(Effective until March 15, 2024)

WAC 51-50-1613 Section 1613—Earthquake loads.

1613.4 Amendments to ASCE 7. The provisions of Section 1613.4 shall be permitted as an amendment to the relevant provisions of ASCE 7. The text of ASCE 7 shall be amended as indicated in Sections 1613.4.1 through 1613.4.2.

1613.4.1 ASCE 7 Section 12.2.5.4. Amend ASCE 7 Section 12.2.5.4 as follows:

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. The limits on height, h_n, in Table 12.2-1 are permitted to be increased from 160 ft (50 m) to 240 ft (75 m) for structures assigned to Seismic Design Categories D or E and from 100 ft (30 m) to 160 ft (50 m) for structures assigned to Seismic Design Category F, provided that the seismic force-resisting systems are limited to steel eccentrically braced frames, steel special concentrically braced frames, steel buckling-restrained braced frames, steel special plate shear walls, or special reinforced concrete cast-in-place shear walls and all of the following requirements are met:

1. The structure shall not have an extreme torsional irregularity as defined in Table 12.3-1 (horizontal structural irregularity Type 1b).
2. The steel eccentrically braced frames, steel special concentrically braced frames, steel buckling-restrained braced frames, steel special plate shear walls or special reinforced concrete shear walls in any one plane shall resist no more than 60 percent of the total seismic forces in each direction, neglecting accidental torsional effects.
3. Where floor and roof diaphragms transfer forces from the vertical seismic force-resisting elements above the diaphragm to other vertical force-resisting elements below the diaphragm, these in-plane transfer forces shall be amplified by the overstrength factor, Ω_o for the design of the diaphragm flexure, shear, and collectors.
4. The earthquake force demands in foundation mat slabs, grade beams, and pile caps supporting braced frames and/or walls arranged to form a shear-resisting core shall be amplified by 2 for shear and 1.5 for flexure. The redundancy factor, ρ, applies and shall be the same as that used for the structure in accordance with Section 12.3.4.
5. The earthquake shear force demands in special reinforced concrete shear walls shall be amplified by the over-strength factor, Ω_o.

1613.4.2 ASCE 7 Section 12.6. Amend ASCE 7 Section 12.6 and Table 12.6-1 to read as follows:

12.6 ANALYSIS PROCEDURE SELECTION

12.6.1 Analysis procedure. The structural analysis required by Chapter 12 shall consist of one of the types permitted in Table 12.6-1, based on the structure's seismic design category, structural system, dynamic properties, and regularity, or with the approval of the authority having jurisdiction, an alternative generally accepted procedure is permitted to be used. The analysis procedure selected shall be completed in accordance with the requirements of the corresponding section referenced in Table 12.6-1.

Table 12.6-1

Permitted Analytical Procedures

Seismic Design Category	Structural Characteristics	Equivalent Lateral Force Procedure, Section 12.8[a]	Modal Response Spectrum Analysis, Section 12.9.1, or Linear Response History Analysis, Section 12.9.2	Nonlinear Response History Procedures, Chapter 16[a]
B, C	All structures	P	P	P
D, E, F	Risk Category I or II buildings not exceeding two stories above the base	P	P	P
	Structures of light frame construction	P	P	P
	Structures with no structural irregularities and not exceeding 160 ft in structural height	P	P	P
	Structures exceeding 160 ft in structural height with no structural irregularities and with $T < 3.5 T_s$	P	P	P
	Structures not exceeding 160 ft in structural height and having only horizontal irregularities of Type 2, 3, 4, or 5 in Table 12.3-1 or vertical irregularities of Type 4, 5a, or 5b in Table 12.3-2	P	P	P
	All other structures ≤ 240 ft in height	NP	P	P
	All structures > 240 ft in height	NP	NP	P[c]

[a] P: Permitted; NP: Not Permitted; $T_s = S_{D1}/S_{DS}$.

[Statutory Authority: RCW 19.27.031 and 19.27.074. WSR 20-21-021, § 51-50-1613, filed 10/9/20, effective 11/9/20; WSR 20-01-090, § 51-50-1613, filed 12/12/19, effective 7/1/20; WSR 19-02-038, § 51-50-1613, filed 12/26/18, effective 7/1/19; WSR 10-03-097, § 51-50-1613, filed 1/20/10, effective 7/1/10. Statutory Authority: RCW 19.27.190, 19.27.020, and chapters 19.27 and 34.05 RCW. WSR 08-01-110, § 51-50-1613, filed 12/18/07, effective 4/1/08.]

(Effective March 15, 2024)

WAC 51-50-1613 Section 1613—Earthquake loads.

1613.4 Amendments to ASCE 7. The provisions of Section 1613.4 shall be permitted as an amendment to the relevant provisions of ASCE 7. The text of ASCE 7 shall be amended as indicated in Sections 1613.4.1 through 1613.4.6.

1613.4.1 ASCE 7 Section 12.2.5.4. Amend ASCE 7 Section 12.2.5.4 as follows:

12.2.5.4 Increased structural height limit for steel eccentrically braced frames, steel special concentrically braced frames, steel buck-

ling-restrained braced frames, steel special plate shear walls, and special reinforced concrete shear walls. The limits on height, h_n, in Table 12.2-1 are permitted to be increased from 160 ft (50 m) to 240 ft (75 m) for structures assigned to Seismic Design Categories D or E and from 100 ft (30 m) to 160 ft (50 m) for structures assigned to Seismic Design Category F, provided that the seismic force-resisting systems are limited to steel eccentrically braced frames, steel special concentrically braced frames, steel buckling-restrained braced frames, steel special plate shear walls, or special reinforced concrete cast-in-place shear walls and all of the following requirements are met:

1. The structure shall not have an extreme torsional irregularity as defined in Table 12.3-1 (horizontal structural irregularity Type 1b).

2. The steel eccentrically braced frames, steel special concentrically braced frames, steel buckling-restrained braced frames, steel special plate shear walls or special reinforced concrete shear walls in any one plane shall resist no more than 60 percent of the total seismic forces in each direction, neglecting accidental torsional effects.

3. Where floor and roof diaphragms transfer forces from the vertical seismic force-resisting elements above the diaphragm to other vertical force-resisting elements below the diaphragm, these in-plane transfer forces shall be amplified by the overstrength factor, Ω_o for the design of the diaphragm flexure, shear, and collectors.

4. The earthquake force demands in foundation mat slabs, grade beams, and pile caps supporting braced frames and/or walls arranged to form a shear-resisting core shall be amplified by 2 for shear and 1.5 for flexure. The redundancy factor, ρ, applies and shall be the same as that used for the structure in accordance with Section 12.3.4.

1613.4.2 ASCE 7 Section 12.6. Amend ASCE 7 Section 12.6 and Table 12.6-1 to read as follows:

12.6 ANALYSIS PROCEDURE SELECTION

12.6.1 Analysis procedure. The structural analysis required by Chapter 12 shall consist of one of the types permitted in Table 12.6-1, based on the structure's seismic design category, structural system, dynamic properties, and regularity, or with the approval of the authority having jurisdiction, an alternative generally accepted procedure is permitted to be used. The analysis procedure selected shall be completed in accordance with the requirements of the corresponding section referenced in Table 12.6-1.

Table 12.6-1

Permitted Analytical Procedures

Seismic Design Category	Structural Characteristics	Equivalent Lateral Force Procedure, Section 12.8[a]	Modal Response Spectrum Analysis, Section 12.9.1, or Linear Response History Analysis, Section 12.9.2	Nonlinear Response History Procedures, Chapter 16[a]
B, C	All structures	P	P	P
D, E, F	Risk Category I or II buildings not exceeding two stories above the base	P	P	P

Seismic Design Category	Structural Characteristics	Equivalent Lateral Force Procedure, Section 12.8[a]	Modal Response Spectrum Analysis, Section 12.9.1, or Linear Response History Analysis, Section 12.9.2	Nonlinear Response History Procedures, Chapter 16[a]
	Structures of light frame construction	P	P	P
	Structures with no structural irregularities and not exceeding 160 ft in structural height	P	P	P
	Structures exceeding 160 ft in structural height with no structural irregularities and with $T < 3.5 T_s$	P	P	P
	Structures not exceeding 160 ft in structural height and having only horizontal irregularities of Type 2, 3, 4, or 5 in Table 12.3-1 or vertical irregularities of Type 4, 5a, or 5b in Table 12.3-2	P	P	P
	All other structures ≤ 240 ft in height	NP	P	P
	All structures > 240 ft in height	NP	NP	P[c]

[a] P: Permitted; NP: Not Permitted; $T_s = S_{D1}/S_{DS}$.

1613.4.3 ASCE 7 Section 11.2. Amend ASCE 7 Section 11.2 to include the following definition:

USGS SEISMIC DESIGN GEODATABASE: A U.S. Geological Survey (USGS) database of geocoded values of seismic design parameters and geocoded sets of multiperiod 5%-damped risk-targeted maximum considered earthquake (MCER) response spectra. The parameters obtained from this database may only be used where referenced by Section 11.4.8.1.

User Note: The USGS Seismic Design Geodatabase is intended to be accessed through a USGS Seismic Design web service that allows the user to specify the site location, by latitude and longitude, and the site class to obtain the seismic design data. The USGS web service spatially interpolates between the gridded data of the USGS geodatabase. Both the USGS geodatabase and the USGS web service can be accessed at https://doi.org/10.5066/F7NK3C76. The USGS Seismic Design Geodatabase is available at the ASCE 7 Hazard Tool https://asce7hazardtool.online/ or an approved equivalent.

1613.4.4 ASCE 7 Section 11.4.8. Amend ASCE 7 Section 11.4.8 to include the following section:

11.4.8.1 Multiperiod design response spectrum. As an alternative to the ground motion hazard analysis requirements of Section 11.4.8, and suitable for all structures other than those designated Site Class F (unless exempted in accordance with Section 20.3.1), a multiperiod design response spectrum may be developed as follows:

1. For exclusive use with the USGS Seismic Design Geodatabase in accordance with this section, the site class shall be determined per Section 20.6.
2. Where a multiperiod design response spectrum is developed in accordance with this section, the parameters S_M, S_{M1}, S_D, S_{D1}, and T_L as obtained by the USGS Seismic Design Geodatabase shall be used for all applications of these parameters in this standard.

3. The S_S and S_1 parameters obtained by the USGS Seismic Design Geodatabase are only permitted to be used in development of the multiperiod design response spectrum and are not permitted to be used in other applications in this standard. The mapped parameters S_S and S_1 as determined by Section 11.4.2 and peak ground acceleration parameter PGA_M as determined by Section 11.8.3 shall be used for all other applications in this standard.

4. At discrete values of period, T, equal to 0.0s, 0.01s, 0.02s, 0.03s, 0.05s, 0.075s, 0.1s, 0.15s, 0.2s, 0.25s, 0.3s, 0.4s, 0.5s, 0.75s, 1.0s, 1.5s, 2.0s, 3.0s, 4.0s, 5.0s, 7.5s, and 10.0s, the 5%-damped design spectral response acceleration parameter, S_a, shall be taken as 2/3 of the multiperiod 5%-damped MCER response spectrum from the USGS Seismic Design Geodatabase for the applicable site class.

5. At each response period, T, less than 10.0s and not equal to one of the discrete values of period, T, listed in Item 4 above, S_a, shall be determined by linear interpolation between values of S_a, of Item 4 above.

6. At each response period, T, greater than 10.0s, S_a shall be taken as the value of S_a at the period of 10.0s, factored by $10/T$, where the value of T is less than or equal to that of the long-period transition period, T_L, and shall be taken as the value of S_a at the period of 10.0s factored by $10T_L/T^2$, where the value of T is greater than that of the long-period transition period, T_L.

7. Where an MCER response spectrum is required, it shall be determined by multiplying the multiperiod design response spectrum by 1.5.

8. For use with the equivalent lateral force procedure, the spectral acceleration S_a at T shall be permitted to replace S_{D1}/T in Equation (12.8-3) and $S_{D1}\ T_L/T^2$ in Equation (12.8-4).

1613.4.5 ASCE 7 Section 20.6. Amend ASCE 7 Chapter 20 to include the following section:

Section 20.6 Site classification procedure for use with Section 11.4.8.1. For exclusive use in determining the multiperiod design response spectrum and associated spectral parameters in accordance with Section 11.4.8.1, the site class shall be determined in accordance with this section. For all other applications in this standard the site class shall be determined per Section 20.1.

20.6.1 Site classification. The site soil shall be classified in accordance with Table 20.6-1 and Section 20.6.2 based on the average shear wave velocity parameter, $\bar{v}_s$, which is derived from the measured shear wave velocity profile from the ground surface to a depth of 100 ft (30 m). Where shear wave velocity is not measured, appropriate generalized correlations between shear wave velocity and standard penetration test (SPT) blow counts, cone penetration test (CPT) tip resistance, shear strength, or other geotechnical parameters shall be used to obtain an estimated shear wave velocity profile, as described in Section 20.6.3. Where site-specific data (measured shear wave velocities or other geotechnical data that can be used to estimate shear wave velocity) are available only to a maximum depth less than 100 ft (30 m), shall be estimated as described in Section 20.6.3.

Where the soil properties are not known in sufficient detail to determine the site class, the most critical site conditions of Site Class C, Site Class CD and Site Class D, as defined in Section 20.6.2, shall be used unless the authority having jurisdiction or geotechnical data determine that Site Class DE, E or F soils are present at the site. Site Classes A and B shall not be assigned to a site if there is more than 10 ft (3.1 m) of soil between the rock surface and the bottom of the spread footing or mat foundation.

20.6.2 Site class definitions. Site class types shall be assigned in accordance with the definitions provided in Table 20.6.2-1 and this section.

20.6.2.1 Soft clay Site Class E. Where a site does not qualify under the criteria for Site Class F per Section 20.3.1 and there is a total thickness of soft clay greater than 10 ft (3 m), where a soft clay layer is defined by s_u<500psf (s_u<25 kPa), $w \geq 40\%$, and $PI > 20$, it shall be classified as Site Class E. This classification is made regardless of $\bar{v}_s$, as computed in Section 20.4.

20.6.2.2 Site Classes C, CD, D, DE and E. The assignment of Site Class C, CD, D, DE and E soils shall be made based on the average shear wave velocity, which is derived from the site shear wave velocity profile from the ground surface to a depth of 100 ft (30 m), as described in Section 20.4.

20.6.2.3 Site Classes B and BC (medium hard and soft rock). Site Class B can only be assigned to a site on the basis of shear wave velocity measured on site. If shear wave velocity data are not available and the site condition is estimated by a geotechnical engineer, engineering geologist, or seismologist as Site Class B or BC on the basis of site geology, consisting of competent rock with moderate fracturing and weathering, the site shall be classified as Site Class BC. Softer and more highly fractured and weathered rock shall either be measured on site for shear wave velocity or classified as Site Class C.

20.6.2.4 Site Class A (hard rock). The hard rock, Site Class A, category shall be supported by shear wave velocity measurement, either on site or on profiles of the same rock type in the same formation with an equal or greater degree of weathering and fracturing. Where hard rock conditions are known to be continuous to a depth of 100 ft (30 m), surficial shear wave velocity measurements to maximum depths less than 100 ft are permitted to be extrapolated to assess $\bar{v}_s$.

Table 20.6.2-1 Site Classification

Site Class	$\bar{v}_s$ Calculated Using Measured or Estimated Shear Wave Velocity Profile (ft/s)
A. Hard Rock	> 5,000
B. Medium Hard Rock	> 3,000 to 5,000
BC. Soft Rock	> 2,100 to 3,000
C. Very Dense Sand or Hard Clay	> 1,450 to 2,100
CD. Dense Sand or Very Stiff Clay	> 1,000 to 1,450
D. Medium Dense Sand or Stiff Clay	> 700 to 1,000
DE. Loose Sand or Medium Stiff Clay	> 500 to 700
E. Very Loose Sand or Soft Clay	≤ 500

20.6.3 Estimation of shear wave velocity profiles. Where measured shear wave velocity data are not available, shear wave velocity shall be estimated as a function of depth using correlations with suitable geotechnical parameters, including standard penetration test (SPT) blow counts, shear strength, overburden pressure, void ratio, or cone penetration test (CPT) tip resistance, measured at the site.

Site class based on estimated values of shall be derived using $\bar{v}_s$, $\bar{v}_s/1.3$, and $1.3\bar{v}_s$ when correlation models are used to derive shear wave velocities. Where correlations derived for specific local regions can be demonstrated to have greater accuracy, factors less than 1.3 can be used if approved by the authority having jurisdiction. If the different average velocities result in different site classes per Table 20.6.2-1, the most critical of the site classes for ground motion analysis at each period shall be used.

Where the available data used to establish the shear wave velocity profile extends to depths less than 100 ft (30 m) but more than 50 ft (15 m), and the site geology is such that soft layers are unlikely to be encountered between 50 and 100 ft, the shear wave velocity of the last layer in the profile shall be extended to 100 ft for the calculation of in Equation (20.4-1). Where the data does not extend to depths of 50 ft (15 m), default site classes, as described in Section 20.6.1, shall be used unless another site class can be justified on the basis of the site geology.

1613.4.6 ASCE 7 Section 21.3.1. Amend ASCE 7 Section 21.3 to include the following section:

Section 21.3.1 Alternate minimum design spectral response accelerations. As an alternate approach to Section 21.3, the lower limit of S_a is permitted to be determined according to this section. The design spectral response acceleration at any period shall not be taken less than 80% of the multiperiod design response spectrum as determined by Section 11.4.8.1.

For sites classified as Site Class F requiring site-specific analysis in accordance with Section 11.4.8, the design spectral response acceleration at any period shall not be less than 80% of S_a determined for Site Class E.

EXCEPTION: Where a different site class can be justified using the site-specific classification procedures in accordance with Section 20.6.2.2, a lower limit of 80% of S_a for the justified site class shall be permitted to be used.

[Statutory Authority: RCW 19.27.031, 19.27.074, and 19.27.540. WSR 23-02-073, 23-12-103, and 23-20-023, § 51-50-1613, filed 1/4/23, 6/7/23, and 9/25/23, effective 3/15/24. Statutory Authority: RCW 19.27.031 and 19.27.074. WSR 20-21-021, § 51-50-1613, filed 10/9/20, effective 11/9/20; WSR 20-01-090, § 51-50-1613, filed 12/12/19, effective 7/1/20; WSR 19-02-038, § 51-50-1613, filed 12/26/18, effective 7/1/19; WSR 10-03-097, § 51-50-1613, filed 1/20/10, effective 7/1/10. Statutory Authority: RCW 19.27.190, 19.27.020, and chapters 19.27 and 34.05 RCW. WSR 08-01-110, § 51-50-1613, filed 12/18/07, effective 4/1/08.]

(Effective March 16, 2024)

WAC 51-50-1613 Section 1613—Earthquake loads.

1613.4 Amendments to ASCE 7. The provisions of Section 1613.4 shall be permitted as an amendment to the relevant provisions of ASCE 7. The text of ASCE 7 shall be amended as indicated in Sections 1613.4.1 through 1613.4.6.

1613.4.1 ASCE 7 Section 12.2.5.4. Amend ASCE 7 Section 12.2.5.4 as follows:

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. The limits on height, h_n, in Table 12.2-1 are permitted to be increased from 160 ft (50 m) to 240 ft (75 m) for structures assigned to Seismic Design Categories D or E and from 100 ft (30 m) to 160 ft (50 m) for structures assigned to Seismic Design Category F, provided that the seismic force-resisting systems are limited to steel eccentrically braced frames, steel special concentrically braced frames, steel buckling-restrained braced frames, steel special plate shear walls, or special reinforced concrete cast-in-place shear walls and all of the following requirements are met:

1. The structure shall not have an extreme torsional irregularity as defined in Table 12.3-1 (horizontal structural irregularity Type 1b).

2. The steel eccentrically braced frames, steel special concentrically braced frames, steel buckling-restrained braced frames, steel special plate shear walls or special reinforced concrete shear walls in any one plane shall resist no more than 60 percent of the total seismic forces in each direction, neglecting accidental torsional effects.

3. Where floor and roof diaphragms transfer forces from the vertical seismic force-resisting elements above the diaphragm to other vertical force-resisting elements below the diaphragm, these in-plane transfer forces shall be amplified by the overstrength factor, Ω_o for the design of the diaphragm flexure, shear, and collectors.

4. The earthquake force demands in foundation mat slabs, grade beams, and pile caps supporting braced frames and/or walls arranged to form a shear-resisting core shall be amplified by 2 for shear and 1.5 for flexure. The redundancy factor, ρ, applies and shall be the same as that used for the structure in accordance with Section 12.3.4.

1613.4.2 ASCE 7 Section 12.6. Amend ASCE 7 Section 12.6 and Table 12.6-1 to read as follows:

12.6 ANALYSIS PROCEDURE SELECTION

12.6.1 Analysis procedure. The structural analysis required by Chapter 12 shall consist of one of the types permitted in Table 12.6-1, based on the structure's seismic design category, structural system, dynamic properties, and regularity, or with the approval of the authority having jurisdiction, an alternative generally accepted procedure is permitted to be used. The analysis procedure selected shall be completed in accordance with the requirements of the corresponding section referenced in Table 12.6-1.

Table 12.6-1

Permitted Analytical Procedures

Seismic Design Category	Structural Characteristics	Equivalent Lateral Force Procedure, Section 12.8[a]	Modal Response Spectrum Analysis, Section 12.9.1, or Linear Response History Analysis, Section 12.9.2	Nonlinear Response History Procedures, Chapter 16[a]
B, C	All structures	P	P	P
D, E, F	Risk Category I or II buildings not exceeding two stories above the base	P	P	P
	Structures of light frame construction	P	P	P
	Structures with no structural irregularities and not exceeding 160 ft in structural height	P	P	P
	Structures exceeding 160 ft in structural height with no structural irregularities and with $T < 3.5T_s$	P	P	P
	Structures not exceeding 160 ft in structural height and having only horizontal irregularities of Type 2, 3, 4, or 5 in Table 12.3-1 or vertical irregularities of Type 4, 5a, or 5b in Table 12.3-2	P	P	P
	All other structures ≤ 240 ft in height	NP	P	P
	All structures > 240 ft in height	NP	NP	P[c]

[a] P: Permitted; NP: Not Permitted; $T_s = S_{D1}/S_{DS}$.

1613.4.3 ASCE 7 Section 11.2. Amend ASCE 7 Section 11.2 to include the following definition:

USGS SEISMIC DESIGN GEODATABASE: A U.S. Geological Survey (USGS) database of geocoded values of seismic design parameters and geocoded sets of multiperiod 5%-damped risk-targeted maximum considered earthquake (MCER) response spectra. The parameters obtained from this database may only be used where referenced by Section 11.4.8.1.

User Note: The USGS Seismic Design Geodatabase is intended to be accessed through a USGS Seismic Design web service that allows the user to specify the site location, by latitude and longitude, and the site class to obtain the seismic design data. The USGS web service spatially interpolates between the gridded data of the USGS geodatabase. Both the USGS geodatabase and the USGS web service can be accessed at https://doi.org/10.5066/F7NK3C76. The USGS Seismic Design Geodatabase is available at the ASCE 7 Hazard Tool https://asce7hazardtool.online/ or an approved equivalent.

1613.4.4 ASCE 7 Section 11.4.8. Amend ASCE 7 Section 11.4.8 to include the following section:

11.4.8.1 Multiperiod design response spectrum. As an alternative to the ground motion hazard analysis requirements of Section 11.4.8, and suitable for all structures other than those designated Site Class F (unless exempted in accordance with Section 20.3.1), a multiperiod design response spectrum may be developed as follows:

1. For exclusive use with the USGS Seismic Design Geodatabase in accordance with this section, the site class shall be determined per Section 20.6.

2. Where a multiperiod design response spectrum is developed in accordance with this section, the parameters S_M, S_{M1}, S_D, S_{D1}, and T_L as obtained by the USGS Seismic Design Geodatabase shall be used for all applications of these parameters in this standard.

3. The S_S and S_1 parameters obtained by the USGS Seismic Design Geodatabase are only permitted to be used in development of the multiperiod design response spectrum and are not permitted to be used in other applications in this standard. The mapped parameters S_S and S_1 as determined by Section 11.4.2 and peak ground acceleration parameter PGA_M as determined by Section 11.8.3 shall be used for all other applications in this standard.

4. At discrete values of period, T, equal to 0.0s, 0.01s, 0.02s, 0.03s, 0.05s, 0.075s, 0.1s, 0.15s, 0.2s, 0.25s, 0.3s, 0.4s, 0.5s, 0.75s, 1.0s, 1.5s, 2.0s, 3.0s, 4.0s, 5.0s, 7.5s, and 10.0s, the 5%-damped design spectral response acceleration parameter, S_a, shall be taken as 2/3 of the multiperiod 5%-damped MCER response spectrum from the USGS Seismic Design Geodatabase for the applicable site class.

5. At each response period, T, less than 10.0s and not equal to one of the discrete values of period, T, listed in Item 4 above, S_a, shall be determined by linear interpolation between values of S_a, of Item 4 above.

6. At each response period, T, greater than 10.0s, S_a shall be taken as the value of S_a at the period of 10.0s, factored by $10/T$, where the value of T is less than or equal to that of the long-period transition period, T_L, and shall be taken as the value of S_a at the period of 10.0s factored by $10T_L/T^2$, where the value of T is greater than that of the long-period transition period, T_L.

7. Where an MCER response spectrum is required, it shall be determined by multiplying the multiperiod design response spectrum by 1.5.

8. For use with the equivalent lateral force procedure, the spectral acceleration S_a at T shall be permitted to replace S_{D1}/T in Equation (12.8-3) and $S_{D1}\ T_L/T^2$ in Equation (12.8-4).

1613.4.5 ASCE 7 Section 20.6. Amend ASCE 7 Chapter 20 to include the following section:

Section 20.6 Site classification procedure for use with Section 11.4.8.1. For exclusive use in determining the multiperiod design response spectrum and associated spectral parameters in accordance with Section 11.4.8.1, the site class shall be determined in accordance with this section. For all other applications in this standard the site class shall be determined per Section 20.1.

20.6.1 Site classification. The site soil shall be classified in accordance with Table 20.6-1 and Section 20.6.2 based on the average shear wave velocity parameter, $\bar{v}_s$, which is derived from the measured shear wave velocity profile from the ground surface to a depth of 100 ft (30 m). Where shear wave velocity is not measured, appropriate generalized correlations between shear wave velocity and standard penetration test (SPT) blow counts, cone penetration test (CPT) tip resistance, shear strength, or other geotechnical parameters shall be used to obtain an estimated shear wave velocity profile, as described in Section 20.6.3. Where site-specific data (measured shear wave velocities or other geotechnical data that can be used to estimate shear wave velocity) are available only to a maximum depth less than 100 ft (30 m), shall be estimated as described in Section 20.6.3.

Where the soil properties are not known in sufficient detail to determine the site class, the most critical site conditions of Site Class C, Site Class CD and Site Class D, as defined in Section 20.6.2, shall be used unless the authority having jurisdiction or geotechnical data determine that Site Class DE, E or F soils are present at the site. Site Classes A and B shall not be assigned to a site if there is more than 10 ft (3.1 m) of soil between the rock surface and the bottom of the spread footing or mat foundation.

20.6.2 Site class definitions. Site class types shall be assigned in accordance with the definitions provided in Table 20.6.2-1 and this section.

20.6.2.1 Soft clay Site Class E. Where a site does not qualify under the criteria for Site Class F per Section 20.3.1 and there is a total thickness of soft clay greater than 10 ft (3 m), where a soft clay layer is defined by s_u<500 psf (s_u<25 kPa), $w \geq 40\%$, and $PI > 20$, it shall be classified as Site Class E. This classification is made regardless of $\bar{v}_s$, as computed in Section 20.4.

20.6.2.2 Site Classes C, CD, D, DE and E. The assignment of Site Class C, CD, D, DE and E soils shall be made based on the average shear wave velocity, which is derived from the site shear wave velocity profile from the ground surface to a depth of 100 ft (30 m), as described in Section 20.4.

20.6.2.3 Site Classes B and BC (medium hard and soft rock). Site Class B can only be assigned to a site on the basis of shear wave velocity measured on site. If shear wave velocity data are not available and the site condition is estimated by a geotechnical engineer, engineering geologist, or seismologist as Site Class B or BC on the basis of site geology, consisting of competent rock with moderate fracturing and weathering, the site shall be classified as Site Class BC. Softer and more highly fractured and weathered rock shall either be measured on site for shear wave velocity or classified as Site Class C.

20.6.2.4 Site Class A (hard rock). The hard rock, Site Class A, category shall be supported by shear wave velocity measurement, either on site or on profiles of the same rock type in the same formation with an equal or greater degree of weathering and fracturing. Where hard rock conditions are known to be continuous to a depth of 100 ft (30 m), surficial shear wave velocity measurements to maximum depths less than 100 ft are permitted to be extrapolated to assess $\bar{v}_s$.

Table 20.6.2-1 Site Classification

Site Class	$\bar{v}_s$ Calculated Using Measured or Estimated Shear Wave Velocity Profile (ft/s)
A. Hard Rock	> 5,000
B. Medium Hard Rock	> 3,000 to 5,000
BC. Soft Rock	> 2,100 to 3,000
C. Very Dense Sand or Hard Clay	> 1,450 to 2,100
CD. Dense Sand or Very Stiff Clay	> 1,000 to 1,450
D. Medium Dense Sand or Stiff Clay	> 700 to 1,000
DE. Loose Sand or Medium Stiff Clay	> 500 to 700

Site Class	$\bar{v}_s$ Calculated Using Measured or Estimated Shear Wave Velocity Profile (ft/s)
E. Very Loose Sand or Soft Clay	≤ 500

20.6.3 Estimation of shear wave velocity profiles. Where measured shear wave velocity data are not available, shear wave velocity shall be estimated as a function of depth using correlations with suitable geotechnical parameters, including standard penetration test (SPT) blow counts, shear strength, overburden pressure, void ratio, or cone penetration test (CPT) tip resistance, measured at the site.

Site class based on estimated values of shall be derived using $\bar{v}_s$, $\bar{v}_s$/1.3, and 1.3$\bar{v}_s$ when correlation models are used to derive shear wave velocities. Where correlations derived for specific local regions can be demonstrated to have greater accuracy, factors less than 1.3 can be used if approved by the authority having jurisdiction. If the different average velocities result in different site classes per Table 20.6.2-1, the most critical of the site classes for ground motion analysis at each period shall be used.

Where the available data used to establish the shear wave velocity profile extends to depths less than 100 ft (30 m) but more than 50 ft (15 m), and the site geology is such that soft layers are unlikely to be encountered between 50 and 100 ft, the shear wave velocity of the last layer in the profile shall be extended to 100 ft for the calculation of in Equation (20.4-1). Where the data does not extend to depths of 50 ft (15 m), default site classes, as described in Section 20.6.1, shall be used unless another site class can be justified on the basis of the site geology.

1613.4.6 ASCE 7 Section 21.3.1. Amend ASCE 7 Section 21.3 to include the following section:

Section 21.3.1 Alternate minimum design spectral response accelerations. As an alternate approach to Section 21.3, the lower limit of S_a is permitted to be determined according to this section. The design spectral response acceleration at any period shall not be taken less than 80% of the multiperiod design response spectrum as determined by Section 11.4.8.1.

For sites classified as Site Class F requiring site-specific analysis in accordance with Section 11.4.8, the design spectral response acceleration at any period shall not be less than 80% of S_a determined for Site Class E.

EXCEPTION: Where a different site class can be justified using the site-specific classification procedures in accordance with Section 20.6.2.2, a lower limit of 80% of S_a for the justified site class shall be permitted to be used.

[Statutory Authority: RCW 19.27.031 and 19.27.074. WSR 23-23-102, § 51-50-1613, filed 11/15/23, effective 3/16/24. Statutory Authority: RCW 19.27.031, 19.27.074, and 19.27.540. WSR 23-02-073, 23-12-103, and 23-20-023, § 51-50-1613, filed 1/4/23, 6/7/23, and 9/25/23, effective 3/15/24. Statutory Authority: RCW 19.27.031 and 19.27.074. WSR 20-21-021, § 51-50-1613, filed 10/9/20, effective 11/9/20; WSR 20-01-090, § 51-50-1613, filed 12/12/19, effective 7/1/20; WSR 19-02-038, § 51-50-1613, filed 12/26/18, effective 7/1/19; WSR 10-03-097, § 51-50-1613, filed 1/20/10, effective 7/1/10. Statutory Authority: RCW 19.27.190, 19.27.020, and chapters 19.27 and 34.05 RCW. WSR 08-01-110, § 51-50-1613, filed 12/18/07, effective 4/1/08.]