

**Table 12.2-1 Design Coefficients and Factors for Seismic Force-Resisting Systems**

Seismic Force-Resisting System	ASCE 7 Section Where Detailing Requirements Are Specified	Response Modification Coefficient, R <sup>a</sup>	Overstrength Factor, Ω <sub>0</sub> <sup>g</sup>	Deflection Amplification Factor, C <sub>d</sub> <sup>b</sup>	Structural System Limitations Including Structural Height, h <sub>n</sub> (ft) Limits <sup>c</sup>				
					Seismic Design Category				
					B	C	D <sup>d</sup>	E <sup>d</sup>	F <sup>e</sup>
<b>A. BEARING WALL SYSTEMS</b>									
1. Special reinforced concrete shear walls <sup>l, m</sup>	14.2	5	2½	5	NL	NL	160	160	100
2. Ordinary reinforced concrete shear walls <sup>l</sup>	14.2	4	2½	4	NL	NL	NP	NP	NP
3. Detailed plain concrete shear walls <sup>l</sup>	14.2	2	2½	2	NL	NP	NP	NP	NP
4. Ordinary plain concrete shear walls <sup>l</sup>	14.2	1½	2½	1½	NL	NP	NP	NP	NP
5. Intermediate precast shear walls <sup>l</sup>	14.2	4	2½	4	NL	NL	40 <sup>k</sup>	40 <sup>k</sup>	40 <sup>k</sup>
6. Ordinary precast shear walls <sup>l</sup>	14.2	3	2½	3	NL	NP	NP	NP	NP
7. Special reinforced masonry shear walls	14.4	5	2½	3½	NL	NL	160	160	100
8. Intermediate reinforced masonry shear walls	14.4	3½	2½	2¼	NL	NL	NP	NP	NP
9. Ordinary reinforced masonry shear walls	14.4	2	2½	1¾	NL	160	NP	NP	NP
10. Detailed plain masonry shear walls	14.4	2	2½	1¾	NL	NP	NP	NP	NP
11. Ordinary plain masonry shear walls	14.4	1½	2½	1¼	NL	NP	NP	NP	NP
12. Prestressed masonry shear walls	14.4	1½	2½	1¾	NL	NP	NP	NP	NP
13. Ordinary reinforced AAC masonry shear walls	14.4	2	2½	2	NL	35	NP	NP	NP
14. Ordinary plain AAC masonry shear walls	14.4	1½	2½	1½	NL	NP	NP	NP	NP
15. Light-frame (wood) walls sheathed with wood structural panels rated for shear resistance or steel sheets	14.1 and 14.5	6½	3	4	NL	NL	65	65	65
16. Light-frame (cold-formed steel) walls sheathed with wood structural panels rated for shear resistance or steel sheets	14.1	6½	3	4	NL	NL	65	65	65
17. Light-frame walls with shear panels of all other materials	14.1 and 14.5	2	2½	2	NL	NL	35	NP	NP
18. Light-frame (cold-formed steel) wall systems using flat strap bracing	14.1	4	2	3½	NL	NL	65	65	65
<b>B. BUILDING FRAME SYSTEMS</b>									
1. Steel eccentrically braced frames	14.1	8	2	4	NL	NL	160	160	100
2. Steel special concentrically braced frames	14.1	6	2	5	NL	NL	160	160	100
3. Steel ordinary concentrically braced frames	14.1	3¼	2	3¼	NL	NL	35 <sup>j</sup>	35 <sup>j</sup>	NP <sup>j</sup>

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Table 12.2-1 (Continued)

Seismic Force-Resisting System	ASCE 7 Section Where Detailing Requirements Are Specified	Response Modification Coefficient, $R^a$	Overstrength Factor, $\Omega_0^g$	Deflection Amplification Factor, $C_d^b$	Structural System Limitations Including Structural Height, $h_n$ (ft) Limits <sup>c</sup>				
					Seismic Design Category				
					B	C	D <sup>d</sup>	E <sup>d</sup>	F <sup>e</sup>
4. Special reinforced concrete shear walls <sup>l,m</sup>	14.2	6	2½	5	NL	NL	160	160	100
5. Ordinary reinforced concrete shear walls <sup>l</sup>	14.2	5	2½	4½	NL	NL	NP	NP	NP
6. Detailed plain concrete shear walls <sup>l</sup>	14.2 and 14.2.2.8	2	2½	2	NL	NP	NP	NP	NP
7. Ordinary plain concrete shear walls <sup>l</sup>	14.2	1½	2½	1½	NL	NP	NP	NP	NP
8. Intermediate precast shear walls <sup>l</sup>	14.2	5	2½	4½	NL	NL	40 <sup>k</sup>	40 <sup>k</sup>	40 <sup>k</sup>
9. Ordinary precast shear walls <sup>l</sup>	14.2	4	2½	4	NL	NP	NP	NP	NP
10. Steel and concrete composite eccentrically braced frames	14.3	8	2 ½	4	NL	NL	160	160	100
11. Steel and concrete composite special concentrically braced frames	14.3	5	2	4½	NL	NL	160	160	100
12. Steel and concrete composite ordinary braced frames	14.3	3	2	3	NL	NL	NP	NP	NP
13. Steel and concrete composite plate shear walls	14.3	6½	2½	5½	NL	NL	160	160	100
14. Steel and concrete composite special shear walls	14.3	6	2½	5	NL	NL	160	160	100
15. Steel and concrete composite ordinary shear walls	14.3	5	2½	4½	NL	NL	NP	NP	NP
16. Special reinforced masonry shear walls	14.4	5½	2½	4	NL	NL	160	160	100
17. Intermediate reinforced masonry shear walls	14.4	4	2½	4	NL	NL	NP	NP	NP
18. Ordinary reinforced masonry shear walls	14.4	2	2½	2	NL	160	NP	NP	NP
19. Detailed plain masonry shear walls	14.4	2	2½	2	NL	NP	NP	NP	NP
20. Ordinary plain masonry shear walls	14.4	1½	2½	1¼	NL	NP	NP	NP	NP
21. Prestressed masonry shear walls	14.4	1½	2½	1¾	NL	NP	NP	NP	NP
22. Light-frame (wood) walls sheathed with wood structural panels rated for shear resistance	14.5	7	2½	4½	NL	NL	65	65	65
23. Light-frame (cold-formed steel) walls sheathed with wood structural panels rated for shear resistance or steel sheets	14.1	7	2½	4½	NL	NL	65	65	65
24. Light-frame walls with shear panels of all other materials	14.1 and 14.5	2½	2½	2½	NL	NL	35	NP	NP
25. Steel buckling-restrained braced frames	14.1	8	2½	5	NL	NL	160	160	100
26. Steel special plate shear walls	14.1	7	2	6	NL	NL	160	160	100

**Table 12.2-1** (Continued)

Seismic Force-Resisting System	ASCE 7 Section Where Detailing Requirements Are Specified	Response Modification Coefficient, R <sup>a</sup>	Overstrength Factor, Ω <sub>0</sub> <sup>g</sup>	Deflection Amplification Factor, C <sub>d</sub> <sup>b</sup>	Structural System Limitations Including Structural Height, h <sub>n</sub> (ft) Limits <sup>c</sup>				
					Seismic Design Category				
					B	C	D <sup>d</sup>	E <sup>d</sup>	F <sup>e</sup>
<b>C. MOMENT-RESISTING FRAME SYSTEMS</b>									
1. Steel special moment frames	14.1 and 12.2.5.5	8	3	5½	NL	NL	NL	NL	NL
2. Steel special truss moment frames	14.1	7	3	5½	NL	NL	160	100	NP
3. Steel intermediate moment frames	12.2.5.7 and 14.1	4½	3	4	NL	NL	35 <sup>h</sup>	NP <sup>h</sup>	NP <sup>h</sup>
4. Steel ordinary moment frames	12.2.5.6 and 14.1	3½	3	3	NL	NL	NP <sup>i</sup>	NP <sup>i</sup>	NP <sup>i</sup>
5. Special reinforced concrete moment frames <sup>n</sup>	12.2.5.5 and 14.2	8	3	5½	NL	NL	NL	NL	NL
6. Intermediate reinforced concrete moment frames	14.2	5	3	4½	NL	NL	NP	NP	NP
7. Ordinary reinforced concrete moment frames	14.2	3	3	2½	NL	NP	NP	NP	NP
8. Steel and concrete composite special moment frames	12.2.5.5 and 14.3	8	3	5½	NL	NL	NL	NL	NL
9. Steel and concrete composite intermediate moment frames	14.3	5	3	4½	NL	NL	NP	NP	NP
10. Steel and concrete composite partially restrained moment frames	14.3	6	3	5½	160	160	100	NP	NP
11. Steel and concrete composite ordinary moment frames	14.3	3	3	2½	NL	NP	NP	NP	NP
12. Cold-formed steel—special bolted moment frame <sup>p</sup>	14.1	3½	3 <sup>o</sup>	3½	35	35	35	35	35
<b>D. DUAL SYSTEMS WITH SPECIAL MOMENT FRAMES CAPABLE OF RESISTING AT LEAST 25% OF PRESCRIBED SEISMIC FORCES</b>									
	12.2.5.1								
1. Steel eccentrically braced frames	14.1	8	2½	4	NL	NL	NL	NL	NL
2. Steel special concentrically braced frames	14.1	7	2½	5½	NL	NL	NL	NL	NL
3. Special reinforced concrete shear walls <sup>l</sup>	14.2	7	2½	5½	NL	NL	NL	NL	NL
4. Ordinary reinforced concrete shear walls <sup>l</sup>	14.2	6	2½	5	NL	NL	NP	NP	NP
5. Steel and concrete composite eccentrically braced frames	14.3	8	2½	4	NL	NL	NL	NL	NL
6. Steel and concrete composite special concentrically braced frames	14.3	6	2½	5	NL	NL	NL	NL	NL

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**Table 12.2-1** (Continued)

Seismic Force-Resisting System	ASCE 7 Section Where Detailing Requirements Are Specified	Response Modification Coefficient, $R^a$	Overstrength Factor, $\Omega_0^g$	Deflection Amplification Factor, $C_d^{b,h}$	Structural System Limitations Including Structural Height, $h_n$ (ft) Limits <sup>c</sup>				
					Seismic Design Category				
					B	C	D <sup>d</sup>	E <sup>d</sup>	F <sup>e</sup>
7. Steel and concrete composite plate shear walls	14.3	7½	2½	6	NL	NL	NL	NL	NL
8. Steel and concrete composite special shear walls	14.3	7	2½	6	NL	NL	NL	NL	NL
9. Steel and concrete composite ordinary shear walls	14.3	6	2½	5	NL	NL	NP	NP	NP
10. Special reinforced masonry shear walls	14.4	5½	3	5	NL	NL	NL	NL	NL
11. Intermediate reinforced masonry shear walls	14.4	4	3	3½	NL	NL	NP	NP	NP
12. Steel buckling-restrained braced frames	14.1	8	2½	5	NL	NL	NL	NL	NL
13. Steel special plate shear walls	14.1	8	2½	6½	NL	NL	NL	NL	NL
<b>E. DUAL SYSTEMS WITH INTERMEDIATE MOMENT FRAMES CAPABLE OF RESISTING AT LEAST 25% OF PRESCRIBED SEISMIC FORCES</b>	12.2.5.1								
1. Steel special concentrically braced frames <sup>f</sup>	14.1	6	2½	5	NL	NL	35	NP	NP
2. Special reinforced concrete shear walls <sup>l</sup>	14.2	6½	2½	5	NL	NL	160	100	100
3. Ordinary reinforced masonry shear walls	14.4	3	3	2½	NL	160	NP	NP	NP
4. Intermediate reinforced masonry shear walls	14.4	3½	3	3	NL	NL	NP	NP	NP
5. Steel and concrete composite special concentrically braced frames	14.3	5½	2½	4½	NL	NL	160	100	NP
6. Steel and concrete composite ordinary braced frames	14.3	3½	2½	3	NL	NL	NP	NP	NP
7. Steel and concrete composite ordinary shear walls	14.3	5	3	4½	NL	NL	NP	NP	NP
8. Ordinary reinforced concrete shear walls <sup>l</sup>	14.2	5½	2½	4½	NL	NL	NP	NP	NP
<b>F. SHEAR WALL-FRAME INTERACTIVE SYSTEM WITH ORDINARY REINFORCED CONCRETE MOMENT FRAMES AND ORDINARY REINFORCED CONCRETE SHEAR WALLS<sup>i</sup></b>	12.2.5.8 and 14.2	4½	2½	4	NL	NP	NP	NP	NP

**Table 12.2-1** (Continued)

Seismic Force-Resisting System	ASCE 7 Section Where Detailing Requirements Are Specified	Response Modification Coefficient, $R^a$	Overstrength Factor, $\Omega_0^g$	Deflection Amplification Factor, $C_d^b$	Structural System Limitations Including Structural Height, $h_n$ (ft) Limits <sup>c</sup>				
					Seismic Design Category				
					B	C	D <sup>d</sup>	E <sup>d</sup>	F <sup>e</sup>
<b>G. CANTILEVERED COLUMN SYSTEMS DETAILED TO CONFORM TO THE REQUIREMENTS FOR:</b>	12.2.5.2								
1. Steel special cantilever column systems	14.1	2½	1¼	2½	35	35	35	35	35
2. Steel ordinary cantilever column systems	14.1	1¼	1¼	1¼	35	35	NP <sup>i</sup>	NP <sup>i</sup>	NP <sup>i</sup>
3. Special reinforced concrete moment frames <sup>n</sup>	12.2.5.5 and 14.2	2½	1¼	2½	35	35	35	35	35
4. Intermediate reinforced concrete moment frames	14.2	1½	1¼	1½	35	35	NP	NP	NP
5. Ordinary reinforced concrete moment frames	14.2	1	1¼	1	35	NP	NP	NP	NP
6. Timber frames	14.5	1½	1½	1½	35	35	35	NP	NP
<b>H. STEEL SYSTEMS NOT SPECIFICALLY DETAILED FOR SEISMIC RESISTANCE, EXCLUDING CANTILEVER COLUMN SYSTEMS</b>	14.1	3	3	3	NL	NL	NP	NP	NP

<sup>a</sup>Response modification coefficient,  $R$ , for use throughout the standard. Note  $R$  reduces forces to a strength level, not an allowable stress level.

<sup>b</sup>Deflection amplification factor,  $C_d$ , for use in Sections 12.8.6, 12.8.7, and 12.9.2.

<sup>c</sup>NL = Not Limited and NP = Not Permitted. For metric units use 30.5 m for 100 ft and use 48.8 m for 160 ft.

<sup>d</sup>See Section 12.2.5.4 for a description of seismic force-resisting systems limited to buildings with a structural height,  $h_n$ , of 240 ft (73.2 m) or less.

<sup>e</sup>See Section 12.2.5.4 for seismic force-resisting systems limited to buildings with a structural height,  $h_n$ , of 160 ft (48.8 m) or less.

<sup>f</sup>Ordinary moment frame is permitted to be used in lieu of intermediate moment frame for Seismic Design Categories B or C.

<sup>g</sup>Where the tabulated value of the overstrength factor,  $\Omega_0$ , is greater than or equal to 2½,  $\Omega_0$  is permitted to be reduced by subtracting the value of 1/2 for structures with flexible diaphragms.

<sup>h</sup>See Section 12.2.5.7 for limitations in structures assigned to Seismic Design Categories D, E, or F.

<sup>i</sup>See Section 12.2.5.6 for limitations in structures assigned to Seismic Design Categories D, E, or F.

<sup>j</sup>Steel ordinary concentrically braced frames are permitted in single-story buildings up to a structural height,  $h_n$ , of 60 ft (18.3 m) where the dead load of the roof does not exceed 20 psf (0.96 kN/m<sup>2</sup>) and in penthouse structures.

<sup>k</sup>An increase in structural height,  $h_n$ , to 45 ft (13.7 m) is permitted for single story storage warehouse facilities.

<sup>l</sup>In Section 2.2 of ACI 318. A shear wall is defined as a structural wall.

<sup>m</sup>In Section 2.2 of ACI 318. The definition of "special structural wall" includes precast and cast-in-place construction.

<sup>n</sup>In Section 2.2 of ACI 318. The definition of "special moment frame" includes precast and cast-in-place construction.

<sup>o</sup>Alternately, the seismic load effect with overstrength,  $E_{mh}$ , is permitted to be based on the expected strength determined in accordance with AISI S110.

<sup>p</sup>Cold-formed steel – special bolted moment frames shall be limited to one-story in height in accordance with AISI S110.