SECTION 014600

SEISMIC DESIGN REQUIREMENTS FOR NONSTRUCTURAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. General: This Section includes requirements for the seismic bracing of components of the building that are “nonstructural,” meaning that these components are not part of the structural support of the building itself.

B. The requirements of this Section shall apply to architectural, mechanical, electrical, plumbing, fire protection, and elevator systems as specified in Table 1 of this Section.

C. Related Sections

1. Divisions 21, 22, 23 – Mechanical
2. Divisions 26, 27, 28 – Electrical

1.2 SUBMITTALS

A. General: In addition to submittals required by individual specification Sections, provide a statement of compliance with the requirements of this Section for any affected system.

1.3 DESIGN RESPONSIBILITY

A. General: Where shown on the Drawings, details establish basic dimensions, profiles, sightlines, and appearance. Design seismic bracing and support systems and anchorages to withstand their own weights, loads due to pressure and suction of wind, seismic forces, thermal stresses, and building movement.

B. Design Engineer: Where seismic design is required by this Section, employ a registered engineer, licensed to perform the work in the jurisdiction where the project is located, to design all structural elements of the seismic bracing system. This engineer shall prepare, stamp, and sign required structural drawings and calculations.

C. Modifications: Minor dimension and profile adjustments to those shown may be made in the interests of fabrication or erection methods or techniques, and the ability of the design to satisfy the performance requirements, provided the visual design concepts (general profile and shape, location of components, and dimension points) are maintained and such adjustments are approved by the Architect and Owner’s Representative at time of shop drawing review.

1.4 REFERENCE STANDARDS

A. 2018 International Building Code (IBC) Section 1613.1 and ASCE 7-16, American Society of Civil Engineers “Minimum Design Loads for Buildings and Other Structures,” Chapter 13, shall define the minimum requirements for seismic design of nonstructural systems.

B. In some cases this Section requires a higher level of seismic performance than that required by the referenced standards. The higher level shall prevail.

1.5 DEFINITIONS

A. Component – A part or element of an architectural, electrical, or mechanical nonstructural system.

B. Support – Those structural members, assemblies of members, or manufactured elements, including braces, frames, legs, lugs, snubbers, hangers, saddles, or struts, which transmit loads between the nonstructural components and the structure.

C. Attachment – Means by which components and their supports are secured or connected to the seismic force resisting system of the structure. Such attachments include anchor bolts, welded connections, and mechanical fasteners.

D. Performance Class – Classification used to identify nonstructural systems and components that are required to function for life safety purposes after an earthquake, contain hazardous materials, are needed for continued operation of the facility, or require substantial time to repair following an earthquake.

1. Note: The term Performance Class is not defined by the 2018 IBC or ASCE 7-16. The term is presented here as a tool to communicate nonstructural seismic design requirements.

E. Ductile Piping – Piping systems constructed with steel, aluminum, or copper.

F. Nonductile Piping – Piping and tubing systems constructed with plastic, cast iron, glass, or ceramics.

1.6 SEISMIC DESIGN CRITERIA FOR NONSTRUCTURAL SYSTEMS

A. The building is assigned to Risk Category II (reference 2018 IBC Table 1604.5) and Seismic Design Category D.

B. Performance Class for nonstructural systems shall be as follows:

1. Critical (C) for systems and components required to function for life safety purposes after an earthquake, systems and components containing hazardous materials, systems and components that are needed for continued operation of the facility, and other systems and components that the Owner has specified to be critical. Specific Critical systems and components shall be as follows:
    a. Required to function for life safety purposes
        1) Fire protection systems
        2) Fire alarm system
        3) Emergency lighting fixtures and low voltage devices mounted in suspended ceilings
        4) Egress stairways
    b. Hazardous material
        1) Generator fuel
        2) Natural gas
    c. Owner specified
        1) Ceiling-mounted lighting in patient care spaces, weighing more than 20 lbs
        2) Normal power unit substations (15 KV systems)
        3) Normal 15 KV equipment and cabling/wiring
        4) Normal distribution system from source to distribution panelboard level for portions serving patient care areas
        5) Normal lighting fixtures and low voltage devices mounted in suspended ceilings
        6) Normal distribution system from source to 480 volt unit substation level for portions serving non-patient care areas
        7) Connections to select cooking and refrigeration equipment

2. Not Critical (NC) for all other nonstructural systems and components.

C. Component Importance Factor (I_p) for nonstructural systems and components shall be per Table 1 of this specification Section.

D. Design earthquake spectral response coefficients: S_{DS} = 0.50, S_{D1} = 0.21.

1.7 SEISMIC DESIGN REQUIREMENTS FOR NONSTRUCTURAL SYSTEMS

A. The seismic design requirements for each nonstructural system shall be as specified in Table 1 below.

B. Seismic forces (F_p) (both horizontal and vertical) and displacements (D_p) shall be calculated in accordance with ASCE 7-16 Section 13.3.

END OF SECTION

Table 1				
Nonstructural System	**Performance Class (Component Importance Factor, I_p)**	**Seismic Design Required?**		**Comments**
		Component	**Support and Attachment**	
Architectural Systems:				
1. Nonstructural Walls and Partitions	C (1.5)	Yes	Yes	
	NC (1.0)	Yes	Yes	
2 Ceilings	C (1.5)	No	Yes	
	NC (1.0)	No	Yes	
3. Casework	C (1.5)	No	Yes	
	NC (1.0)	No	Yes	
4. Audio-Visual Equipment	NC (1.0)	No	Yes	
5. Egress Stairs and Ramps	C (1.5)	Yes	Yes	
Mechanical and Electrical Systems[2]:				
1. General Mechanical Equipment (Components)	C (1.5)	Yes[1]	Yes	
	NC (1.0)	No	Yes	See ASCE 7-16 Section 13.1.4 for exceptions to seismic design of support and attachment.
2. General Electrical Equipment (Components)	C (1.5)	Yes[1]	Yes	
	NC (1.0)	No	Yes	See ASCE 7-16 Section 13.1.4 for exceptions to seismic design of support and attachment.
3. Piping Systems	C (1.5)	Yes	Yes	Component design shall consider the allowable stress for pipe materials defined by ASCE 7-16 Section 13.6.7. See ASCE 7-16 Section 13.6.7.3 for exceptions to seismic design of support and attachment.
	NC (1.0)	No	Yes	See ASCE 7-16 Section 13.6.7.3 for exceptions to seismic design of support and attachment.
4. Fire Protection Alarm and Sprinkler System	C (1.5)	No	Yes	Design shall be in accordance with NFPA 13 per ASCE 7-16 Section 13.6.7.2.
5. HVAC and Duct Systems	C (1.5)	Yes	Yes	Component design shall consider the duct material strength and method of connection between sections. See ASCE 7-16 Section 13.6.6 for exceptions to seismic design of support and attachment.
	NC (1.0)	No	Yes	See ASCE 7-16 Section 13.6.6 for exceptions to seismic design of support and attachment.

Table 1				
Nonstructural System	**Performance Class (Component Importance Factor, I_p)**	**Seismic Design Required?**		**Comments**
		Component	**Support and Attachment**	
6. Conduit and Cable Tray	C (1.5)	No	Yes	
	NC (1.0)	No	Yes	See ASCE 7-16 Section 13.6.5 for exceptions to seismic design of support and attachment.
7. Elevators and Escalators	C (1.5)	No	Yes	
	NC (1.0)	No	Yes	
8. Rooftop Solar Panels	NC (1.0)	Yes	Yes	See ASCE 7-16 Section 13.6.12 for exceptions to seismic design of support and attachment.

[1] Active mechanical and electrical equipment which must remain operable following the design earthquake shall be certified by the supplier as operable, and components with hazardous contents shall be certified by the supplier as maintaining containment following the design earthquake.

[2] Clearances between equipment, distribution systems, supports, and sprinkler system drops and sprigs shall be considered per ASCE 7-16 Section 13.2.3.1.