete topping slab with a minimum thickness of 2 in. (50.8 mm).	5.6.4	A.4.5.1
Connections			
C NC N/A U	WOOD LEDGERS: The connection between the wall panels and the diaphragm does not induce cross-grain bending or tension in the wood ledgers or top plates fastened to the walls.	5.7.1.3	A.5.1.2
C NC N/A U	TRANSFER TO SHEAR WALLS: Diaphragms are connected for transfer of seismic forces to the shear walls.	5.7.2	A.5.2.1
C NC N/A U	TOPPING SLAB TO WALLS OR FRAMES: Reinforced concrete topping slabs that interconnect the precast concrete diaphragm elements are doweled for transfer of forces into the shear wall or frame elements.	5.7.2	A.5.2.3
C NC N/A U	GIRDER–COLUMN CONNECTION: There is a positive connection using plates, connection hardware, or straps between the girder and the column support.	5.7.4.1	A.5.4.1
High Seismicity (Complete the Following Items in Addition to the Items for Low and Moderate Seismicity)			
Seismic-Force-Resisting System			
C NC N/A U	DEFLECTION COMPATIBILITY FOR RIGID DIAPHRAGMS: Secondary components have the shear capacity to develop the flexural strength of the components.	5.5.2.5.2	A.3.1.6.2
C NC N/A U	WALL OPENINGS: The total combined width of openings and wall piers with aspect ratios greater than 2-to-1 along any perimeter wall line constitutes less than 75% of the total length of any perimeter wall.	5.5.3.3.1	A.3.2.3.3
Diaphragms			
C NC N/A U	DIAPHRAGM CONTINUITY: Floor and roof diaphragms do not have expansion joints or vertical offsets, such as split levels, sawtooth, or clerestory configurations.	5.6.1.1	A.4.1.1
C NC N/A U	ROOF CHORD CONTINUITY: All chord elements are continuous, regardless of changes in roof elevation.	5.6.1.1	A.4.1.3
C NC N/A U	CROSSTIES IN FLEXIBLE DIAPHRAGMS: There are continuous crossties between diaphragm chords to distribute the out-of-plane wall anchorage forces into the diaphragm. Where each out-of-plane connection does not have a continuous crosstie across the entire diaphragm, these connections are developed into subdiaphragms between crossties with a maximum length-to-width ratio of 3-to-1.	5.6.1.2	A.4.1.2

continues

Table 17-28 *(Continued)*. Collapse Prevention Structural Checklist for Building Types PC1 and PC1a.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
C NC N/A U	STRAIGHT SHEATHING: All straight-sheathed diaphragms have horizontal spans less than 24 ft (7.3 m) and aspect ratios less than 2-to-1 in the direction being considered.	5.6.2	A.4.2.1
C NC N/A U	DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 40 ft (12.2 m) and aspect ratios less than or equal to 4-to-1.	5.6.2	A.4.2.2
C NC N/A U	BLOCKED DIAPHRAGMS: All blocked wood structural panel diaphragms have horizontal spans less than 120 ft (36.5 m) and have aspect ratios less than or equal to 4-to-1.	5.6.2	A.4.2.3
C NC N/A U	CANTILEVERED WOOD DIAPHRAGMS: All cantilevered wood diaphragms that provide lateral support for concrete or masonry walls consist of wood structural panels and have a maximum cantilever length of 20 ft (6.1 m) if unblocked or 35 ft (10.7 m) if blocked, and a maximum ratio of cantilever length to diaphragm width of 1:2 if unblocked and 1:1 if blocked. In addition, the cantilevered diaphragm has a back-span length equal to or greater than the cantilevered portion.	5.6.2	A.4.2.4
C NC N/A U	NON-CONCRETE-FILLED DIAPHRAGMS: Bare steel deck diaphragms or steel deck diaphragms with fill other than reinforced structural concrete consist of horizontal spans of less than 120 ft (36.5 m) and have aspect ratios less than 4-to-1.	5.6.3	A.4.3.1
C NC N/A U	OTHER DIAPHRAGMS: Diaphragms do not consist of a system other than wood, steel deck, concrete, or horizontal bracing.	5.6.5	A.4.7.1
Connections			
C NC N/A U	MINIMUM NUMBER OF WALL ANCHORS PER PANEL: There are at least two anchors connecting each precast wall panel to the diaphragm elements.	5.7.1.4	A.5.1.3
C NC N/A U	PRECAST WALL PANELS: Precast wall panels are connected to the foundation.	5.7.3.4	A.5.3.6
C NC N/A U	UPLIFT AT PILE CAPS: Pile caps have top reinforcement, and piles are anchored to the pile caps.	5.7.3.5	A.5.3.8
C NC N/A U	GIRDERS: Girders supported by walls or pilasters have at least two ties securing the anchor bolts unless provided with independent stiff wall anchors with strength to resist the connection force calculated in the Quick Check procedure of Section 4.4.3.7.	5.7.4.2	A.5.4.2

Note: C = Compliant, NC = Noncompliant, N/A = Not Applicable, and U = Unknown.

Table 17-29. Immediate Occupancy Structural Checklist for Building Types PC1 and PC1a.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Very Low Seismicity			
Seismic-Force-Resisting System			
C NC N/A U	REDUNDANCY: The number of lines of shear walls in each principal direction is greater than or equal to 2.	5.5.1.1	A.3.2.1.1
C NC N/A U	WALL SHEAR STRESS CHECK: The shear stress in the precast panels, calculated using the Quick Check procedure of Section 4.4.3.3 is less than the greater of 100 lb/in.^{2} (0.69 MPa) or $2\sqrt{f'_c}$.	5.5.3.1.1	A.3.2.3.1
C NC N/A U	REINFORCING STEEL: The ratio of reinforcing steel area to gross concrete area is not less than 0.0012 in the vertical direction and 0.0020 in the horizontal direction. The spacing of reinforcing steel is equal to or less than 18 in. (457 mm).	5.5.3.1.3	A.3.2.3.2

continues

Table 17-29 *(Continued)*. Immediate Occupancy Structural Checklist for Building Types PC1 and PC1a.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Diaphragms (Stiff or Flexible)			
C NC N/A U	TOPPING SLAB: Precast concrete diaphragm elements are interconnected by a continuous reinforced concrete topping slab with a minimum thickness of 2 in. (50.8 mm).	5.6.4	A.4.5.1
Connections			
C NC N/A U	WALL ANCHORAGE: Exterior concrete or masonry walls that are dependent on the diaphragm for lateral support are anchored for out-of-plane forces at each diaphragm level with steel anchors, reinforcing dowels, or straps that are developed into the diaphragm. Connections have strength to resist the connection force calculated in the Quick Check procedure of Section 4.4.3.7.	5.7.1.1	A.5.1.1
C NC N/A U	WOOD LEDGERS: The connection between the wall panels and the diaphragm does not induce cross-grain bending or tension in the wood ledgers or top plates fastened to the walls.	5.7.1.4	A.5.1.2
C NC N/A U	TRANSFER TO SHEAR WALLS: Diaphragms are connected for transfer of seismic forces to the shear walls, and the connections are able to develop the lesser of the shear strength of the walls or diaphragms.	5.7.2	A.5.2.1
C NC N/A U	TOPPING SLAB TO WALLS OR FRAMES: Reinforced concrete topping slabs that interconnect the precast concrete diaphragm elements are doweled for transfer of forces into the shear wall or frame elements, and the dowels are able to develop the least of the shear strength of the walls, frames, or slabs.	5.7.2	A.5.2.3
C NC N/A U	GIRDER–COLUMN CONNECTION: There is a positive connection using plates, connection hardware, or straps between the girder and the column support.	5.7.4.1	A.5.4.1
Low Seismicity (Complete the Following Items in Addition to the Items for Very Low Seismicity)			
Seismic-Force-Resisting System			
C NC N/A U	DEFLECTION COMPATIBILITY FOR RIGID DIAPHRAGMS: Secondary components have the shear capacity to develop the flexural strength of the components.	5.5.2.5.2	A.3.1.6.2
C NC N/A U	WALL OPENINGS: The total combined width of openings and wall piers with aspect ratios greater than 2-to-1 along any perimeter wall line constitutes less than 50% of the total length of any perimeter wall.	5.5.3.3.1	A.3.2.3.3
C NC N/A U	PANEL-TO-PANEL CONNECTIONS: Adjacent wall panels are interconnected to transfer overturning forces between panels by methods other than welded steel inserts.	5.5.3.3.3	A.3.2.3.4
C NC N/A U	WALL THICKNESS: Thicknesses of bearing walls are not less than 1/25 the unsupported height or length, whichever is shorter, nor less than 4 in. (101.6 mm).	5.5.3.1.2	A.3.2.3.5
Diaphragms			
C NC N/A U	DIAPHRAGM CONTINUITY: Floor and roof diaphragms do not have expansion joints or vertical offsets, such as split levels, sawtooth, or clerestory configurations.	5.6.1.1	A.4.1.1
C NC N/A U	ROOF CHORD CONTINUITY: All chord elements are continuous, regardless of changes in roof elevation.	5.6.1.1	A.4.1.3
C NC N/A U	CROSSTIES FOR FLEXIBLE DIAPHRAGMS: There are continuous crossties between diaphragm chords to distribute the out-of-plane wall anchorage forces into the diaphragm. Where each out-of-plane connection does not have a continuous crosstie across the entire diaphragm, these connections are developed into subdiaphragms between crossties with a maximum length-to-width ratio of 3-to-1.	5.6.1.2	A.4.1.2
C NC N/A U	PLAN IRREGULARITIES: There is tensile capacity to develop the strength of the diaphragm at reentrant corners or other locations of plan irregularities.	5.6.1.4	A.4.1.7
C NC N/A U	DIAPHRAGM REINFORCEMENT AT OPENINGS: There is reinforcing around all diaphragm openings larger than 50% of the building width in either major plan dimension.	5.6.1.5	A.4.1.8

continues

Table 17-29 *(Continued)*. Immediate Occupancy Structural Checklist for Building Types PC1 and PC1a.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
C NC N/A U	STRAIGHT SHEATHING: All straight-sheathed diaphragms have horizontal spans less than 12 ft (3.6 m) and aspect ratios less than 1-to-1 in the direction being considered.	5.6.2	A.4.2.1
C NC N/A U	DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 30 ft (9.1 m) and aspect ratios less than or equal to 3-to-1.	5.6.2	A.4.2.2
C NC N/A U	BLOCKED DIAPHRAGMS: All blocked wood structural panel diaphragms have horizontal spans less than 90 ft (27.4 m) and have aspect ratios less than or equal to 4-to-1.	5.6.2	A.4.2.3
C NC N/A U	CANTILEVERED WOOD DIAPHRAGMS: All cantilevered wood diaphragms that provide lateral support for concrete or masonry walls consist of wood structural panels and have a maximum cantilever length of 15 ft (4.6 m) if unblocked or 25 ft (7.6 m) if blocked, and a maximum ratio of cantilever length to diaphragm width of 1:2.5 if unblocked and 1:1.5 if blocked. In addition, the cantilevered diaphragm has a back-span length equal to or greater than the cantilevered portion.	5.6.2	A.4.2.4
C NC N/A U	OTHER DIAPHRAGMS: Diaphragms do not consist of a system other than wood, steel deck, concrete, or horizontal bracing.	5.6.5	A.4.7.1
Connections			
C NC N/A U	MINIMUM NUMBER OF WALL ANCHORS PER PANEL: There are at least two anchors connecting each precast wall panel into the diaphragm elements.	5.7.1.4	A.5.1.3
C NC N/A U	PRECAST WALL PANELS: Precast wall panels are connected to the foundation, and the connections are able to develop the strength of the walls.	5.7.3.4	A.5.3.6
C NC N/A U	UPLIFT AT PILE CAPS: Pile caps have top reinforcement, and piles are anchored to the pile caps; the pile cap reinforcement and pile anchorage are able to develop the tensile capacity of the piles.	5.7.3.5	A.5.3.8
C NC N/A U	GIRDERS: Girders supported by walls or pilasters have at least two ties securing the anchor bolts unless provided with independent stiff wall anchors with strength to resist the connection force calculated in the Quick Check procedure of Section 4.4.3.7.	5.7.4.2	A.5.4.2
Moderate and High Seismicity (Complete the Following Items in Addition to the Items for Very Low and Low Seismicity)			
Foundation System			
C NC N/A U	OVERTURNING: The ratio of the least horizontal dimension of the seismic-force-resisting system at the foundation level to the building height (base/height) is greater than $0.6S_a$.	5.4.3.3	A.6.2.1

Note: C = Compliant, NC = Noncompliant, N/A = Not Applicable, and U = Unknown.

Checklist in Table 17-29 shall be completed where required by Table 4-6 for Immediate Occupancy Structural Performance. Tier 1 screening shall include on-site investigation and condition assessment as required by Section 4.2.1.

Where applicable, each of the evaluation statements listed in this checklist shall be marked Compliant (C), Noncompliant (NC), Not Applicable (N/A), or Unknown (U) for a Tier 1 screening. Items that are deemed acceptable to the design professional in accordance with the evaluation statement shall be categorized as Compliant, whereas items that are determined by the design professional to require further investigation shall be categorized as Noncompliant or Unknown. For evaluation statements classified as Noncompliant or Unknown, the design professional is permitted to choose to conduct further investigation using the corresponding Tier 2 evaluation procedure listed next to each evaluation statement.

17.15 STRUCTURAL CHECKLISTS FOR BUILDING TYPE PC2: PRECAST CONCRETE FRAMES WITH SHEAR WALLS

For building systems and configurations that comply with the PC2 building type description in Table 3-1, the Collapse Prevention Structural Checklist in Table 17-30 shall be completed where required by Table 4-6 for Collapse Prevention Structural Performance, and the Immediate Occupancy Structural Checklist in Table 17-31 shall be completed where required by Table 4-6 for Immediate Occupancy Structural Performance. Tier 1

Table 17-30. Collapse Prevention Structural Checklist for Building Type PC2.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Low and Moderate Seismicity			
Seismic-Force-Resisting System			
C NC N/A U	CONCRETE BEARING WALLS: Floor and roof girders and trusses are not supported at the ends of concrete walls that are less than 10 in. (254 mm) thick. This statement only applies to framing supports located less than two times the wall thickness away from the wall end.	5.5.2.5.1	A.3.1.6.1
C NC N/A U	REDUNDANCY: The number of lines of shear walls in each principal direction is greater than or equal to 2.	5.5.1.1	A.3.2.1.1
C NC N/A U	SHEAR STRESS CHECK: The shear stress in the concrete shear walls, calculated using the Quick Check procedure of Section 4.4.3.3 is less than the greater of 100 lb/in.^{2} (0.69 MPa) or $2\sqrt{f_c'}$.	5.5.3.1.1	A.3.2.2.1
C NC N/A U	REINFORCING STEEL: The ratio of reinforcing steel area to gross concrete area is not less than 0.0012 in the vertical direction and 0.0020 in the horizontal direction.	5.5.3.1.3	A.3.2.2.2
Diaphragms			
C NC N/A U	TOPPING SLAB: Precast concrete diaphragm elements are interconnected by a continuous reinforced concrete topping slab with a minimum thickness of 2 in. (50.8 mm).	5.6.4	A.4.5.1
Connections			
C NC N/A U	TRANSFER TO SHEAR WALLS: Diaphragms are connected for transfer of seismic forces to the shear walls.	5.7.2	A.5.2.1
C NC N/A U	TOPPING SLAB TO WALLS OR FRAMES: Reinforced concrete topping slabs that interconnect the precast concrete diaphragm elements are doweled for transfer of forces into the shear wall or frame elements.	5.7.2	A.5.2.3
C NC N/A U	FOUNDATION DOWELS: Wall reinforcement is doweled into the foundation.	5.7.3.4	A.5.3.5
C NC N/A U	GIRDER–COLUMN CONNECTION: There is a positive connection using plates, connection hardware, or straps between the girder and the column support.	5.7.4.1	A.5.4.1
High Seismicity (Complete the Following Items in Addition to the Items for Low and Moderate Seismicity)			
Seismic-Force-Resisting System			
C NC N/A U	PRECAST FRAMES: For buildings with concrete shear walls, precast concrete frame elements are not considered as primary components for resisting seismic forces.	5.5.2.4 5.5.2.5.1 5.5.2.5.2	A.3.1.5.2
C NC N/A U	PRECAST CONNECTIONS: For buildings with concrete shear walls, the connection between precast frame elements, such as chords, ties, and collectors in the seismic-force-resisting system, develops the capacity of the connected members.	5.6.1.1	A.3.1.5.3
C NC N/A U	DEFLECTION COMPATIBILITY: Secondary components have the shear capacity to develop the flexural strength of the components.	5.5.2.5.2	A.3.1.6.2
C NC N/A U	COUPLING BEAMS: Coupling beams have stirrups spaced at or less than d/2, and each wall or wall segment connected to the coupling beam is supported such that it can resist shear and overturning forces in the absence of the coupling beam. This statement only applies to coupling beams with span-to-depth ratios exceeding 2-to-1.	5.5.3.2.1	A.3.2.2.3
Diaphragms			
C NC N/A U	OPENINGS AT SHEAR WALLS: Diaphragm openings immediately adjacent to the shear walls are less than 25% of the wall length.	5.5.3.3.1	A.4.1.4
Connections			
C NC N/A U	UPLIFT AT PILE CAPS: Pile caps have top reinforcement, and piles are anchored to the pile caps.	5.7.3.5	A.5.3.8
C NC N/A U	CORBEL BEARING: If the frame girders bear on column corbels, the length of bearing is greater than 3 in. (76 mm).	5.7.4.3	A.5.4.3
C NC N/A U	CORBEL CONNECTIONS: The frame girders are not connected to corbels with welded elements.	5.7.4.3	A.5.4.4

Note: C = Compliant, NC = Noncompliant, N/A = Not Applicable, and U = Unknown.

Table 17-31. Immediate Occupancy Structural Checklist for Building Type PC2.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Very Low Seismicity			
Seismic-Force-Resisting System			
C NC N/A U	CONCRETE BEARING WALLS: Floor and roof girders and trusses are not supported at the ends of concrete walls that are less than 10 in. (254 mm) thick. This statement only applies to framing supports located less than two times the wall thickness away from the wall end.	5.5.2.5.1	A.3.1.6.1
C NC N/A U	REDUNDANCY: The number of lines of shear walls in each principal direction is greater than or equal to 2.	5.5.1.1	A.3.2.1.1
C NC N/A U	SHEAR STRESS CHECK: The shear stress in the concrete shear walls, calculated using the Quick Check procedure of Section 4.4.3.3 is less than the greater of 100 lb/in.^{2} (0.69 MPa) or $2\sqrt{f'_c}$.	5.5.3.1.1	A.3.2.2.1
C NC N/A U	REINFORCING STEEL: The ratio of reinforcing steel area to gross concrete area is not less than 0.0012 in the vertical direction and 0.0020 in the horizontal direction. The spacing of reinforcing steel is equal to or less than 18 in. (457 mm).	5.5.3.1.3	A.3.2.2.2
Diaphragms			
C NC N/A U	TOPPING SLAB: Precast concrete diaphragm elements are interconnected by a continuous reinforced concrete topping slab with a minimum thickness of 2 in. (50.8 mm).	5.6.4	A.4.5.1
Connections			
C NC N/A U	TRANSFER TO SHEAR WALLS: Diaphragms are connected for transfer of seismic forces to the shear walls, and the connections are able to develop the lesser of the shear strength of the walls or diaphragms.	5.7.2	A.5.2.1
C NC N/A U	TOPPING SLAB TO WALLS OR FRAMES: Reinforced concrete topping slabs that interconnect the precast concrete diaphragm elements are doweled for transfer of forces into the shear wall or frame elements, and the dowels are able to develop the least of the shear strength of the walls, frames, or slabs.	5.7.2	A.5.2.3
C NC N/A U	FOUNDATION DOWELS: Wall reinforcement is doweled into the foundation, and the dowels are able to develop the lesser of the strength of the walls or the uplift capacity of the foundation.	5.7.3.4	A.5.3.5
C NC N/A U	GIRDER–COLUMN CONNECTION: There is a positive connection using plates, connection hardware, or straps between the girder and the column support.	5.7.4.1	A.5.4.1
Low Seismicity (Complete the Following Items in Addition to the Items for Very Low Seismicity)			
Seismic-Force-Resisting System			
C NC N/A U	PRECAST FRAMES: For buildings with concrete shear walls, precast concrete frame elements are not considered as primary components for resisting seismic forces.	5.5.2.4 5.5.2.5.1 5.5.2.5.2	A.3.1.5.2
C NC N/A U	PRECAST CONNECTIONS: For buildings with concrete shear walls, the connection between precast frame elements, such as chords, ties, and collectors in the seismic-force-resisting system, develops the capacity of the connected members.	5.6.1.1	A.3.1.5.3
C NC N/A U	DEFLECTION COMPATIBILITY: Secondary components have the shear capacity to develop the flexural strength of the components.	5.5.2.5.2	A.3.1.6.2
C NC N/A U	COUPLING BEAMS: Coupling beams have the capacity in shear to develop the uplift capacity of the adjacent wall or to develop the flexural capacity of the coupling beam, whichever is less. This statement only applies to coupling beams with span-to-depth ratios exceeding 2-to-1.	5.5.3.2.1	A.3.2.2.3
C NC N/A U	OVERTURNING: All shear walls have aspect ratios less than 4-to-1. Wall piers need not be considered.	5.5.3.1.4	A.3.2.2.4
C NC N/A U	CONFINEMENT REINFORCING: For shear walls with aspect ratios greater than 2-to-1, the boundary elements are confined with spirals or ties with spacing less than $8d_b$.	5.5.3.2.2	A.3.2.2.5

continues

Table 17-31 *(Continued)*. Immediate Occupancy Structural Checklist for Building Type PC2.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
C NC N/A U	WALL REINFORCING AT OPENINGS: There is added trim reinforcement around all wall openings with a dimension greater than three times the thickness of the wall.	5.5.3.1.5	A.3.2.2.6
C NC N/A U	WALL THICKNESS: Thickness of bearing walls is not less than 1/25 the unsupported height or length, whichever is shorter, nor less than 4 in. (101.6 mm).	5.5.3.1.2	A.3.2.3.5
Diaphragms			
C NC N/A U	OPENINGS AT SHEAR WALLS: Diaphragm openings immediately adjacent to the shear walls are less than 15% of the wall length.	5.6.1.3	A.4.1.4
C NC N/A U	PLAN IRREGULARITIES: There is tensile capacity to develop the strength of the diaphragm at reentrant corners or other locations of plan irregularities.	5.6.1.4	A.4.1.7
C NC N/A U	DIAPHRAGM REINFORCEMENT AT OPENINGS: There is reinforcing around all diaphragm openings larger than 50% of the building width in either major plan dimension.	5.6.1.5	A.4.1.8
Connections			
C NC N/A U	UPLIFT AT PILE CAPS: Pile caps have top reinforcement, and piles are anchored to the pile caps; the pile cap reinforcement and pile anchorage are able to develop the tensile capacity of the piles.	5.7.3.5	A.5.3.8
C NC N/A U	CORBEL BEARING: If the frame girders bear on column corbels, the length of bearing is greater than 3 in. (76 mm).	5.7.4.3	A.5.4.3
C NC N/A U	CORBEL CONNECTIONS: The frame girders are not connected to corbels with welded elements.	5.7.4.3	A.5.4.4
Moderate and High Seismicity (Complete the Following Items in Addition to the Items for Very Low and Low Seismicity)			
Foundation System			
C NC N/A U	OVERTURNING: The ratio of the least horizontal dimension of the seismic-force-resisting system at the foundation level to the building height (base/height) is greater than $0.6S_a$.	5.4.3.3	A.6.2.1

Note: C = Compliant, NC = Noncompliant, N/A = Not Applicable, and U = Unknown.

screening shall include on-site investigation and condition assessment as required by Section 4.2.1.

Where applicable, each of the evaluation statements listed in this checklist shall be marked Compliant (C), Noncompliant (NC), Not Applicable (N/A), or Unknown (U) for a Tier 1 screening. Items that are deemed acceptable to the design professional in accordance with the evaluation statement shall be categorized as Compliant, whereas items that are determined by the design professional to require further investigation shall be categorized as Noncompliant or Unknown. For evaluation statements classified as Noncompliant or Unknown, the design professional is permitted to choose to conduct further investigation using the corresponding Tier 2 evaluation procedure listed next to each evaluation statement.

17.16 STRUCTURAL CHECKLISTS FOR BUILDING TYPE PC2A: PRECAST CONCRETE FRAMES WITHOUT SHEAR WALLS

For building systems and configurations that comply with the PC2a building type description in Table 3-1, the Collapse Prevention Structural Checklist in Table 17-32 shall be completed where required by Table 4-6 for Collapse Prevention Structural Performance, and the Immediate Occupancy Structural Checklist in Table 17-33 shall be completed where required by Table 4-6 for Immediate Occupancy Structural Performance. Tier 1 screening shall include on-site investigation and condition assessment as required by Section 4.2.1.

Where applicable, each of the evaluation statements listed in this checklist shall be marked Compliant (C), Noncompliant (NC), Not Applicable (N/A), or Unknown (U) for a Tier 1 screening. Items that are deemed acceptable to the design professional in accordance with the evaluation statement shall be categorized as Compliant, whereas items that are determined by the design professional to require further investigation shall be categorized as Noncompliant or Unknown. For evaluation statements classified as Noncompliant or Unknown, the design professional is permitted to choose to conduct further investigation using the corresponding Tier 2 evaluation procedure listed next to each evaluation statement.

17.17 STRUCTURAL CHECKLISTS FOR BUILDING TYPES RM1: REINFORCED MASONRY BEARING WALLS WITH FLEXIBLE DIAPHRAGMS, AND RM2: REINFORCED MASONRY BEARING WALLS WITH STIFF DIAPHRAGMS

For building systems and configurations that comply with the RM1 or RM2 building type description in Table 3-1, the Collapse Prevention Structural Checklist in Table 17-34 shall be completed where required by Table 4-6 for Collapse Prevention Structural Performance, and the Immediate Occupancy Structural Checklist in Table 17-35 shall be completed where required by Table 4-6 for Immediate Occupancy Structural Performance. Tier 1 screening shall include on-site investigation and condition assessment as required by Section 4.2.1.

Table 17-32. Collapse Prevention Structural Checklist for Building Type PC2a.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Low and Moderate Seismicity			
Seismic-Force-Resisting System			
C NC N/A U	REDUNDANCY: The number of lines of moment frames in each principal direction is greater than or equal to 2. The number of bays of moment frames in each line is greater than or equal to 2.	5.5.1.1	A.3.1.1.1
C NC N/A U	COLUMN SHEAR STRESS CHECK: The shear stress in the concrete columns, calculated using the Quick Check procedure of Section 4.4.3.2 is less than the greater of 100 lb/in.^{2} (0.69 MPa) or $2\sqrt{f'_c}$.	5.5.2.1.4	A.3.1.4.1
C NC N/A U	COLUMN AXIAL STRESS CHECK: The axial stress caused by gravity loads in columns subjected to overturning forces is less than $0.10f'_c$. Alternatively, the axial stress caused by overturning forces alone, calculated using the Quick Check procedure of Section 4.4.3.6 is less than $0.30f'_c$.	5.5.2.1.3	A.3.1.4.2
C NC N/A U	PRECAST CONNECTION CHECK: The precast connections at frame joints have the capacity to resist the shear and moment demands calculated using the Quick Check procedure of Section 4.4.3.5.	5.5.2.4	A.3.1.5.1
Diaphragms			
C NC N/A U	TOPPING SLAB: Precast concrete diaphragm elements are interconnected by a continuous reinforced concrete topping slab with a minimum thickness of 2 in. (50.8 mm).	5.6.4	A.4.5.1
Connections			
C NC N/A U	TOPPING SLAB TO WALLS OR FRAMES: Reinforced concrete topping slabs that interconnect the precast concrete diaphragm elements are doweled for transfer of forces into the shear wall or frame elements, and the dowels are able to develop the least of the shear strength of the walls, frames, or slabs.	5.7.2	A.5.2.3
C NC N/A U	GIRDER–COLUMN CONNECTION: There is a positive connection using plates, connection hardware, or straps between the girder and the column support.	5.7.4.1	A.5.4.1
High Seismicity (Complete the Following Items in Addition to the Items for Low and Moderate Seismicity)			
Seismic-Force-Resisting System			
C NC N/A U	PRESTRESSED FRAME ELEMENTS: The seismic-force-resisting frames do not include any prestressed or posttensioned elements where the average prestress exceeds the lesser of 700 lb/in.^{2} (4.83 MPa) or $f'_c/6$ at potential hinge locations. The average prestress is calculated in accordance with the Quick Check procedure of Section 4.4.3.8.	5.5.2.3.2	A.3.1.4.4
C NC N/A U	CAPTIVE COLUMNS: There are no columns at a level with height-to-depth ratios less than 50% of the nominal height-to-depth ratio of the typical columns at that level.	5.5.2.3.3	A.3.1.4.5
C NC N/A U	JOINT REINFORCING: Beam–column joints have ties spaced at or less than $8d_b$.	5.5.2.3.8	A.3.1.4.13
C NC N/A U	DEFLECTION COMPATIBILITY: Secondary components have the shear capacity to develop the flexural strength of the components.	5.5.2.5.2	A.3.1.6.2
Connections			
C NC N/A U	UPLIFT AT PILE CAPS: Pile caps have top reinforcement, and piles are anchored to the pile caps.	5.7.3.5	A.5.3.8
C NC N/A U	GIRDERS: Girders supported by walls or pilasters have at least two ties securing the anchor bolts unless provided with independent stiff wall anchors with strength to resist the connection force calculated in the Quick Check procedure of Section 4.4.3.7.	5.7.4.2	A.5.4.2
C NC N/A U	CORBEL BEARING: If the frame girders bear on column corbels, the length of bearing is greater than 3 in. (76 mm).	5.7.4.3	A.5.4.3
C NC N/A U	CORBEL CONNECTIONS: The frame girders are not connected to corbels with welded elements.	5.7.4.3	A.5.4.4

Note: C = Compliant, NC = Noncompliant, N/A = Not Applicable, and U = Unknown.

Table 17-33. Immediate Occupancy Structural Checklist for Building Type PC2a.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Very Low Seismicity			
Seismic-Force-Resisting System			
C NC N/A U	REDUNDANCY: The number of lines of moment frames in each principal direction is greater than or equal to two. The number of bays of moment frames in each line is greater than or equal to 3.	5.5.1.1	A.3.1.1.1
C NC N/A U	COLUMN SHEAR STRESS CHECK: The shear stress in the concrete columns, calculated using the Quick Check procedure of Section 4.4.3.2 is less than the greater of 100 lb/in.^{2} (0.69 MPa) or $2\sqrt{f'_c}$.	5.5.2.1.4	A.3.1.4.1
C NC N/A U	COLUMN AXIAL STRESS CHECK: The axial stress caused by gravity loads in columns subjected to overturning forces is less than $0.10f'_c$. Alternatively, the axial stresses caused by overturning forces alone, calculated using the Quick Check procedure of Section 4.4.3.6 is less than $0.30f'_c$.	5.5.2.1.3	A.3.1.4.2
C NC N/A U	PRECAST CONNECTION CHECK: The precast connections at frame joints have the capacity to resist the shear and moment demands calculated using the Quick Check procedure of Section 4.4.3.5.	5.5.2.4	A.3.1.5.1
Diaphragms			
C NC N/A U	TOPPING SLAB: Precast concrete diaphragm elements are interconnected by a continuous reinforced concrete topping slab with a minimum thickness of 2 in. (50.8 mm).	5.6.4	A.4.5.1
Connections			
C NC N/A U	TOPPING SLAB TO WALLS OR FRAMES: Reinforced concrete topping slabs that interconnect the precast concrete diaphragm elements are doweled for transfer of forces into the shear wall or frame elements, and the dowels are able to develop the least of the shear strength of the walls, frames, or slabs.	5.7.2	A.5.2.3
C NC N/A U	GIRDER–COLUMN CONNECTION: There is a positive connection using plates, connection hardware, or straps between the girder and the column support.	5.7.4.1	A.5.4.1
Low Seismicity (Complete the Following Items in Addition to the Items for Very Low Seismicity)			
Seismic-Force-Resisting System			
C NC N/A U	PRESTRESSED FRAME ELEMENTS: The seismic-force-resisting frames do not include any prestressed or posttensioned elements where the average prestress exceeds the lesser of 700 lb/in.^{2} (4.83 MPa) or $f'_c/6$ at potential hinge locations. The average prestress is calculated in accordance with the Quick Check procedure of Section 4.4.3.8.	5.5.2.3.2	A.3.1.4.4
C NC N/A U	CAPTIVE COLUMNS: There are no columns at a level with height-to-depth ratios less than 75% of the nominal height-to-depth ratio of the typical columns at that level.	5.5.2.3.3	A.3.1.4.5
C NC N/A U	JOINT REINFORCING: Beam–column joints have ties spaced at or less than $8d_b$.	5.5.2.3.8	A.3.1.4.13
C NC N/A U	DEFLECTION COMPATIBILITY: Secondary components have the shear capacity to develop the flexural strength of the components.	5.5.2.5.2	A.3.1.6.2
Diaphragms			
C NC N/A U	PLAN IRREGULARITIES: There is tensile capacity to develop the strength of the diaphragm at reentrant corners or other locations of plan irregularities.	5.6.1.4	A.4.1.7
C NC N/A U	DIAPHRAGM REINFORCEMENT AT OPENINGS: There is reinforcing around all diaphragm openings larger than 50% of the building width in either major plan dimension.	5.6.1.5	A.4.1.8
Connections			
C NC N/A U	UPLIFT AT PILE CAPS: Pile caps have top reinforcement, and piles are anchored to the pile caps; the pile cap reinforcement and pile anchorage are able to develop the tensile capacity of the piles.	5.7.3.5	A.5.3.8
C NC N/A U	GIRDERS: Girders supported by frames have at least two ties securing the anchor bolts unless provided with independent stiff wall anchors with strength to resist the connection force calculated in the Quick Check procedure of Section 4.4.3.7.	5.7.4.2	A.5.4.2

continues

Table 17-33 *(Continued)*. Immediate Occupancy Structural Checklist for Building Type PC2a.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
C NC N/A U	CORBEL BEARING: If the frame girders bear on column corbels, the length of bearing is greater than 3 in. (76 mm).	5.7.4.3	A.5.4.3
C NC N/A U	CORBEL CONNECTIONS: The frame girders are not connected to corbels with welded elements.	5.7.4.3	A.5.4.4
C NC N/A U	TRANSFER TO FRAMES: Diaphragms are connected for transfer of loads to the frames.	5.7.2	A.5.2.1
Moderate and High Seismicity (Complete the Following Items in Addition to the Items for Very Low and Low Seismicity)			
Foundation System			
C NC N/A U	OVERTURNING: The ratio of the least horizontal dimension of the seismic-force-resisting system at the foundation level to the building height (base/height) is greater than $0.6S_a$.	5.4.3.3	A.6.2.1

Note: C = Compliant, NC = Noncompliant, N/A = Not Applicable, and U = Unknown.

Table 17-34. Collapse Prevention Structural Checklist for Building Types RM1 and RM2.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Low and Moderate Seismicity			
Seismic-Force-Resisting System			
C NC N/A U	REDUNDANCY: The number of lines of shear walls in each principal direction is greater than or equal to 2.	5.5.1.1	A.3.2.1.1
C NC N/A U	SHEAR STRESS CHECK: The shear stress in the reinforced masonry shear walls, calculated using the Quick Check procedure of Section 4.4.3.3 is less than 70 lb/in.^{2} (0.48 MPa).	5.5.3.1.1	A.3.2.4.1
C NC N/A U	REINFORCING STEEL: The total vertical and horizontal reinforcing steel ratio in reinforced masonry walls is greater than 0.002 of the wall with the minimum of 0.0007 in either of the two directions; the spacing of reinforcing steel is less than 48 in. (1.2 m), and all vertical bars extend to the top of the walls.	5.5.3.1.3	A.3.2.4.2
Stiff Diaphragms			
C NC N/A U	TOPPING SLAB: Precast concrete diaphragm elements are interconnected by a continuous reinforced concrete topping slab.	5.6.4	A.4.5.1
Connections			
C NC N/A U	WALL ANCHORAGE: Exterior concrete or masonry walls that are dependent on the diaphragm for lateral support are anchored for out-of-plane forces at each diaphragm level with steel anchors, reinforcing dowels, or straps that are developed into the diaphragm. Connections have strength to resist the connection force calculated in the Quick Check procedure of Section 4.4.3.7.	5.7.1.1	A.5.1.1
C NC N/A U	WOOD LEDGERS: The connection between the wall panels and the diaphragm does not induce cross-grain bending or tension in the wood ledgers or top plates fastened to the walls.	5.7.1.3	A.5.1.2
C NC N/A U	TRANSFER TO SHEAR WALLS: Diaphragms are connected for transfer of seismic forces to the shear walls.	5.7.2	A.5.2.1
C NC N/A U	TOPPING SLAB TO WALLS OR FRAMES: Reinforced concrete topping slabs that interconnect the precast concrete diaphragm elements are doweled for transfer of forces into the shear wall or frame elements.	5.7.2	A.5.2.3
C NC N/A U	FOUNDATION DOWELS: Wall reinforcement is doweled into the foundation.	5.7.3.4	A.5.3.5
C NC N/A U	GIRDER–COLUMN CONNECTION: There is a positive connection using plates, connection hardware, or straps between the girder and the column support.	5.7.4.1	A.5.4.1

continues

Table 17-34 *(Continued)*. Collapse Prevention Structural Checklist for Building Types RM1 and RM2.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
High Seismicity (Complete the Following Items in Addition to the Items for Low and Moderate Seismicity)			
Stiff Diaphragms			
C NC N/A U	OPENINGS AT SHEAR WALLS: Diaphragm openings immediately adjacent to the shear walls are less than 25% of the wall length.	5.6.1.3	A.4.1.4
C NC N/A U	OPENINGS AT EXTERIOR MASONRY SHEAR WALLS: Diaphragm openings immediately adjacent to exterior masonry shear walls are not greater than 8 ft (2.4 m) long.	5.6.1.3	A.4.1.6
Flexible Diaphragms			
C NC N/A U	DIAPHRAGM CONTINUITY: Floor and roof diaphragms do not have expansion joints or vertical offsets, such as split levels, sawtooth, or clerestory configurations.	5.6.1.1	A.4.1.1
C NC N/A U	ROOF CHORD CONTINUITY: All chord elements are continuous, regardless of changes in roof elevation.	5.6.1.1	A.4.1.3
C NC N/A U	CROSSTIES: There are continuous crossties between diaphragm chords to distribute the out-of-plane wall anchorage forces into the diaphragm. Where each out-of-plane connection does not have a continuous crosstie across the entire diaphragm, these connections are developed into subdiaphragms between crossties with a maximum length-to-width ratio of 3-to-1.	5.6.1.2	A.4.1.2
C NC N/A U	OPENINGS AT SHEAR WALLS: Diaphragm openings immediately adjacent to the shear walls are less than 25% of the wall length.	5.6.1.3	A.4.1.4
C NC N/A U	OPENINGS AT EXTERIOR MASONRY SHEAR WALLS: Diaphragm openings immediately adjacent to exterior masonry shear walls are not greater than 8 ft (2.4 m) long.	5.6.1.3	A.4.1.6
C NC N/A U	STRAIGHT SHEATHING: All straight-sheathed diaphragms have horizontal spans less than 24 ft (7.3 m) and aspect ratios less than 2-to-1 in the direction being considered.	5.6.2	A.4.2.1
C NC N/A U	DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 40 ft (12.2 m) and aspect ratios less than or equal to 4-to-1.	5.6.2	A.4.2.2
C NC N/A U	BLOCKED DIAPHRAGMS: All blocked wood structural panel diaphragms have horizontal spans less than 120 ft (36.5 m) and have aspect ratios less than or equal to 4-to-1.	5.6.2	A.4.2.3
C NC N/A U	CANTILEVERED WOOD DIAPHRAGMS: All cantilevered wood diaphragms that provide lateral support for concrete or masonry walls consist of wood structural panels and have a maximum cantilever length of 20 ft (6.1 m) if unblocked or 35 ft (10.7 m) if blocked, and a maximum ratio of cantilever length to diaphragm width of 1:2 if unblocked and 1:1 if blocked. In addition, the cantilevered diaphragm has a back-span length equal to or greater than the cantilevered portion.	5.6.2	A.4.2.4
C NC N/A U	NON-CONCRETE-FILLED DIAPHRAGMS: Bare steel deck diaphragms or steel deck diaphragms with fill other than reinforced structural concrete consist of horizontal spans of less than 120 ft (36.5 m) and have aspect ratios less than 4-to-1.	5.6.3	A.4.3.1
C NC N/A U	OTHER DIAPHRAGMS: Diaphragms do not consist of a system other than wood, steel deck, concrete, or horizontal bracing.	5.6.5	A.4.7.1
Connections			
C NC N/A U	STIFFNESS OF WALL ANCHORS: Anchors of concrete or masonry walls to wood structural elements are installed taut and are stiff enough to limit the relative movement between the wall and the diaphragm to no greater than 1/8 in. (3.1 mm) before engagement of the anchors.	5.7.1.2	A.5.1.4

Note: C = Compliant, NC = Noncompliant, N/A = Not Applicable, and U = Unknown.

Table 17-35. Immediate Occupancy Structural Checklist for Building Types RM1 and RM2.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Very Low Seismicity			
Seismic-Force-Resisting System			
C NC N/A U	REDUNDANCY: The number of lines of shear walls in each principal direction is greater than or equal to 2.	5.5.1.1	A.3.2.1.1
C NC N/A U	SHEAR STRESS CHECK: The shear stress in the reinforced masonry shear walls, calculated using the Quick Check procedure of Section 4.4.3.3 is less than 70 lb/in.^{2} (0.48 MPa).	5.5.3.1.1	A.3.2.4.1
C NC N/A U	REINFORCING STEEL: The total vertical and horizontal reinforcing steel ratio in reinforced masonry walls is greater than 0.002 of the wall with the minimum of 0.0007 in either of the two directions; the spacing of reinforcing steel is less than 48 in. (1.2 m), and all vertical bars extend to the top of the walls.	5.5.3.1.3	A.3.2.4.2
Connections			
C NC N/A U	WALL ANCHORAGE: Exterior concrete or masonry walls that are dependent on the diaphragm for lateral support are anchored for out-of-plane forces at each diaphragm level with steel anchors, reinforcing dowels, or straps that are developed into the diaphragm. Connections have strength to resist the connection force calculated in the Quick Check procedure of Section 4.4.3.7.	5.7.1.1	A.5.1.1
C NC N/A U	WOOD LEDGERS: The connection between the wall panels and the diaphragm does not induce cross-grain bending or tension in the wood ledgers or top plates fastened to the walls.	5.7.1.3	A.5.1.2
C NC N/A U	TRANSFER TO SHEAR WALLS: Diaphragms are connected for transfer of seismic forces to the shear walls, and the connections are able to develop the lesser of the shear strength of the walls or diaphragms.	5.7.2	A.5.2.1
C NC N/A U	FOUNDATION DOWELS: Wall reinforcement is doweled into the foundation, and the dowels are able to develop the lesser of the strength of the walls or the uplift capacity of the foundation.	5.7.3.4	A.5.3.5
C NC N/A U	GIRDER–COLUMN CONNECTION: There is a positive connection using plates, connection hardware, or straps between the girder and the column support.	5.7.4.1	A.5.4.1
Stiff Diaphragms			
C NC N/A U	TOPPING SLAB: Precast concrete diaphragm elements are interconnected by a continuous reinforced concrete topping slab.	5.6.4	A.4.5.1
C NC N/A U	TOPPING SLAB TO WALLS OR FRAMES: Reinforced concrete topping slabs that interconnect the precast concrete diaphragm elements are doweled for transfer of forces into the shear wall or frame elements.	5.7.2	A.5.2.3
Low, Seismicity (Complete the Following Items in Addition to the Items for Very Low Seismicity)			
Seismic-Force-Resisting System			
C NC N/A U	REINFORCING AT WALL OPENINGS: All wall openings that interrupt rebar have trim reinforcing on all sides.	5.5.3.1.5	A.3.2.4.3
C NC N/A U	PROPORTIONS: The height-to-thickness ratio of the shear walls at each story is less than 30.	5.5.3.1.2	A.3.2.4.4
Diaphragms (Stiff or Flexible)			
C NC N/A U	DIAPHRAGM CONTINUITY: Floor and roof diaphragms do not have expansion joints or vertical offsets, such as split levels, sawtooth, or clerestory configurations.	5.6.1.1	A.4.1.1
C NC N/A U	ROOF CHORD CONTINUITY: All chord elements are continuous, regardless of changes in roof elevation.	5.6.1.1	A.4.1.3
C NC N/A U	OPENINGS AT SHEAR WALLS: Diaphragm openings immediately adjacent to the shear walls are less than 15% of the wall length.	5.6.1.3	A.4.1.4
C NC N/A U	OPENINGS AT EXTERIOR MASONRY SHEAR WALLS: Diaphragm openings immediately adjacent to exterior masonry shear walls are not greater than 4 ft (1.2 m) long.	5.6.1.3	A.4.1.6
C NC N/A U	PLAN IRREGULARITIES: There is tensile capacity to develop the strength of the diaphragm at reentrant corners or other locations of plan irregularities.	5.6.1.4	A.4.1.7

continues

Table 17-35 *(Continued)*. Immediate Occupancy Structural Checklist for Building Types RM1 and RM2.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
C NC N/A U	DIAPHRAGM REINFORCEMENT AT OPENINGS: There is reinforcing around all diaphragm openings larger than 50% of the building width in either major plan dimension.	5.6.1.5	A.4.1.8
Flexible Diaphragms			
C NC N/A U	CROSSTIES: There are continuous crossties between diaphragm chords to distribute the out-of-plane wall anchorage forces into the diaphragm. Where each out-of-plane connection does not have a continuous crosstie across the entire diaphragm, these connections are developed into subdiaphragms between crossties with a maximum length-to-width ratio of 3-to-1.	5.6.1.2	A.4.1.2
C NC N/A U	STRAIGHT SHEATHING: All straight-sheathed diaphragms have horizontal spans less than 12 ft (3.6 m) and aspect ratios less than 1-to-1 in the direction being considered.	5.6.2	A.4.2.1
C NC N/A U	DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 30 ft (9.1 m) and aspect ratios less than or equal to 3-to-1.	5.6.2	A.4.2.2
C NC N/A U	BLOCKED DIAPHRAGMS: All blocked wood structural panel diaphragms have horizontal spans less than 90 ft (27.4 m) and have aspect ratios less than or equal to 4-to-1.	5.6.2	A.4.2.3
C NC N/A U	CANTILEVERED WOOD DIAPHRAGMS: All cantilevered wood diaphragms that provide lateral support for concrete or masonry walls consist of wood structural panels and have a maximum cantilever length of 15 ft (4.6 m) if unblocked or 25 ft (7.6 m) if blocked, and a maximum ratio of cantilever length to diaphragm width of 1:2.5 if unblocked and 1:1.5 if blocked. In addition, the cantilevered diaphragm has a back-span length equal to or greater than the cantilevered portion.	5.6.2	A.4.2.4
C NC N/A U	NON-CONCRETE-FILLED DIAPHRAGMS: Bare steel deck diaphragms or steel deck diaphragms with fill other than reinforced concrete consist of horizontal spans of less than 40 ft (12.2 m) and have aspect ratios less than 4-to-1.	5.6.3	A.4.3.1
C NC N/A U	OTHER DIAPHRAGMS: Diaphragms do not consist of a system other than wood, steel deck, concrete, or horizontal bracing.	5.6.5	A.4.7.1
Connections			
C NC N/A U	STIFFNESS OF WALL ANCHORS: Anchors of concrete or masonry walls to wood structural elements are installed taut and are stiff enough to limit the relative movement between the wall and the diaphragm to no greater than 1/8 in. (3.1 mm) before engagement of the anchors.	5.7.1.2	A.5.1.4
Moderate and High Seismicity (Complete the Following Items in Addition to the Items for Very Low and Low Seismicity)			
Foundation System			
C NC N/A U	OVERTURNING: The ratio of the least horizontal dimension of the seismic-force-resisting system at the foundation level to the building height (base/height) is greater than $0.6S_a$.	5.4.3.3	A.6.2.1

Note: C = Compliant, NC = Noncompliant, N/A = Not Applicable, and U = Unknown.

Where applicable, each of the evaluation statements listed in this checklist shall be marked Compliant (C), Noncompliant (NC), Not Applicable (N/A), or Unknown (U) for a Tier 1 screening. Items that are deemed acceptable to the design professional in accordance with the evaluation statement shall be categorized as Compliant, whereas items that are determined by the design professional to require further investigation shall be categorized as Noncompliant or Unknown. For evaluation statements classified as Noncompliant or Unknown, the design professional is permitted to choose to conduct further investigation using the corresponding Tier 2 evaluation procedure listed next to each evaluation statement.

17.18 STRUCTURAL CHECKLISTS FOR BUILDING TYPES URM: UNREINFORCED MASONRY BEARING WALLS WITH FLEXIBLE DIAPHRAGMS, AND URMA: UNREINFORCED MASONRY BEARING WALLS WITH STIFF DIAPHRAGMS

For building systems and configurations that comply with the URM or URMa building type description in Table 3-1, the Collapse Prevention Structural Checklist in Table 17-36 shall be completed where required by Table 4-6 for Collapse Prevention Structural Performance, and the Immediate Occupancy Structural Checklist in Table 17-37 shall be completed where required by

Table 17-36. Collapse Prevention Structural Checklist for Building Types URM and URMa.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Low and Moderate Seismicity			
Seismic-Force-Resisting System			
C NC N/A U	REDUNDANCY: The number of lines of shear walls in each principal direction is greater than or equal to 2.	5.5.1.1	A.3.2.1.1
C NC N/A U	SHEAR STRESS CHECK: The shear stress in the unreinforced masonry shear walls, calculated using the Quick Check procedure of Section 4.4.3.3, is less than 30 lb/in.^{2} (0.21 MPa) for clay units and 70 lb/in.^{2} (0.48 MPa) for concrete units.	5.5.3.1.1	A.3.2.5.1
Connections			
C NC N/A U	WALL ANCHORAGE: Exterior concrete or masonry walls that are dependent on the diaphragm for lateral support are anchored for out-of-plane forces at each diaphragm level with steel anchors, reinforcing dowels, or straps that are developed into the diaphragm. Connections have strength to resist the connection force calculated in the Quick Check procedure of Section 4.4.3.7.	5.7.1.1	A.5.1.1
C NC N/A U	WOOD LEDGERS: The connection between the wall panels and the diaphragm does not induce cross-grain bending or tension in the wood ledgers or top plates fastened to the walls.	5.7.1.3	A.5.1.2
C NC N/A U	TRANSFER TO SHEAR WALLS: Diaphragms are connected for transfer of seismic forces to the shear walls.	5.7.2	A.5.2.1
C NC N/A U	GIRDER–COLUMN CONNECTION: There is a positive connection using plates, connection hardware, or straps between the girder and the column support.	5.7.4.1	A.5.4.1
High Seismicity (Complete the Following Items in Addition to the Items for Low and Moderate Seismicity)			
Seismic-Force-Resisting System			
C NC N/A U	PROPORTIONS: The height-to-thickness ratio of the shear walls at each story is less than the following: Top story of multistory building, 9; First story of multistory building, 15; and All other conditions, 13.	5.5.3.1.2	A.3.2.5.2
C NC N/A U	MASONRY LAYUP: Filled collar joints of multiwythe masonry walls have negligible voids.	5.5.3.4.1	A.3.2.5.3
Diaphragms (Stiff or Flexible)			
C NC N/A U	DIAPHRAGM CONTINUITY: Floor and roof diaphragms do not have expansion joints or vertical offsets, such as split levels, sawtooth, or clerestory configurations.	5.6.1.1	A.4.1.1
C NC N/A U	ROOF CHORD CONTINUITY: All chord elements are continuous, regardless of changes in roof elevation.	5.6.1.1	A.4.1.3
C NC N/A U	OPENINGS AT SHEAR WALLS: Diaphragm openings immediately adjacent to the shear walls are less than 25% of the wall length.	5.6.1.3	A.4.1.4
C NC N/A U	OPENINGS AT EXTERIOR MASONRY SHEAR WALLS: Diaphragm openings immediately adjacent to exterior masonry shear walls are not greater than 8 ft (2.4 m) long.	5.6.1.3	A.4.1.6
Flexible Diaphragms			
C NC N/A U	CROSSTIES: There are continuous crossties between diaphragm chords to distribute the out-of-plane wall anchorage forces into the diaphragm. Where each out-of-plane connection does not have a continuous crosstie across the entire diaphragm, these connections are developed into subdiaphragms between crossties with a maximum length-to-width ratio of 3-to-1.	5.6.1.2	A.4.1.2
C NC N/A U	STRAIGHT SHEATHING: All straight-sheathed diaphragms have horizontal spans less than 24 ft (7.3 m) and aspect ratios less than 2-to-1 in the direction being considered.	5.6.2	A.4.2.1
C NC N/A U	DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 40 ft (12.2 m) and aspect ratios less than or equal to 4-to-1.	5.6.2	A.4.2.2

continues

Table 17-36 *(Continued)*. Collapse Prevention Structural Checklist for Building Types URM and URMa.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
C NC N/A U	BLOCKED DIAPHRAGMS: All blocked wood structural panel diaphragms have horizontal spans less than 120 ft (36.5 m) and have aspect ratios less than or equal to 4-to-1.	5.6.2	A.4.2.3
C NC N/A U	CANTILEVERED WOOD DIAPHRAGMS: All cantilevered wood diaphragms that provide lateral support for concrete or masonry walls consist of wood structural panels and have a maximum cantilever length of 20 ft (6.1 m) if unblocked or 35 ft (10.7 m) if blocked, and a maximum ratio of cantilever length to diaphragm width of 1:2 if unblocked and 1:1 if blocked. In addition, the cantilevered diaphragm has a back-span length equal to or greater than the cantilevered portion.	5.6.2	A.4.2.4
C NC N/A U	NON-CONCRETE-FILLED DIAPHRAGMS: Bare steel deck diaphragms or steel deck diaphragms with fill other than reinforced structural concrete consist of horizontal spans of less than 120 ft (36.5 m) and have aspect ratios less than 4-to-1.	5.6.3	A.4.3.1
C NC N/A U	OTHER DIAPHRAGMS: The diaphragms do not consist of a system other than wood, steel deck, concrete, or horizontal bracing.	5.6.5	A.4.7.1
Connections			
C NC N/A U	STIFFNESS OF WALL ANCHORS: Anchors of concrete or masonry walls to wood structural elements are installed taut and are stiff enough to limit the relative movement between the wall and the diaphragm to no greater than 1/8 in. (3.1 mm) before engagement of the anchors.	5.7.1.2	A.5.1.4
C NC N/A U	BEAM, GIRDER, AND TRUSS SUPPORTS: Beams, girders, and trusses supported by unreinforced masonry walls or pilasters have independent secondary columns for support of vertical loads.	5.7.4.4	A.5.4.5

Note: C = Compliant, NC = Noncompliant, N/A = Not Applicable, and U = Unknown.

Table 17-37. Immediate Occupancy Structural Checklist for Building Types URM and URMa.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Very Low Seismicity			
Seismic-Force-Resisting System			
C NC N/A U	REDUNDANCY: The number of lines of shear walls in each principal direction is greater than or equal to 2.	5.5.1.1	A.3.2.1.1
C NC N/A U	SHEAR STRESS CHECK: The shear stress in the unreinforced masonry shear walls, calculated using the Quick Check procedure of Section 4.4.3.3, is less than 30 lb/in.^{2} (0.21 MPa) for clay units and 70 lb/in.^{2} (0.48 MPa) for concrete units.	5.5.3.1.1	A.3.2.5.1
Connections			
C NC N/A U	WALL ANCHORAGE: Exterior concrete or masonry walls that are dependent on the diaphragm for lateral support are anchored for out-of-plane forces at each diaphragm level with steel anchors, reinforcing dowels, or straps that are developed into the diaphragm. Connections have strength to resist the connection force calculated in the Quick Check procedure of Section 4.4.3.7.	5.7.1.1	A.5.1.1
C NC N/A U	WOOD LEDGERS: The connection between the wall panels and the diaphragm does not induce cross-grain bending or tension in the wood ledgers or top plates fastened to the walls.	5.7.1.3	A.5.1.2
C NC N/A U	TRANSFER TO SHEAR WALLS: Diaphragms are connected for transfer of seismic forces to the shear walls, and the connections are able to develop the lesser of the shear strength of the walls or diaphragms.	5.7.2	A.5.2.1

continues

Table 17-37 *(Continued)*. Immediate Occupancy Structural Checklist for Building Types URM and URMa.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
C NC N/A U	GIRDER–COLUMN CONNECTION: There is a positive connection using plates, connection hardware, or straps between the girder and the column support.	5.7.4.1	A.5.4.1
Low, Moderate, and High Seismicity (Complete the Following Items in Addition to the Items for Very Low Seismicity)			
Seismic-Force-Resisting System			
C NC N/A U	PROPORTIONS: The height-to-thickness ratio of the shear walls at each story is less than the following: Top story of multistory building, 9; First story of multistory building, 15; and All other conditions, 13.	5.5.3.1.2	A.3.2.5.2
C NC N/A U	MASONRY LAYUP: Filled collar joints of multiwythe masonry walls have negligible voids.	5.5.3.4.1	A.3.2.5.3
Diaphragms (Stiff or Flexible)			
C NC N/A U	DIAPHRAGM CONTINUITY: Floor and roof diaphragms do not have expansion joints or vertical offsets, such as split levels, sawtooth, or clerestory configurations.	5.6.1.1	A.4.1.1
C NC N/A U	ROOF CHORD CONTINUITY: All chord elements are continuous, regardless of changes in roof elevation.	5.6.1.1	A.4.1.3
C NC N/A U	OPENINGS AT SHEAR WALLS: Diaphragm openings immediately adjacent to the shear walls are less than 15% of the wall length.	5.6.1.3	A.4.1.4
C NC N/A U	OPENINGS AT EXTERIOR MASONRY SHEAR WALLS: Diaphragm openings immediately adjacent to exterior masonry shear walls are not greater than 4 ft (1.2 m) long.	5.6.1.3	A.4.1.6
C NC N/A U	PLAN IRREGULARITIES: There is tensile capacity to develop the strength of the diaphragm at reentrant corners or other locations of plan irregularities.	5.6.1.4	A.4.1.7
C NC N/A U	DIAPHRAGM REINFORCEMENT AT OPENINGS: There is reinforcing around all diaphragm openings larger than 50% of the building width in either major plan dimension.	5.6.1.5	A.4.1.8
Flexible Diaphragms			
C NC N/A U	CROSSTIES: There are continuous crossties between diaphragm chords to distribute the out-of-plane wall anchorage forces into the diaphragm. Where each out-of-plane connection does not have a continuous crosstie across the entire diaphragm, these connections are developed into subdiaphragms between crossties with a maximum length-to-width ratio of 3-to-1.	5.6.1.2	A.4.1.2
C NC N/A U	STRAIGHT SHEATHING: All straight-sheathed diaphragms have horizontal spans less than 12 ft (3.6 m) and aspect ratios less than 1-to-1 in the direction being considered.	5.6.2	A.4.2.1
C NC N/A U	DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 30 ft (9.1 m) and aspect ratios less than or equal to 3-to-1.	5.6.2	A.4.2.2
C NC N/A U	BLOCKED DIAPHRAGMS: All blocked wood structural panel diaphragms have horizontal spans less than 90 ft (27.4 m) and have aspect ratios less than or equal to 4-to-1.	5.6.2	A.4.2.3
C NC N/A U	CANTILEVERED WOOD DIAPHRAGMS: All cantilevered wood diaphragms that provide lateral support for concrete or masonry walls consist of wood structural panels and have a maximum cantilever length of 15 ft (4.6 m) if unblocked or 25 ft (7.6 m) if blocked, and a maximum ratio of cantilever length to diaphragm width of 1:2.5 if unblocked and 1:1.5 if blocked. In addition, the cantilevered diaphragm has a back-span length equal to or greater than the cantilevered portion.	5.6.2	A.4.2.4
C NC N/A U	NON-CONCRETE-FILLED DIAPHRAGMS: Bare steel deck diaphragms or steel deck diaphragms with fill other than reinforced concrete consist of horizontal spans of less than 40 ft (12.2 m) and have aspect ratios less than 4-to-1.	5.6.3	A.4.3.1

continues

Table 17-37 *(Continued)*. Immediate Occupancy Structural Checklist for Building Types URM and URMa.

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
C NC N/A U	OTHER DIAPHRAGMS: Diaphragms do not consist of a system other than wood, steel deck, concrete, or horizontal bracing.	5.6.5	A.4.7.1
Connections			
C NC N/A U	STIFFNESS OF WALL ANCHORS: Anchors of concrete or masonry walls to wood structural elements are installed taut and are stiff enough to limit the relative movement between the wall and the diaphragm to no greater than 1/8 in. (3.1 mm) before engagement of the anchors.	5.7.1.2	A.5.1.4
C NC N/A U	BEAM, GIRDER, AND TRUSS SUPPORTS: Beams, girders, and trusses supported by unreinforced masonry walls or pilasters have independent secondary columns for support of vertical loads.	5.7.4.4	A.5.4.5

Note: C = Compliant, NC = Noncompliant, N/A = Not Applicable, and U = Unknown.

Table 4-6 for Immediate Occupancy Structural Performance. Tier 1 screening shall include on-site investigation and condition assessment as required by Section 4.2.1.

Where applicable, each of the evaluation statements listed in this checklist shall be marked Compliant (C), Noncompliant (NC), Not Applicable (N/A), or Unknown (U) for a Tier 1 screening. Items that are deemed acceptable to the design professional in accordance with the evaluation statement shall be categorized as Compliant, whereas items that are determined by the design professional to require further investigation shall be categorized as Noncompliant or Unknown. For evaluation statements classified as Noncompliant or Unknown, the design professional is permitted to choose to conduct further investigation using the corresponding Tier 2 evaluation procedure listed next to each evaluation statement.

17.19 NONSTRUCTURAL CHECKLIST

The nonstructural checklist in Table 17-38 shall be completed for combinations of Performance Levels and Level of Seismicity

Table 17-38. Nonstructural Checklist.

Status	Evaluation Statement[a,b]	Tier 2 Reference	Commentary Reference
Life Safety Systems			
C NC N/A U	**HR—not required; LS—LMH; PR—LMH.** FIRE SUPPRESSION PIPING: Fire suppression piping is anchored and braced in accordance with NFPA-13.	13.7.4	A.7.13.1
C NC N/A U	**HR—not required; LS—LMH; PR—LMH.** FLEXIBLE COUPLINGS: Fire suppression piping has flexible couplings in accordance with NFPA-13.	13.7.4	A.7.13.2
C NC N/A U	**HR—not required; LS—LMH; PR—LMH.** EMERGENCY POWER: Equipment used to power or control Life Safety systems is anchored or braced.	13.7.7	A.7.12.1
C NC N/A U	**HR—not required; LS—LMH; PR—LMH.** STAIR AND SMOKE DUCTS: Stair pressurization and smoke control ducts are braced and have flexible connections at seismic joints.	13.7.6	A.7.14.1
C NC N/A U	**HR—not required; LS—MH; PR—MH.** SPRINKLER CEILING CLEARANCE: Penetrations through panelized ceilings for fire suppression devices provide clearances in accordance with NFPA-13.	13.7.4	A.7.13.3
C NC N/A U	**HR—not required; LS—not required; PR—LMH.** EMERGENCY LIGHTING: Emergency and egress lighting equipment is anchored or braced.	13.7.9	A.7.3.1
Hazardous Materials			
C NC N/A U	**HR—LMH; LS—LMH; PR—LMH.** HAZARDOUS MATERIAL EQUIPMENT: Equipment mounted on vibration isolators and containing hazardous material is equipped with restraints or snubbers.	13.7.1	A.7.12.2
C NC N/A U	**HR—LMH; LS—LMH; PR—LMH.** HAZARDOUS MATERIAL STORAGE: Breakable containers that hold hazardous material, including gas cylinders, are restrained by latched doors, shelf lips, wires, or other methods.	13.8.3	A.7.15.1
C NC N/A U	**HR—MH; LS—MH; PR—MH.** HAZARDOUS MATERIAL DISTRIBUTION: Piping or ductwork conveying hazardous materials is braced or otherwise protected from damage that would allow hazardous material release.	13.7.3 13.7.5 13.7.6	A7.13.4 A.7.14.2

continues

Table 17-38 *(Continued)*. Nonstructural Checklist.

Status	Evaluation Statement[a,b]	Tier 2 Reference	Commentary Reference
C NC N/A U	**HR—MH; LS—MH; PR—MH.** SHUTOFF VALVES: Piping containing hazardous material, including natural gas, has shutoff valves or other devices to limit spills or leaks.	13.7.3 13.7.5	A.7.15.3
C NC N/A U	**HR—LMH; LS—LMH; PR—LMH.** FLEXIBLE COUPLINGS: Hazardous material ductwork and piping, including natural gas piping, have flexible couplings.	13.7.3 13.7.5 13.7.6	A.7.15.4
C NC N/A U	**HR—MH; LS—MH; PR—MH.** PIPING OR DUCTS CROSSING SEISMIC JOINTS: Piping or ductwork carrying hazardous material that either crosses seismic joints or isolation planes or is connected to independent structures has couplings or other details to accommodate the relative seismic displacements.	13.7.3 13.7.5 13.7.6	A.7.13.6
Partitions			
C NC N/A U	**HR—LMH; LS—LMH; PR—LMH.** UNREINFORCED MASONRY: Unreinforced masonry or hollow-clay tile partitions are braced at a spacing of at most 10 ft (3 m) in Low or Moderate Seismicity, or at most 6 ft (1.8 m) in High Seismicity.	13.6.2	A.7.1.1
C NC N/A U	**HR—LMH; LS—LMH; PR—LMH.** HEAVY PARTITIONS SUPPORTED BY CEILINGS: The tops of masonry or hollow-clay tile partitions are not laterally supported by an integrated ceiling system.	13.6.2	A.7.2.1
C NC N/A U	**HR—not required; LS—MH; PR—MH.** DRIFT: Rigid cementitious partitions are detailed to accommodate the following drift ratios: in steel moment frame, concrete moment frame, and wood frame buildings, 0.02; in other buildings, 0.005.	13.6.2	A.7.1.2
C NC N/A U	**HR—not required; LS—not required; PR—MH.** LIGHT PARTITIONS SUPPORTED BY CEILINGS: The tops of gypsum board partitions are not laterally supported by an integrated ceiling system.	13.6.2	A.7.2.1
C NC N/A U	**HR—not required; LS—not required; PR—MH.** STRUCTURAL SEPARATIONS: Partitions that cross structural separations have seismic or control joints.	13.6.2	A.7.1.3
C NC N/A U	**HR—not required; LS—not required; PR—MH.** TOPS: The tops of ceiling-high framed or panelized partitions have lateral bracing to the structure at a spacing equal to or less than 6 ft (1.8 m).	13.6.2	A.7.1.4
Ceilings			
C NC N/A U	**HR—H; LS—MH; PR—LMH.** SUSPENDED LATH AND PLASTER: Suspended lath and plaster ceilings have attachments that resist seismic forces for every 12 ft^2 (1.1 m^2) of area.	13.6.4	A.7.2.3
C NC N/A U	**HR—not required; LS—MH; PR—LMH.** SUSPENDED GYPSUM BOARD: Suspended gypsum board ceilings have attachments that resist seismic forces for every 12 ft^2 (1.1 m^2) of area.	13.6.4	A.7.2.3
C NC N/A U	**HR—not required; LS—not required; PR—MH.** INTEGRATED CEILINGS: Integrated suspended ceilings with continuous areas greater than 144 ft^2 (13.4 m^2) and ceilings of smaller areas that are not surrounded by restraining partitions are laterally restrained at a spacing no greater than 12 ft (3.6 m) with members attached to the structure above. Each restraint location has a minimum of four diagonal wires and compression struts, or diagonal members capable of resisting compression.	13.6.4	A.7.2.2
C NC N/A U	**HR—not required; LS—not required; PR—MH.** EDGE CLEARANCE: The free edges of integrated suspended ceilings with continuous areas greater than 144 ft^2 (13.4 m^2) have clearances from the enclosing wall or partition of at least the following: in Moderate Seismicity, 1/2 in. (13 mm); in High Seismicity, 3/4 in. (19 mm).	13.6.4	A.7.2.4
C NC N/A U	**HR—not required; LS—not required; PR—MH.** CONTINUITY ACROSS STRUCTURE JOINTS: The ceiling system does not cross any seismic joint and is not attached to multiple independent structures.	13.6.4	A.7.2.5

continues

Table 17-38 *(Continued)*. Nonstructural Checklist.

Status	Evaluation Statement[a,b]	Tier 2 Reference	Commentary Reference
C NC N/A U	**HR—not required; LS—not required; PR—H.** EDGE SUPPORT: The free edges of integrated suspended ceilings with continuous areas greater than 144 ft^2 (13.4 m^2) are supported by closure angles or channels not less than 2 in. (50.8 mm) wide.	13.6.4	A.7.2.6
C NC N/A U	**HR—not required; LS—not required; PR—H.** SEISMIC JOINTS: Acoustical tile or lay-in panel ceilings have seismic separation joints such that each continuous portion of the ceiling is no more than 2,500 ft^2 (232.3 m^2) and has a ratio of long-to-short dimension no more than 4-to-1.	13.6.4	A.7.2.7
Light Fixtures			
C NC N/A U	**HR—not required; LS—MH; PR—MH.** INDEPENDENT SUPPORT: Light fixtures that weigh more per square foot (square meter) than the ceiling they penetrate are supported independent of the grid ceiling suspension system by a minimum of two wires at diagonally opposite corners of each fixture.	13.6.4 13.7.9	A.7.3.2
C NC N/A U	**HR—not required; LS—not required; PR—H.** PENDANT SUPPORTS: Light fixtures on pendant supports are attached at a spacing equal to or less than 6 ft (1.8 m). Unbraced suspended fixtures are free to allow a 360-degree range of motion at an angle not less than 45 degrees from horizontal without contacting adjacent components. Alternatively, if fixures are rigidly supported and/or braced, they are free to move with the structure to which they are attached without damaging adjoining components. Additionally, the connection to the structure is capable of accommodating the movement without failure.	13.7.9	A.7.3.3
C NC N/A U	**HR—not required; LS—not required; PR—H.** LENS COVERS: Lens covers on light fixtures are attached with safety devices.	13.7.9	A.7.3.4
Cladding and Glazing			
C NC N/A U	**HR—MH; LS—MH; PR—MH.** CLADDING ANCHORS: Cladding components weighing more than 10 lb/ft^2 (0.48 kN/m^2) are mechanically anchored to the structure at a spacing equal to or less than the following: for Life Safety in Moderate Seismicity, 6 ft (1.8 m); for Life Safety in High Seismicity and for Position Retention in any seismicity, 4 ft (1.2 m).	13.6.1	A.7.4.1
C NC N/A U	**HR—not required; LS—MH; PR—MH.** CLADDING ISOLATION: For steel or concrete moment-frame buildings, panel connections are detailed to accommodate a story drift ratio by the use of rods attached to framing with oversize holes or slotted holes of at least the following: for Life Safety in Moderate Seismicity, 0.01; for Life Safety in High Seismicity and for Position Retention in any seismicity, 0.02, and the rods have a length-to-diameter ratio of 4.0 or less.	13.6.1	A.7.4.2
C NC N/A U	**HR—MH; LS—MH; PR—MH.** MULTISTORY PANELS: For multistory panels attached at more than one floor level, panel connections are detailed to accommodate a story drift ratio by the use of rods attached to framing with oversize holes or slotted holes of at least the following: for Life Safety in Moderate Seismicity, 0.01; for Life Safety in High Seismicity and for Position Retention in any seismicity, 0.02, and the rods have a length-to-diameter ratio of 4.0 or less.	13.6.1	A.7.4.3
C NC N/A U	**HR—not required; LS—MH; PR—MH.** THREADED RODS: Threaded rods for panel connections detailed to accommodate drift by bending of the rod have a length-to-diameter ratio greater than 0.06 times the story height in inches (millimeters) for Life Safety in Moderate Seismicity and 0.12 times the story height in inches (millimeters) for Life Safety in High Seismicity and Position Retention in any seismicity.	13.6.1	A.7.4.8
C NC N/A U	**HR—MH; LS—MH; PR—MH.** PANEL CONNECTIONS: Cladding panels are anchored out of plane with a minimum number of connections for each wall panel, as follows: for Life Safety in Moderate Seismicity, 2 connections; for Life Safety in High Seismicity and for Position Retention in any seismicity, 4 connections.	13.6.1.4	A.7.4.4

continues

Table 17-38 *(Continued)*. Nonstructural Checklist.

Status	Evaluation Statement[a,b]	Tier 2 Reference	Commentary Reference
C NC N/A U	**HR—MH; LS—MH; PR—MH.** BEARING CONNECTIONS: Where bearing connections are used, there is a minimum of two bearing connections for each cladding panel.	13.6.1.4	A.7.4.5
C NC N/A U	**HR—MH; LS—MH; PR—MH.** INSERTS: Where concrete cladding components use inserts, the inserts have positive anchorage or are anchored to reinforcing steel.	13.6.1.4	A.7.4.6
C NC N/A U	**HR—not required; LS—MH; PR—MH.** OVERHEAD GLAZING: Glazing panes of any size in curtain walls and individual interior or exterior panes more than 16 ft^2 (1.5 m^2) in area are laminated annealed or laminated heat-strengthened glass and are detailed to remain in the frame when cracked.	13.6.1.5	A.7.4.7
Masonry Veneer			
C NC N/A U	**HR—not required; LS—LMH; PR—LMH.** TIES: Masonry veneer is connected to the backup with corrosion-resistant ties. There is a minimum of one tie for every 2-2/3 ft^2 (0.25 m^2), and the ties have spacing no greater than the following: for Life Safety in Low or Moderate Seismicity, 36 in. (914 mm); for Life Safety in High Seismicity and for Position Retention in any seismicity, 24 in. (610 mm).	13.6.1.2	A.7.5.1
C NC N/A U	**HR—not required; LS—LMH; PR—LMH.** SHELF ANGLES: Masonry veneer is supported by shelf angles or other elements at each floor above the ground floor.	13.6.1.2	A.7.5.2
C NC N/A U	**HR—not required; LS—LMH; PR—LMH.** WEAKENED PLANES: Masonry veneer is anchored to the backup adjacent to weakened planes, such as at the locations of flashing.	13.6.1.2	A.7.5.3
C NC N/A U	**HR—LMH; LS—LMH; PR—LMH.** UNREINFORCED MASONRY BACKUP: There is no unreinforced masonry backup.	13.6.1.1 13.6.1.2	A.7.7.2
C NC N/A U	**HR—not required; LS—MH; PR—MH.** STUD TRACKS: For veneer with cold-formed steel stud backup, stud tracks are fastened to the structure at a spacing equal to or less than 24 in. (610 mm) on center.	13.6.1.1 13.6.1.2	A.7.6.1
C NC N/A U	**HR—not required; LS—MH; PR—MH.** ANCHORAGE: For veneer with concrete block or masonry backup, the backup is positively anchored to the structure at a horizontal spacing equal to or less than 4 ft (1.2 m) along the floors and roof.	13.6.1.1 13.6.1.2	A.7.7.1
C NC N/A U	**HR—not required; LS—not required; PR—MH.** WEEP HOLES: In veneer anchored to stud walls, the veneer has functioning weep holes and base flashing.	13.6.1.2	A.7.5.4
C NC N/A U	**HR—not required; LS—not required; PR—MH.** OPENINGS: For veneer with cold-formed-steel stud backup, steel studs frame window and door openings.	13.6.1.1 13.6.1.2	A.7.6.2
Parapets, Cornices, Penthouses, and Appendages			
C NC N/A U	**HR—LMH; LS—LMH; PR—LMH.** URM PARAPETS OR CORNICES: Laterally unsupported unreinforced masonry parapets or cornices have height-to-thickness ratios no greater than the following: for Life Safety in Low or Moderate Seismicity, 2.5; for Life Safety in High Seismicity and for Position Retention in any seismicity, 1.5.	13.6.5	A.7.8.1
C NC N/A U	**HR—not required; LS—LMH; PR—LMH.** CANOPIES: Canopies at building exits are anchored to the structure at a spacing no greater than the following: for Life Safety in Low or Moderate Seismicity, 10 ft (3 m); for Life Safety in High Seismicity and for Position Retention in any seismicity, 6 ft (1.8 m).	13.6.6	A.7.8.2
C NC N/A U	**HR—H; LS—MH; PR—LMH.** CONCRETE PARAPETS: Concrete parapets with height-to-thickness ratios greater than 2.5 have vertical reinforcement.	13.6.5	A.7.8.3
C NC N/A U	**HR—MH; LS—MH; PR—LMH.** APPENDAGES: Cornices, parapets, signs, and other ornamentation or appendages that extend above the highest point of anchorage to the structure or cantilever from components are reinforced and anchored to the structural system at a spacing equal to or less than 6 ft (1.8 m). This evaluation statement item does not apply to parapets or cornices covered by other evaluation statements.	13.6.6	A.7.8.4

continues

Table 17-38 *(Continued)*. Nonstructural Checklist.

Status	Evaluation Statement[a,b]	Tier 2 Reference	Commentary Reference
C NC N/A U	**HR—MH; LS—MH; PR—LMH.** PENTHOUSES: Penthouses are not used for regular occupancy and are constructed as an extension of the building frame or have a lateral-force-resisting system in each direction consistent with structural systems listed in Table 12.2-1 or Table 15.4-1 of ASCE 7.	13.6.7	A.7.8.5
C NC N/A U	**HR—MH; LS—MH; PR—LMH.** TILE ROOFS: For roofs with slopes greater than or equal to 3 vertical to 12 horizontal, roof tiles weighing more than 4 lb/ft^2 (0.05 kN/m^2) are individually secured to the roof framing or roof deck with wires, fasteners, or adhesive.	13.6.8	A.7.8.6
Masonry Chimneys			
C NC N/A U	**HR—LMH; LS—LMH; PR—LMH.** URM CHIMNEYS: Unreinforced masonry chimneys extend above the roof surface no more than the following: for Life Safety in Low or Moderate Seismicity, three times the least dimension of the chimney; for Life Safety in High Seismicity and for Position Retention in any seismicity, two times the least dimension of the chimney.	13.6.9	A.7.9.1
C NC N/A U	**HR—LMH; LS—LMH; PR—LMH.** ANCHORAGE: Masonry chimneys are anchored at each floor level, at the topmost ceiling level, and at the roof.	13.6.9	A.7.9.2
Stairs			
C NC N/A U	**HR—not required; LS—LMH; PR—LMH.** STAIR ENCLOSURES: Hollow-clay tile or unreinforced masonry walls around stair enclosures are restrained out of plane and have height-to-thickness ratios not greater than the following: for Life Safety in Low or Moderate Seismicity, 15-to-1; for Life Safety in High Seismicity and for Position Retention in any seismicity, 12-to-1.	13.6.2 13.6.10	A.7.10.1
C NC N/A U	**HR—not required; LS—LMH; PR—LMH.** STAIR DETAILS: The connection between the stairs and the structure does not rely on post-installed anchors in concrete or masonry, and the stair details are capable of accommodating the drift calculated using the Quick Check procedure of Section 4.4.3.1, for moment-frame structures or 1/2 in. (12.7 mm) for all other structures without including any lateral stiffness contribution from the stairs.	13.6.10	A.7.10.2
Contents and Furnishings			
C NC N/A U	**HR—LMH; LS—MH; PR—MH.** INDUSTRIAL STORAGE RACKS: Industrial storage racks or pallet racks more than 12 ft (3.6 m) high meet the requirements of ANSI/RMI MH 16.1 as modified by ASCE 7, Chapter 15.	13.8.1	A.7.11.1
C NC N/A U	**HR—not required; LS—H; PR—MH.** TALL NARROW CONTENTS: Contents more than 6 ft (1.8 m) high with a height-to-depth or height-to-width ratio greater than 3-to-1 are anchored to the structure or to each other.	13.8.2	A.7.11.2
C NC N/A U	**HR—not required; LS—H; PR—H.** FALL-PRONE CONTENTS: Equipment, stored items, or other contents weighing more than 20 lb (9.1 kg) whose center of mass is more than 4 ft (1.2 m) above the adjacent floor level are braced or otherwise restrained.	13.8.2	A.7.11.3
C NC N/A U	**HR—not required; LS—not required; PR—MH.** ACCESS FLOORS: Access floors more than 9 in. (229 mm) high are braced.	13.6.12	A.7.11.4
C NC N/A U	**HR—not required; LS—not required; PR—MH.** EQUIPMENT ON ACCESS FLOORS: Equipment and other contents supported by access floor systems are anchored or braced to the structure independent of the access floor.	13.7.7 13.6.12	A.7.11.5
C NC N/A U	**HR—not required; LS—not required; PR—H.** SUSPENDED CONTENTS: Items suspended without lateral bracing are free to swing from or move with the structure from which they are suspended without damaging themselves or adjoining components.	13.8.2	A.7.11.6
Mechanical and Electrical Equipment			
C NC N/A U	**HR—not required; LS—H; PR—H.** FALL-PRONE EQUIPMENT: Equipment weighing more than 20 lb (9.1 kg) whose center of mass is more than 4 ft (1.2 m) above the adjacent floor level, and which is not in-line equipment, is braced.	13.7.1 13.7.7	A.7.12.4

continues

Table 17-38 *(Continued)*. Nonstructural Checklist.

Status	Evaluation Statement[a,b]	Tier 2 Reference	Commentary Reference
C NC N/A U	**HR—not required; LS—H; PR—H.** IN-LINE EQUIPMENT: Equipment installed in line with a duct or piping system, with an operating weight more than 75 lb (34.0 kg), is supported and laterally braced independent of the duct or piping system.	13.7.1	A.7.12.5
C NC N/A U	**HR—not required; LS—H; PR—MH.** TALL NARROW EQUIPMENT: Equipment more than 6 ft (1.8 m) high with a height-to-depth or height-to-width ratio greater than 3-to-1 is anchored to the floor slab or adjacent structural walls.	13.7.1 13.7.7	A.7.12.6
C NC N/A U	**HR—not required; LS—not required; PR—MH.** MECHANICAL DOORS: Mechanically operated doors are detailed to operate at a story drift ratio of 0.01.	13.6.11	A.7.12.7
C NC N/A U	**HR—not required; LS—not required; PR—H.** SUSPENDED EQUIPMENT: Equipment suspended without lateral bracing is free to swing from or move with the structure from which it is suspended without damaging itself or adjoining components.	13.7.1 13.7.7	A.7.12.8
C NC N/A U	**HR—not required; LS—not required; PR—H.** VIBRATION ISOLATORS: Equipment mounted on vibration isolators is equipped with horizontal restraints or snubbers and with vertical restraints to resist overturning.	13.7.1	A.7.12.9
C NC N/A U	**HR—not required; LS—not required; PR—H.** HEAVY EQUIPMENT: Floor-supported or platform-supported equipment weighing more than 400 lb (181.4 kg) is anchored to the structure.	13.7.1 13.7.7	A.7.12.10
C NC N/A U	**HR—not required; LS—not required; PR—H.** ELECTRICAL EQUIPMENT: Electrical equipment is laterally braced to the structure.	13.7.7	A.7.12.11
C NC N/A U	**HR—not required; LS—not required; PR—H.** CONDUIT COUPLINGS: Conduit greater than 2.5 in. (64 mm) trade size that is attached to panels, cabinets, or other equipment and is subject to relative seismic displacement has flexible couplings or connections.	13.7.8	A.7.12.12
Piping			
C NC N/A U	**HR—not required; LS—not required; PR—H.** FLEXIBLE COUPLINGS: Fluid and gas piping has flexible couplings.	13.7.3 13.7.5	A.7.13.2
C NC N/A U	**HR—not required; LS—not required; PR—H.** FLUID AND GAS PIPING: Fluid and gas piping is anchored and braced to the structure to limit spills or leaks.	13.7.3 13.7.5	A.7.13.4
C NC N/A U	**HR—not required; LS—not required; PR—H.** C-CLAMPS: One-sided C-clamps that support piping larger than 2.5 in. (64 mm) in diameter are restrained.	13.7.3 13.7.5	A.7.13.5
C NC N/A U	**HR—not required; LS—not required; PR—H.** PIPING CROSSING SEISMIC JOINTS: Piping that crosses seismic joints or isolation planes or is connected to independent structures has couplings or other details to accommodate the relative seismic displacements.	13.7.3 13.7.5	A.7.13.6
Ducts			
C NC N/A U	**HR—not required; LS—not required; PR—H.** DUCT BRACING: Rectangular ductwork larger than 6 ft^2 (0.56 m^2) in cross-sectional area and round ducts larger than 28 in. (711 mm) in diameter are braced. The maximum spacing of transverse bracing does not exceed 30 ft (9.1 m). The maximum spacing of longitudinal bracing does not exceed 60 ft (18.3 m).	13.7.6	A.7.14.2
C NC N/A U	**HR—not required; LS—not required; PR—H.** DUCT SUPPORT: Ducts are not supported by piping or electrical conduit.	13.7.6	A.7.14.3
C NC N/A U	**HR—not required; LS—not required; PR—H.** DUCTS CROSSING SEISMIC JOINTS: Ducts that cross seismic joints or isolation planes or are connected to independent structures have couplings or other details to accommodate the relative seismic displacements.	13.7.6	A.7.14.4
Elevators			
C NC N/A U	**HR—not required; LS—H; PR—H.** RETAINER GUARDS: Sheaves and drums have cable retainer guards.	13.7.11	A.7.16.1
C NC N/A U	**HR—not required; LS—H; PR—H.** RETAINER PLATE: A retainer plate is present at the top and bottom of both car and counterweight.	13.7.11	A.7.16.2

continues

Table 17-38 *(Continued)*. Nonstructural Checklist.

Status	Evaluation Statement[a,b]	Tier 2 Reference	Commentary Reference
C NC N/A U	**HR—not required; LS—not required; PR—H.** ELEVATOR EQUIPMENT: Equipment, piping, and other components that are part of the elevator system are anchored.	13.7.11	A.7.16.3
C NC N/A U	**HR—not required; LS—not required; PR—H.** SEISMIC SWITCH: Elevators capable of operating at speeds of 150 ft/min (0.30 m/min) or faster are equipped with seismic switches that meet the requirements of ASME A17.1 (ASME 2000a) or have trigger levels set to 20% of the acceleration of gravity at the base of the structure and 50% of the acceleration of gravity in other locations.	13.7.11	A.7.16.4
C NC N/A U	**HR—not required; LS—not required; PR—H.** SHAFT WALLS: Elevator shaft walls are anchored and reinforced to prevent toppling into the shaft during strong shaking.	13.7.11	A.7.16.5
C NC N/A U	**HR—not required; LS—not required; PR—H.** COUNTERWEIGHT RAILS: All counterweight rails and divider beams are sized in accordance with ASME A17.1.	13.7.11	A.7.16.6
C NC N/A U	**HR—not required; LS—not required; PR—H.** BRACKETS: The brackets that tie the car rails and the counterweight rail to the structure are sized in accordance with ASME A17.1.	13.7.11	A.7.16.7
C NC N/A U	**HR—not required; LS—not required; PR—H.** SPREADER BRACKET: Spreader brackets are not used to resist seismic forces.	13.7.11	A.7.16.8
C NC N/A U	**HR—not required; LS—not required; PR—H.** GO-SLOW ELEVATORS: The building has a go-slow elevator system.	13.7.11	A.7.16.9

[a]Performance Level: HR = Hazards Reduced, LS = Life Safety, and PR = Position Retention.
[b]Level of Seismicity: L = Low, M = Moderate, and H = High.
Note: C = Compliant, NC = Noncompliant, N/A = Not Applicable, and U = Unknown.

as required by Table 4-6. Tier 1 screening shall include on-site investigation and condition assessment as required by Section 4.2.1.

Where applicable, each of the evaluation statements listed in this checklist shall be marked Compliant (C), Noncompliant (NC), Not Applicable (N/A), or Unknown (U) for a Tier 1 screening. Items that are deemed acceptable to the design professional in accordance with the evaluation statement shall be categorized as Compliant, whereas items that are determined by the design professional to require further investigation shall be categorized as Noncompliant or Unknown. For evaluation statements classified as Noncompliant or Unknown, the design professional is permitted to choose to conduct further investigation using the corresponding Tier 2 evaluation procedure listed next to each evaluation statement.

Compliant items shall be deemed by the design professional to satisfy the corresponding Performance Objective in the evaluation statement and shall meet all of the following conditions:

1. Supporting members relied on for compliance have complete load paths to supporting structural members;
2. Bracing members, connecting members, and supporting structural or architectural components relied on for compliance are of materials and dimensions suitable to the application; and
3. Fasteners and connectors relied on for compliance are of materials and sizes suitable to the application.

Items that are determined by the design professional to require further investigation shall be categorized as Noncompliant or Unknown. For evaluation at the Life Safety Nonstructural Performance Level, an evaluation statement need not be marked Noncompliant if the noncompliance occurs only in locations where related damage would not cause severe injury or death to one or more people.

For the Hazards Reduced Nonstructural Performance Level, the evaluation statement is permitted to be found Compliant if it can be shown that the specific hazard will not endanger many people.