1612.2 Design and construction. The design and construction of buildings and structures located in *flood hazard areas*, including *coastal high hazard areas* and *coastal A zones*, shall be in accordance with Chapter 5 of ASCE 7 and ASCE 24.

1612.3 Establishment of flood hazard areas. Where the local governing authority has adopted a flood hazard map and supporting data, the structure design and construction shall be in conformance with Section 1612.4.

OAR 918-008-0000 is not part of this code but is reprinted here for the reader's convenience:

918-008-0000 Purpose and Scope.

(1) The Department of Consumer and Business Services, Building Codes Division, adopts model building codes, standards and other publications by reference, as necessary, through administrative rule to create the state building code. When a matter is included in a specialty code or referenced publication that is in conflict with Oregon Revised Statutes or Oregon Administrative Rules, the statute or rule applies, and the code or standard provision does not. All remaining parts or application of the code or standard remain in effect.

(2) Unless required by law, matters generally not authorized for inclusion in a specialty code or referenced standard include, but are not limited to: licensing or certification requirements, or other qualifications and standards for businesses or workers; structures or equipment maintenance requirements; matters covered by federal or state law; and matters that conflict with other specialty codes or publications adopted by the department.

(3) OAR 918-008-0000 to OAR 918-008-0070 provides the process for adopting and amending the state building code that is consistent across all program areas.

(4) The state building code is derived from the most appropriate version of base model codes, which are updated periodically.

(5) The Oregon specialty code amendment process begins approximately midway into a code cycle.

(6) An appropriate advisory board approves or forwards the adoption of the Oregon specialty code and amendments to the Department for adoption.

(7) Notwithstanding sections (3) through (6) of this rule, the division may adopt supplemental code amendments as authorized by OAR 918-008-0028.

[Publications: Publications referenced are available from the agency.]

Stat. Auth.: ORS 447.020, 455.030 & 479.730

Stats. Implemented: ORS 447.020, 455.030 & 479.730

Hist.: BCD 26-1994, f. & cert. ef. 11-15-94; BCD 6-1997, f. & cert. ef. 4-1-97; BCD 3-2006(Temp), f. & cert. ef. 3-1-06 thru 8-27-06; BCD 9-2006, f. 6-30-06, cert. ef. 7-1-06; BCD 1-2014, f. 1-22-14, cert. ef. 4-1-14

1612.4 Flood hazard documentation. The following documentation shall be prepared and sealed by a *registered design professional* and submitted to the *building official*:

1. For construction in *flood hazard areas* other than *coastal high hazard areas* or *coastal A zones*:
   1.1. The elevation of the lowest floor, including the basement, as required by the lowest floor elevation inspection in Section 110.3.3 and for the final inspection in Section 110.3.11.1.
   1.2. For fully enclosed areas below the design flood elevation where provisions to allow for the automatic entry and exit of floodwaters do not meet the minimum requirements in Section 2.7.2.1 of ASCE 24, *construction documents* shall include a statement that the design will provide for equalization of hydrostatic flood forces in accordance with Section 2.7.2.2 of ASCE 24.
   1.3. For dry floodproofed nonresidential buildings, *construction documents* shall include a statement that the dry floodproofing is designed in accordance with ASCE 24.
2. For construction in *coastal high hazard areas* and *coastal A zones*:
   2.1. The elevation of the bottom of the lowest horizontal structural member as required by the lowest floor elevation inspection in Section 110.3.3 and for the final inspection in Section 110.3.11.1.
   2.2. *Construction documents* shall include a statement that the building is designed in accordance with ASCE 24, including that the pile or column foundation and building or structure to be attached thereto is designed to be anchored to resist flotation, collapse and lateral movement due to the effects of wind and flood loads acting simultaneously on all building components, and other load requirements of Chapter 16.
   2.3. For breakaway walls designed to have a resistance of more than 20 psf (0.96 kN/m^2) determined using allowable stress design, *construction documents* shall include a statement that the breakaway wall is designed in accordance with ASCE 24.

SECTION 1613
EARTHQUAKE LOADS

1613.1 Scope. Every structure, and portion thereof, including nonstructural components that are permanently attached to structures and their supports and attachments, shall be designed and constructed to resist the effects of earthquake motions in accordance with Chapters 11, 12, 13, 15, 17 and 18 of ASCE 7, as applicable. The *seismic design category* for a structure is permitted to be determined in accordance with Section 1613 or ASCE 7.

Exceptions:

1. Detached one- and two-family dwellings, assigned to *Seismic Design Category* A, B or C, or located where the mapped short-period spectral response acceleration, S_S, is less than 0.4 g.
2. The seismic force-resisting system of wood-frame buildings that conform to the provisions of Section

2308 are not required to be analyzed as specified in this section.

3. Agricultural storage structures intended only for incidental human occupancy.
4. Structures that require special consideration of their response characteristics and environment that are not addressed by this code or ASCE 7 and for which other regulations provide seismic criteria, such as vehicular bridges, electrical transmission towers, hydraulic structures, buried utility lines and their appurtenances and nuclear reactors.
5. References within ASCE 7 to Chapter 14 shall not apply, except as specifically required herein.

1613.2 Seismic ground motion values. Seismic ground motion values shall be determined in accordance with this section.

1613.2.1 Mapped acceleration parameters. The parameters S_S and S_1, as illustrated in Figures 1613.2.1(1) and 1613.2.1(2), shall be determined using the Applied Technology Council (ATC) Hazards by Location Tool at https://hazards.atcouncil.org, with ASCE 7-16 selected as the "Reference Document."

1613.2.2 Site class definitions. Based on the site soil properties, the site shall be classified as *Site Class* A, B, C, D, E or F in accordance with Chapter 20 of ASCE 7.

Where the soil properties are not known in sufficient detail to determine the site class, Site Class D, subjected to the requirements of Section 1613.2.3, shall be used unless the *building official* or geotechnical data determines that Site Class E or F soils are present at the site.

Where site investigations that are performed in accordance with Chapter 20 of ASCE 7 reveal rock conditions consistent with Site Class B, but site-specific velocity measurements are not made, the site coefficients F_a and F_v shall be taken at unity (1.0).

1613.2.3 Site coefficients and adjusted maximum considered earthquake spectral response acceleration parameters. The maximum considered earthquake spectral response acceleration for short periods, S_{MS}, and at 1-second period, S_{M1}, adjusted for *site class* effects shall be determined by Equations 16-36 and 16-37, respectively:

$$S_{MS} = F_a S_s \quad \textbf{(Equation 16-36)}$$

$$S_{M1} = F_v S_1 \quad \textbf{(Equation 16-37)}$$

but S_{MS} shall not be taken less than S_{M1} except when determining the seismic design category in accordance with Section 1613.2.5.

where:

F_a = Site coefficient defined in Table 1613.2.3(1).

F_v = Site coefficient defined in Table 1613.2.3(2).

S_S = The mapped spectral accelerations for short periods as determined in Section 1613.2.1.

S_1 = The mapped spectral accelerations for a 1-second period as determined in Section 1613.2.1.

Where Site Class D is selected as the default site class per Section 1613.2.2, the value of F_a shall be not less than 1.2. Where the simplified design procedure of ASCE 7 Section 12.14 is used, the value of F_a shall be determined in accordance with ASCE 7 Section 12.14.8.1, and the values of F_v, S_{MS} and S_{M1} need not be determined.

1613.2.4 Design spectral response acceleration parameters. Five-percent damped design spectral response acceleration at short periods, S_{DS}, and at 1-second period, S_{D1}, shall be determined from Equations 16-38 and 16-39, respectively:

$$S_{DS} = \frac{2}{3} S_{MS} \quad \textbf{(Equation 16-38)}$$

$$S_{D1} = \frac{2}{3} S_{M1} \quad \textbf{(Equation 16-39)}$$

where:

S_{MS} = The maximum considered earthquake spectral response accelerations for short period as determined in Section 1613.2.3.

S_{M1} = The maximum considered earthquake spectral response accelerations for 1-second period as determined in Section 1613.2.3.

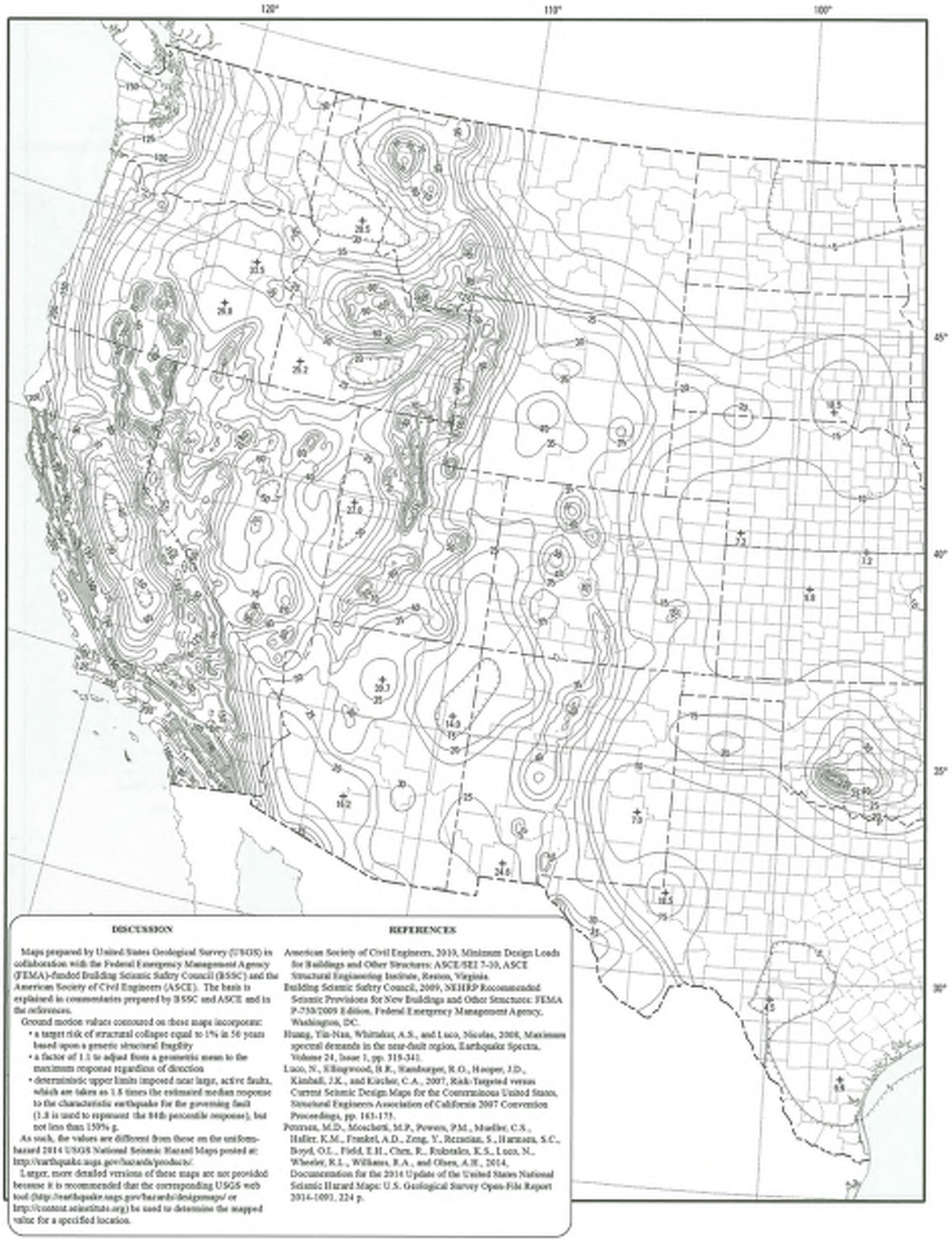

FIGURE 1613.2.1(1)
RISK-TARGETED MAXIMUM CONSIDERED EARTHQUAKE (MCE_R) GROUND MOTION RESPONSE ACCELERATIONS FOR THE CONTERMINOUS UNITED STATES OF 0.2-SECOND SPECTRAL RESPONSE ACCELERATION (5% OF CRITICAL DAMPING)

(continued)

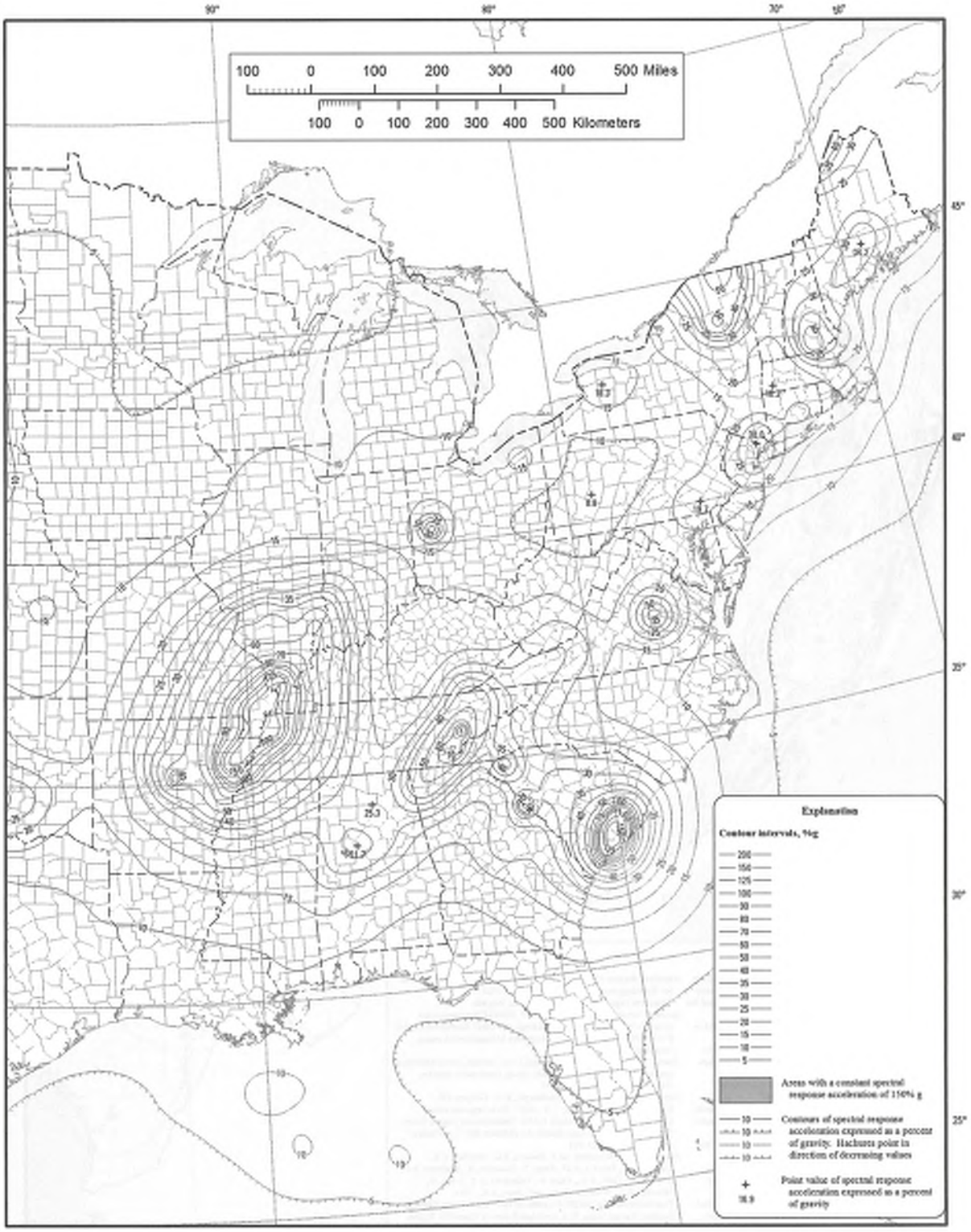

FIGURE 1613.2.1(1)—continued
RISK-TARGETED MAXIMUM CONSIDERED EARTHQUAKE (MCE_R) GROUND MOTION RESPONSE ACCELERATIONS FOR THE CONTERMINOUS UNITED STATES OF 0.2-SECOND SPECTRAL RESPONSE ACCELERATION (5% OF CRITICAL DAMPING)

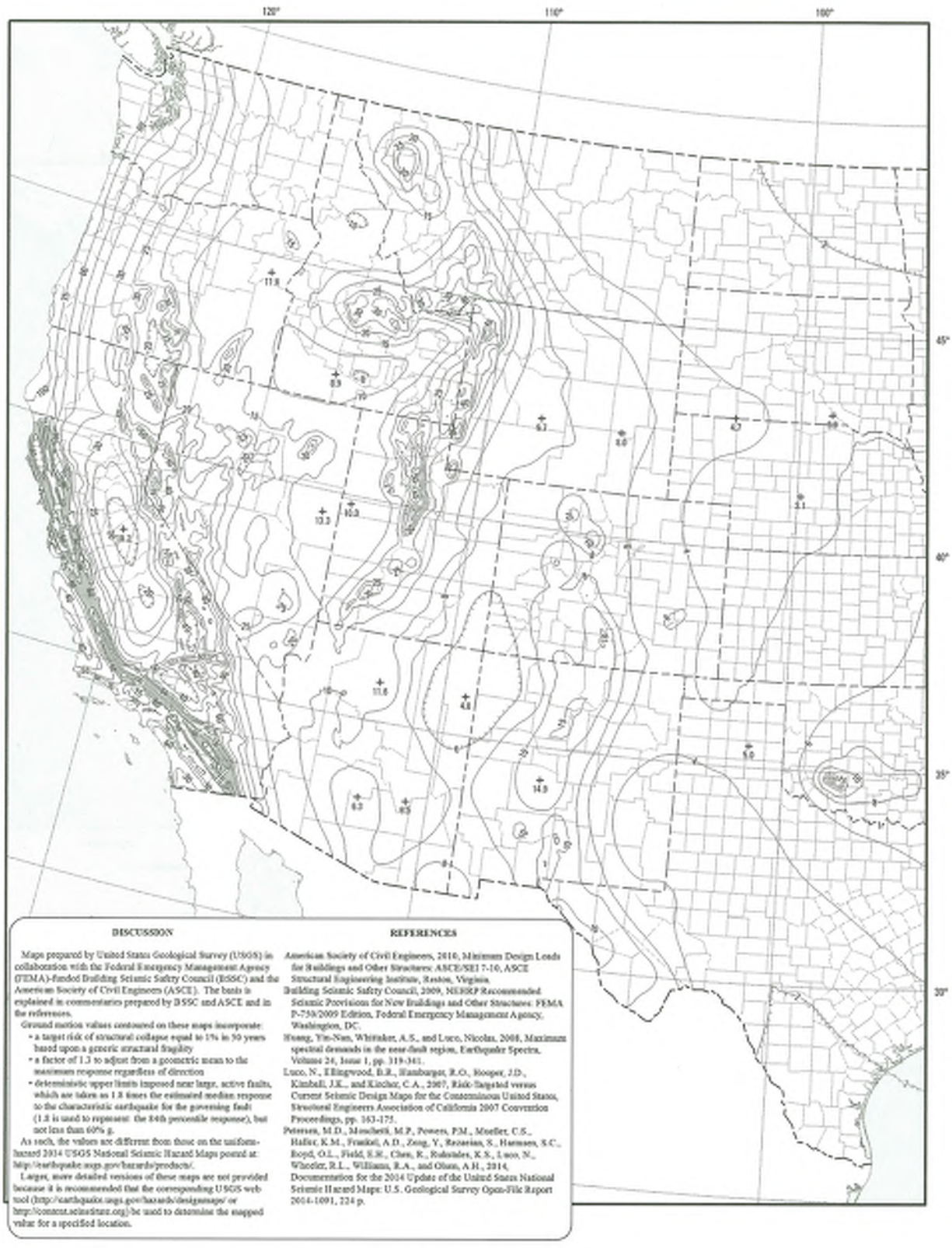

FIGURE 1613.2.1(2)
RISK-TARGETED MAXIMUM CONSIDERED EARTHQUAKE (MCE_R) GROUND MOTION RESPONSE ACCELERATIONS FOR THE CONTERMINOUS UNITED STATES OF 1-SECOND SPECTRAL RESPONSE ACCELERATION (5% OF CRITICAL DAMPING)

(continued)

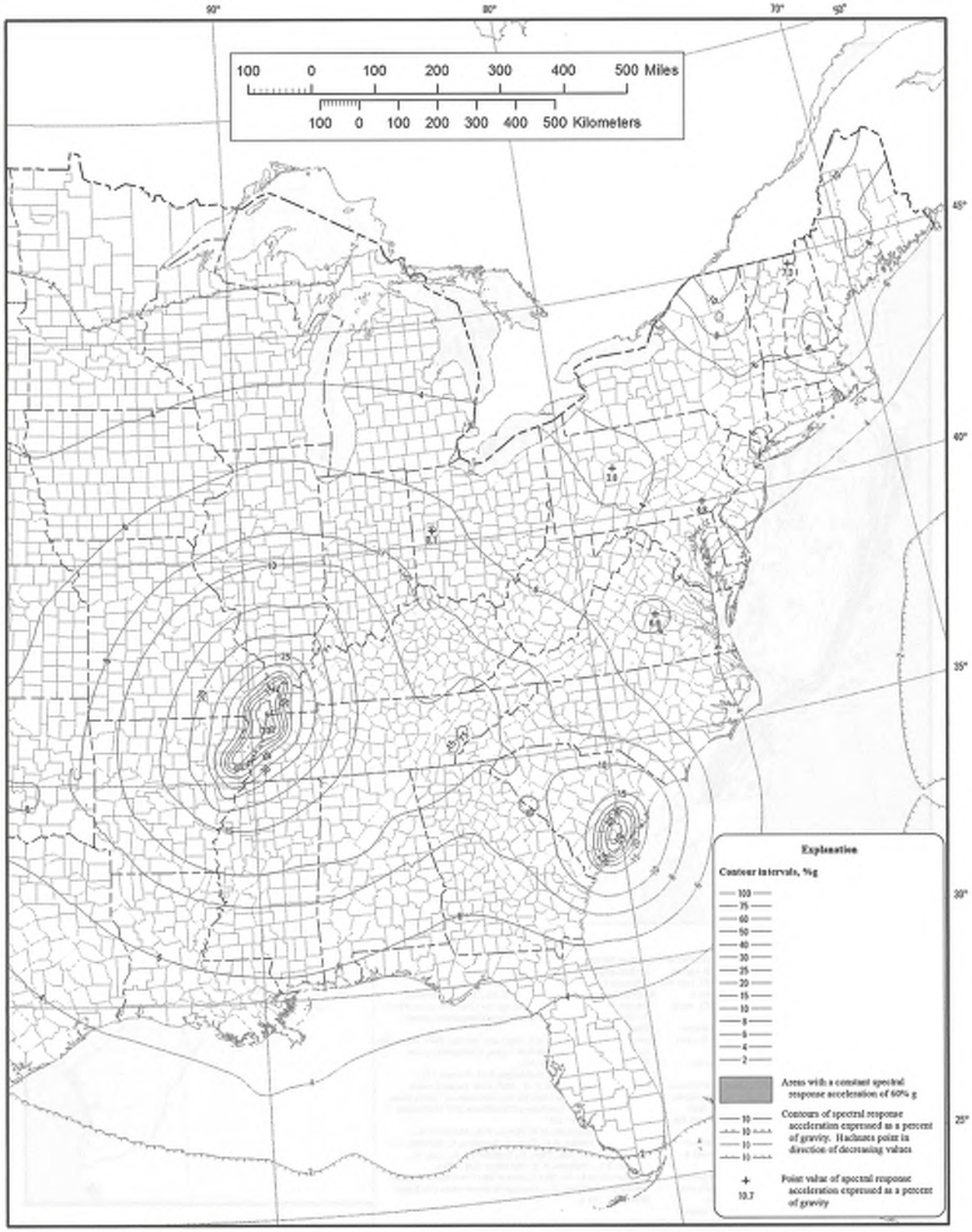

FIGURE 1613.2.1(2)—continued
RISK-TARGETED MAXIMUM CONSIDERED EARTHQUAKE (MCE_R) GROUND MOTION RESPONSE ACCELERATIONS FOR THE CONTERMINOUS UNITED STATES OF 1-SECOND SPECTRAL RESPONSE ACCELERATION (5% OF CRITICAL DAMPING)

TABLE 1613.2.3(1)
VALUES OF SITE COEFFICIENT F_a [a]

SITE CLASS	MAPPED RISK TARGETED MAXIMUM CONSIDERED EARTHQUAKE (MCE_R) SPECTRAL RESPONSE ACCELERATION PARAMETER AT SHORT PERIOD					
	$S_s \leq 0.25$	$S_s = 0.50$	$S_s = 0.75$	$S_s = 1.00$	$S_s = 1.25$	$S_s \geq 1.5$
A	0.8	0.8	0.8	0.8	0.8	0.8
B	0.9	0.9	0.9	0.9	0.9	0.9
C	1.3	1.3	1.2	1.2	1.2	1.2
D	1.6	1.4	1.2	1.1	1.0	1.0
E	2.4	1.7	1.3	Note b	Note b	Note b
F	Note b	Note b	Note b	Note b	Note b	Note b

a. Use straight-line interpolation for intermediate values of mapped spectral response acceleration at short period, S_s.
b. Values shall be determined in accordance with Section 11.4.8 of ASCE 7.

TABLE 1613.2.3(2)
VALUES OF SITE COEFFICIENT F_v [a]

SITE CLASS	MAPPED RISK TARGETED MAXIMUM CONSIDERED EARTHQUAKE (MCE_R) SPECTRAL RESPONSE ACCELERATION PARAMETER AT 1-SECOND PERIOD					
	$S_1 \leq 0.1$	$S_1 = 0.2$	$S_1 = 0.3$	$S_1 = 0.4$	$S_1 = 0.5$	$S_1 \geq 0.6$
A	0.8	0.8	0.8	0.8	0.8	0.8
B	0.8	0.8	0.8	0.8	0.8	0.8
C	1.5	1.5	1.5	1.5	1.5	1.4
D	2.4	2.2[c]	2.0[c]	1.9[c]	1.8[c]	1.7[c]
E	4.2	3.3[c]	2.8[c]	2.4[c]	2.2[c]	2.0[c]
F	Note b	Note b	Note b	Note b	Note b	Note b

a. Use straight-line interpolation for intermediate values of mapped spectral response acceleration at 1-second period, S_1.
b. Values shall be determined in accordance with Section 11.4.8 of ASCE 7.

1613.2.5 Determination of seismic design category. Structures classified as *Risk Category* I, II or III that are located where the mapped spectral response acceleration parameter at 1-second period, S_1, is greater than or equal to 0.75 shall be assigned to *Seismic Design Category* E. Structures classified as *Risk Category* IV that are located where the mapped spectral response acceleration parameter at 1-second period, S_1, is greater than or equal to 0.75 shall be assigned to *Seismic Design Category* F. Other structures shall be assigned to a *seismic design category* based on their *risk category* and the design spectral response acceleration parameters, S_{DS} and S_{D1}, determined in accordance with Section 1613.2.4 or the site-specific procedures of ASCE 7. Each building and structure shall be assigned to the more severe *seismic design category* in accordance with Table 1613.2.5(1) or 1613.2.5(2), irrespective of the fundamental period of vibration of the structure, T.

1613.2.5.1 Alternative seismic design category determination. Where S_1 is less than 0.75, the *seismic design category* is permitted to be determined from Table 1613.2.5(1) alone where all of the following apply:

1. In each of the two orthogonal directions, the approximate fundamental period of the structure, T_a, in each of the two orthogonal directions determined in accordance with Section 12.8.2.1 of ASCE 7, is less than 0.8 T_s determined in accordance with Section 11.8.6 of ASCE 7.
2. In each of the two orthogonal directions, the fundamental period of the structure used to calculate the story drift is less than T_s.
3. Equation 12.8-2 of ASCE 7 is used to determine the seismic response coefficient, C_s.
4. The diaphragms are rigid or are permitted to be idealized as rigid in accordance with Section 12.3.1 of ASCE 7 or, for diaphragms permitted to be idealized as flexible in accordance with Section 12.3.1 of ASCE 7, the distances between vertical elements of the seismic force-resisting system do not exceed 40 feet (12 192 mm).

TABLE 1613.2.5(1)
SEISMIC DESIGN CATEGORY BASED ON SHORT-PERIOD (0.2 second) RESPONSE ACCELERATION

VALUE OF S_{DS}	RISK CATEGORY		
	I or II	III	IV
$S_{DS} < 0.167g$	A	A	A
$0.167g \le S_{DS} < 0.33g$	B	B	C
$0.33g \le S_{DS} < 0.50g$	C	C	D
$0.50g \le S_{DS}$	D	D	D

TABLE 1613.2.5(2)
SEISMIC DESIGN CATEGORY BASED ON 1-SECOND PERIOD RESPONSE ACCELERATION

VALUE OF S_{D1}	RISK CATEGORY		
	I or II	III	IV
$S_{D1} < 0.067g$	A	A	A
$0.067g \le S_{D1} < 0.133g$	B	B	C
$0.133g \le S_{D1} < 0.20g$	C	C	D
$0.20g \le S_{D1}$	D	D	D

1613.2.5.2 Simplified design procedure. Where the alternate simplified design procedure of ASCE 7 is used, the *seismic design category* shall be determined in accordance with ASCE 7.

1613.3 Ballasted photovoltaic panel systems. Ballasted, roof-mounted *photovoltaic panel systems* need not be rigidly attached to the roof or supporting structure. Ballasted nonpenetrating systems shall be designed and installed only on roofs with slopes not more than one unit vertical in 12 units horizontal. Ballasted nonpenetrating systems shall be designed to resist sliding and uplift resulting from lateral and vertical forces as required by Section 1605, using a coefficient of friction determined by acceptable engineering principles. In structures assigned to *Seismic Design Category* C, D, E or F, ballasted nonpenetrating systems shall be designed to accommodate seismic displacement determined by nonlinear response-history or other approved analysis or shake-table testing, using input motions consistent with ASCE 7 lateral and vertical seismic forces for nonstructural components on roofs.

1613.4 Modifications to ASCE 7. The text of ASCE 7 shall be modified as indicated in Sections 1613.5.1 through 1613.5.14.

1613.4.1 ASCE 7, Section 12.2.3.2, Item e. Modify ASCE 7, Section 12.2.3.2, *Two-Stage Analysis Procedure*, Item e to read as follows:

e. The upper portion is analyzed with the equivalent lateral force or modal response spectrum procedure, and the lower portion is analyzed with the equivalent lateral force procedure. Compliance with Table 12.6-1 shall be based on the height of each portion of the structure analyzed independently.

1613.4.2 ASCE 7, Section 13.1.4, Items 5 and 6. Modify ASCE 7, Section 13.1.4, *Exemptions*, Items 5 and 6 to read as follows:

5. Mechanical and electrical components in *Seismic Design Category* C provided that either
   a. The component Importance factor, I_p, is equal to 1.0 and the component is positively attached to the structure; or
   b. The component weighs 75 pounds (333N) or less or, in the case of a distributed system, 5 lb/ft (73 N/m) or less.
6. Discrete mechanical and electrical components in *Seismic Design Categories* D, E and F that are positively attached to the structure, provided that either
   a. The component weighs 400 pounds (1,779 N) or less, the center of mass is located 4 feet or less above the adjacent floor or roof level, flexible connections are provided between the component and associated ductwork, piping, and conduit, and the component Importance Factor, I_p, is equal to 1.0; or
   b. The component weighs 75 pounds (333 N) or less or, in the case of a distributed system, 5 lb/ft (73 N/m) or less;

1613.4.3 ASCE 7, Table 12.2-1, G.2 and footnote q. Modify ASCE 7, Table 12.2-1, *Design Coefficients and Factors for Seismic Force-Resisting Systems*, Item G.2 and add footnote q as follows:

2. Steel ordinary cantilever column systems	14.1	1 3/4	1 1/4	1 3/4	35	35	NP[q]	NP[q]	NP[q]

q. Single-story steel ordinary cantilever column systems in structures assigned to *Seismic Design Category* D, E or F are permitted in penthouse structures not exceeding 20 feet (6096 mm) in height and in single-story buildings up to a structural height, h_n, of

35 feet (10 668 mm), provided that the total effective seismic weight tributary to the roof, including the weight of walls, does not exceed 20 psf (0.96 kN/m^2). The weight of the wall included in the 20 psf (0.96 kN/m^2) previously noted shall be the seismic weight of the wall tributary to the roof, divided by the roof area.

1613.4.4 ASCE 7, Table 12.2-1 footnote j. Modify ASCE 7, Table 12.2-1, *Design Coefficients and Factors for Seismic Force-Resisting Systems*, footnote j to read as follows:

j. Steel ordinary concentrically braced frames are permitted in penthouses not exceeding 20 feet (6096 mm) in height and in single-story buildings up to a structural height, h_n, of 60 feet (18 288 mm), provided that the total effective seismic weight tributary to the roof, including the weight of walls, does not exceed 20 psf (0.96 kN/m^2). The weight of the wall included in the 20 psf (0.96 kN/m^2) previously noted shall be the seismic weight of the wall tributary to the roof, divided by the roof area. In addition, the weight of the exterior wall more than 35 feet (10 668 mm) above the base and tributary to the braced frame shall not exceed 20 psf (0.96 kN/m^2).

1613.4.5 ASCE 7, Section 12.2.5.4. Modify ASCE 7, Section 12.2.5.4, *Increased Structural Height Limit for Steel Eccentrically Braced Frames, Steel Special Concentrically Braced Frames, Steel Buckling-Restrained Braced Frames, Steel Special Plate Shear Walls, and Special Reinforced Concrete Shear Walls*, by adding the following exception:

Exception: For application of the provisions in this section only, stories where the story drift ratio measured at the extreme corners of the diaphragm does not exceed 0.25 percent need not be considered in the determination of horizontal structural irregularity Type 1b in Table 12.3-1.

1613.4.6 ASCE 7, Section 12.2.5.6. Modify ASCE 7, Section 12.2.5.6, *Steel Ordinary Moment Frames*.

1613.4.6.1 ASCE 7, Section 12.2.5.6.1, Item a. Modify ASCE 7, Section 12.2.5.6.1, *Seismic Design Category D or E*, Item a to read as follows:

a. Single-story steel ordinary moment frames in structures assigned to *Seismic Design Category* D or E are permitted in penthouses not exceeding 20 feet (6096 mm) in height and in buildings up to a structural height, h_n, of 65 feet (19 812 mm), provided that the total effective seismic weight tributary to the roof, including the weight of walls, does not exceed 20 psf (0.96 kN/m^2). The weight of the wall included in the 20 psf (0.96 kN/m^2) previously noted shall be the seismic weight of the wall tributary to the roof, divided by the roof area. In addition, the weight of the exterior wall more than 35 feet (10 668 mm) above the base and tributary to the moment frame shall not exceed 20 psf (0.96 kN/m^2).

Exception: Single-story structures with steel ordinary moment frames whose purpose is to enclose equipment or machinery (including cranes) and whose occupants are engaged in maintenance or monitoring of that equipment, machinery, or their associated processes shall be permitted to be of unlimited height, provided that the total effective seismic weight tributary to the roof, including contribution from walls, equipment or machinery, does not exceed 20 psf (0.96 kN/m^2). In addition, the dead load of the exterior wall system, including exterior columns more than 35 feet (10 668 mm) above the base, shall not exceed 20 psf (0.96 kN/ m^2). For determining compliance with effective seismic weight limitations of the roof and exterior walls, equipment and machinery, including cranes, not self-supporting for all loads, shall be treated as fully tributary to either the roof or adjacent exterior wall (but not both) where located in an exterior bay, or as fully tributary to the adjacent roof where located in an interior bay. The tributary area used for weight distribution of equipment and machinery shall not exceed 600 square feet (56 m^2).

1613.4.6.2 ASCE 7, Section 12.2.5.6.2. Modify ASCE 7, Section 12.2.5.6, *Seismic Design Category F*, to read as follows:

Single-story steel ordinary moment frames in structures assigned to *Seismic Design Category* F are permitted in penthouses not exceeding 20 feet (6096 mm) in height and in buildings up to a structural height, h_n, of 65 feet (19 812 mm), provided that the total effective seismic weight tributary to the roof, including the weight of walls, does not exceed 20 psf (0.96kN/m^2). The weight of the wall included in the 20 psf (0.96 kN/ m^2) previously noted shall be the seismic weight of the wall tributary to the roof, divided by the roof area. In addition, the weight of the exterior wall more than 35 feet (10 668 mm) above the base and tributary to the moment frame shall not exceed 20 psf (0.96 kN/m^2).

1613.4.7 ASCE 7, Section 12.2.5.7. Modify ASCE 7, Section 12.2.5.7, *Steel Intermediate Moment Frames*, according to Sections 1613.5.7.1 through 1613.5.7.3.

1613.4.7.1 ASCE 7, Section 12.2.5.7.1, Item a. Modify ASCE 7, Section 12.2.5.7.1, *Seismic Design Category D*, Item a, to read as follows:

a. Single-story steel intermediate moment frames in structures assigned to *Seismic Design Category* D are permitted in penthouses not exceeding 20 feet (6096 mm) in height and in buildings up to a structural height, h_n, of 65 feet (19 812 mm), provided that the total effective seismic weight tributary to the roof, including the weight of walls, does not exceed 20 psf (0.96 kN/m^2). The weight of the wall included in the 20 psf (0.96 kN/m^2) previously noted shall be the seismic weight of the wall tributary to the roof, divided by the roof area. In addition, the weight of the exterior wall more than 35 feet (10 668 mm) above the base

and tributary to the moment frame shall not exceed 20 psf (0.96 kN/m^2).

Exception: Single-story structures with steel intermediate moment frames whose purpose is to enclose equipment or machinery (including cranes) and whose occupants are engaged in maintenance or monitoring of that equipment, machinery or their associated processes, shall be permitted to be of unlimited height, provided that the total effective seismic weight tributary to the roof, including contribution from walls, equipment or machinery, does not exceed 20 psf (0.96 kN/m^2). In addition, the dead load of the exterior wall system, including exterior columns more than 35 feet (10 668 mm) above the base, shall not exceed 20 psf (0.96 kN/ m^2). For determining compliance with effective seismic weight limitations of the roof and exterior walls, equipment and machinery, including cranes, not self-supporting for all loads, shall be treated as fully tributary to either the roof or adjacent exterior wall (but not both) where located in an exterior bay, or as fully tributary to the adjacent roof where located in an interior bay. The tributary area used for weight distribution of equipment and machinery shall not exceed 600 square feet (56 m^2).

1613.4.7.2 ASCE 7, Section 12.2.5.7.2, Item a. Modify ASCE 7, Section 12.2.5.7.2, *Seismic Design Category E*, Item a, to read as follows:

a. Single-story steel intermediate moment frames in structures assigned to *Seismic Design Category* E are permitted in penthouses not exceeding 20 feet (6096 mm) in height and in buildings up to a structural height, h_n, of 65 feet (19 812 mm), provided that the total effective seismic weight tributary to the roof, including the weight of walls, does not exceed 20 psf (0.96 kN/m^2). The weight of the wall included in the 20 psf (0.96 kN/m^2) previously noted shall be the seismic weight of the wall tributary to the roof, divided by the roof area. In addition, the weight of the exterior wall more than 35 feet (10 668 mm) above the base and tributary to the moment frame shall not exceed 20 psf (0.96 kN/m^2).

Exception: Single-story structures with steel intermediate moment frames whose purpose is to enclose equipment or machinery (including cranes) and whose occupants are engaged in maintenance or monitoring of that equipment, machinery or their associated processes shall be permitted to be of unlimited height, provided that the total effective seismic weight tributary to the roof, including contribution from walls, equipment or machinery, does not exceed 20 psf (0.96 kN/m^2). In addition, the dead load of the exterior wall system, including exterior columns more than 35 feet (10 668 mm) above the base, shall not exceed 20 psf (0.96 kN/ m^2). For determining compliance with effective seismic weight limitations of the roof and exterior walls, equipment and machinery, including cranes, not self-supporting for all loads, shall be treated as fully tributary to either the roof or adjacent exterior wall (but not both) where located in an exterior bay, or as fully tributary to the adjacent roof where located in an interior bay. The tributary area used for weight distribution of equipment and machinery shall not exceed 600 square feet (56 m^2).

1613.4.7.3 ASCE 7, Section 12.2.5.7.3, Item a. Modify ASCE 7, Section 12.2.5.7.3, *Seismic Design Category F*, Item a, to read as follows:

a. Single-story steel intermediate moment frames in structures assigned to *Seismic Design Category* F are permitted in penthouses not exceeding 20 feet (6096 mm) in height and in buildings up to a structural height, h_n, of 65 feet (19 812 mm), provided that the total effective seismic weight tributary to the roof, including the weight of walls, does not exceed 20 psf (0.96 kN/m^2). The weight of the wall included in the 20 psf (0.96 kN/m^2) previously noted shall be the seismic weight of the wall tributary to the roof, divided by the roof area. In addition, the weight of the exterior wall more than 35 feet (10 668 mm) above the base and tributary to the moment frame shall not exceed 20 psf (0.96 kN/m^2).

1613.4.8 ASCE 7, Section 12.3.3.1. Modify ASCE 7, Section 12.3.3.1, *Prohibited Horizontal and Vertical Irregularities for Seismic Design Categories D through F*, by adding the following exception:

Exception: For application of the provisions in this section only, stories where the story drift ratio measured at the extreme corners of the diaphragm does not exceed 0.25 percent need not be considered in the determination of horizontal structural irregularity Type 1b in Table 12.3-1.

1613.4.9 ASCE 7, Section 12.7.2, Item 1. Modify ASCE 7, Section 12.7.2, *Effective Seismic Weight*, Item 1, to read as follows:

1. In areas used for storage or in library stack rooms, a minimum of 25 percent of the floor live load shall be included.

   Exceptions:

   a. Where the inclusion of storage loads or library stack loads adds not more than 5 percent to the effective seismic weight at that level, it need not be included in the effective seismic weight.

   b. Floor live load in public garages and open parking structures need not be included.

1613.4.10 ASCE 7, Section 12.14.8.1, Item 1. Modify ASCE 7, Section 12.14.8.1, *Seismic Base Shear*, Item 1, to read as follows:

1. In areas used for storage or in library stack rooms, a minimum of 25 percent of the floor live load shall be included.

   Exceptions:

   a. Where the inclusion of storage loads or library stack loads adds not more than 5 percent to the effective seismic weight at that level, it need not be included in the effective seismic weight.

   b. Floor live load in public garages and open parking structures need not be included.

1613.4.11 ASCE 7, Section 13.5.6.2.2, Item c. Modify ASCE 7, Section 13.5.6.2.2, *Seismic Design Category D through F*, by adding an Item c to read as follows:

c. For ceiling areas exceeding 1,000 square feet (93 m^2), horizontal restraint of the ceiling to the structural system shall be provided.

1613.4.12 ASCE 7, Section 15.4.3. Modify ASCE 7, Section 15.4.3, *Loads*, to read as follows:

The seismic effective weight, *W*, for nonbuilding structures shall include the dead load and other loads as defined for structures in Section 12.7.2. For purposes of calculating design seismic forces in nonbuilding structures, *W* also shall include all normal operating contents for items such as tanks, vessels, bins, hoppers and the contents of piping. *W* shall include 20 percent of snow or ice loads where the flat roof snow load, P_f, or weight of ice, D_i, exceeds 30 psf (1.44 kN/m^2), regardless of actual roof or top of structure slope.

1613.4.13 ASCE 7, Section 21.3. Modify ASCE 7, Section 21.3, *Design Response Spectrum*, to read as follows:

The design spectral response acceleration at any period shall be determined from Equation (21.3-1):

$$S_a = {}^2/_3 S_{aM} \qquad (21.3\text{-}1)$$

where S_{aM} is the MCE spectral response acceleration obtained from Section 21.1 or 21.2.

The design spectral response acceleration at any period shall not be taken as less than 80 percent of *Sa* determined in accordance with Section 11.4.6, where F_a and F_v are determined as follows:

(i) For Site Classes A, B, and C: F_a and F_v are determined using Tables 11.4-1 and 11.4-2, respectively;

(ii) For Site Class D: F_a is determined using Table 11.4-1, and F_v is taken as 2.4 for $S_1 < 0.2$ or 2.5 for $S_1 \geq 0.2$; and

(iii) For Site Class E: F_a is determined using Table 11.4-1 for $S_s < 1.0$ or taken as 1.0 for $S_s \geq 1.0$, and F_v is taken as 4.2 for $S_1 \leq 0.1$ or 4.0 for $S_1 > 0.1$.

Exception: For Site Classes D and E, the value of F_v may be determined using straight-line interpolation between the value determined from ASCE 7, Section 21.3, without the provisions of this exception and the value determined from Table 1613.2.3(2) in the *Building Code*, based on the relative hazard contribution from the Cascadia Subduction Zone interface sources. The values of F_v from ASCE 7, Section 21.3, without the provisions of this exception and Table 1613.2.3(2) in the *Building Code*, shall be associated with a relative hazard contribution from the Cascadia Subduction Zone interface sources of zero (0) percent and 100 percent, respectively. The relative hazard contribution shall be determined using the USGS Unified Hazard Tool and the 2014 National Seismic Hazard Map model data for the 2-percent probability of occurrence in 50-year hazard, a spectral period of one (1) second and the soil site class for the site. All Cascadia Subduction Zone interface sources shall be summed and divided by the sum of the deaggregated hazards, which contribute a minimum of 1 percent to the hazard. A site-specific probabilistic seismic hazard analysis (PSHA) at spectral periods greater than 1 second that are consistent with the first modal period of the structure can substitute the USGS Unified Hazard Tool where geotechnical peer review is included in the project.

For sites classified as Site Class F requiring site-specific analysis in accordance with Section 11.4.7, the design spectral response acceleration at any period shall not be less than 80 percent of S_a, determined for site class E in accordance with Section 11.4.5.

Exception: Where a different site class can be justified using the site-specific classification procedures in accordance with Section 20.3.3, a lower limit of 80 percent of S_a, for the justified site class shall be permitted to be used.

1613.4.14 ASCE 7, Section 31.6.1.2. Modify ASCE 7, Section 31.6.1.2, *Peer Review Requirements for Wind Tunnel Tests of Roof-Mounted Solar Connectors,* last paragraph to read as follows:

The peer reviewer shall submit a written report to the authority having jurisdiction and the client. The report shall include, at a minimum, statements regarding the following: scope of peer review with limitations defined; status of wind tunnel test at the time of review; conformance of wind tunnel study with requirements of ASCE 49 and Section 31.6.1; conclusion of the reviewer identifying areas that need further review, investigation and/or clarification; recommendations; and whether in the reviewer's opinion, the wind loads derived from the wind tunnel study have correctly been applied to the specific situation/project and are in conformance with ASCE 7 for the intended use(s).

1613.5 Earthquake recording instrumentation. In *Seismic Design Category* D, E or F, every new building over six stories above grade in height with an aggregate floor area of 60,000 square feet (5574 m^2) or more, and every new building over 10 stories in height regardless of the floor area, shall be provided with an approved system with not less than three

approved recording accelerographs. The accelerographs shall be interconnected for common start and common timing.

Exception: In lieu of installing the earthquake recording instrumentation as outlined in this section, the applicant is permitted to make a deposit of an equivalent cost to the Earthquake Recording Instrument Fund in the Oregon Department of Geology and Mineral Industries (DOGAMI). Proof of this deposit shall be provided to the *building official*.

1613.5.1 Location. The instruments shall be located in the lowest floor level, midportion, and near the top of the building. (Upper-level instruments shall be positioned to record earthquake motions at mutually orthogonal directions; for example, N-S and E-W directions.) Each instrument shall be located so that access is maintained at all times and is unobstructed by room contents. A sign stating "MAINTAIN CLEAR ACCESS TO THIS INSTRUMENT" shall be posted in a conspicuous location. Agents of DOGAMI are considered deputies of the *building official* with jurisdiction and shall have access to accelerographs. If access to accelerographs is denied, DOGAMI shall have recourse to remedies provided by law.

1613.5.2 Maintenance. Maintenance and service of the instruments shall be provided by the owner of the building, subject to the approval of the *building official* and DOGAMI. Data produced by the instruments shall be made available to the *building official* on request.

1613.5.3 Records. Noninterpretive seismic data recorded by the accelerographs shall be filed with DOGAMI. Copies of individual records shall be made available by DOGAMI to the public on request and payment of an appropriate fee.

Note: Where strong motion accelerographs are required and installed in a building, the *building official* shall notify DOGAMI and indicate the address and location of the accelerographs within the building. DOGAMI can be reached at: 800 NE Oregon St., Suite 965, Portland, OR 97232.

SECTION 1614
ATMOSPHERIC ICE LOADS

1614.1 General. Ice-sensitive structures shall be designed for atmospheric ice loads in accordance with Chapter 10 of ASCE 7.

SECTION 1615
TSUNAMI LOADS

1615.1 Reserved. See Appendix O.

SECTION 1616
STRUCTURAL INTEGRITY

1616.1 General. *High-rise buildings* that are assigned to *Risk Category* III or IV shall comply with the requirements of Section 1616.2 if they are frame structures, or Section 1616.3 if they are bearing wall structures.

1616.2 Frame structures. Frame structures shall comply with the requirements of this section.

1616.2.1 Concrete frame structures. Frame structures constructed primarily of reinforced or prestressed concrete, either cast-in-place or precast, or a combination of these, shall conform to the requirements of Section 4.10 of ACI 318. Where ACI 318 requires that nonprestressed reinforcing or prestressing steel pass through the region bounded by the longitudinal column reinforcement, that reinforcing or prestressing steel shall have a minimum nominal tensile strength equal to two-thirds of the required one-way vertical strength of the connection of the floor or roof system to the column in each direction of beam or slab reinforcement passing through the column.

Exception: Where concrete slabs with continuous reinforcement having an area not less than 0.0015 times the concrete area in each of two orthogonal directions are present and are either monolithic with or equivalently bonded to beams, girders or columns, the longitudinal reinforcing or prestressing steel passing through the column reinforcement shall have a nominal tensile strength of one-third of the required one-way vertical strength of the connection of the floor or roof system to the column in each direction of beam or slab reinforcement passing through the column.

1616.2.2 Structural steel, open web steel joist or joist girder, or composite steel and concrete frame structures. Frame structures constructed with a structural steel frame or a frame composed of open web steel joists, joist girders with or without other structural steel elements or a frame composed of composite steel or composite steel joists and reinforced concrete elements shall conform to the requirements of this section.

1616.2.2.1 Columns. Each column splice shall have the minimum design strength in tension to transfer the design dead and live load tributary to the column between the splice and the splice or base immediately below.

1616.2.2.2 Beams. End connections of all beams and girders shall have a minimum nominal axial tensile strength equal to the required vertical shear strength for *allowable stress design* (ASD) or two-thirds of the required shear strength for *load and resistance factor design* (LRFD) but not less than 10 kips (45 kN). For the purpose of this section, the shear force and the axial tensile force need not be considered to act simultaneously.

Exception: Where beams, girders, open web joist and joist girders support a concrete slab or concrete slab on metal deck that is attached to the beam or girder with not less than $^3/_8$-inch-diameter (9.5 mm) headed shear studs, at a spacing of not more than 12 inches (305 mm) on center, averaged over the length of the member, or other attachment having equivalent shear strength, and the slab contains continuous distributed reinforcement in each of two orthogonal directions with an area not less than 0.0015 times the