

TABLE 9.5.2.2  
DESIGN COEFFICIENTS AND FACTORS FOR BASIC SEISMIC-FORCE-RESISTING SYSTEMS

BASIC SEISMIC-FORCE-RESISTING SYSTEM	DETAILING REFERENCE SECTION <sup>c</sup>	RESPONSE MODIFICATION COEFFICIENT, $R^{a,c}$	SYSTEM OVERSTRENGTH FACTOR, $W_o^{c,g}$	DEFLECTION AMPLIFICATION FACTOR, $C_d^{b,c}$	STRUCTURAL SYSTEM LIMITATIONS AND BUILDING HEIGHT (ft) LIMITATIONS BY SEISMIC DESIGN CATEGORY <sup>c</sup>		
					B	C	D <sup>d</sup>
<b>1. Bearing Wall Systems</b>							
A. Ordinary steel braced frames in light-gage construction	2211	4	2	3-1/2	NL	NL	65
B. Ordinary steel concentrically braced frames	N/A	4	2	N/A	NP	NP	NP
C. Special reinforced concrete shear walls	1910.2.4	5	2-1/2	5	NL	NL	160
D. Ordinary reinforced concrete shear walls	1910.2.3	4	2-1/2	4	NL	NL	NP
E. Detailed plain concrete shear walls	N/A	N/A	N/A	N/A	NP	NP	NP
F. Ordinary plain concrete shear walls	N/A	N/A	N/A	N/A	NP	NP	NP
G. Special reinforced masonry shear walls	1.13.2.2.5 <sup>o</sup>	5	2-1/2	3-1/2	NL	NL	160
H. Intermediate reinforced masonry shear walls	1.13.2.2.4 <sup>o</sup>	3-1/2	2-1/2	2-1/4	NL	NL	NP
I. Ordinary reinforced masonry shear walls	N/A	2	N/A	N/A	NP	NP	NP
J. Detailed plain masonry shear walls	N/A	2	N/A	N/A	NP	NP	NP
K. Ordinary plain masonry shear walls	N/A	N/A	N/A	N/A	NP	NP	NP
L. Light-framed walls sheathed with wood structural panels rated for shear resistance or steel sheets	2306.4.1/2211	6	3	4	NL	NL	65
M. Light-framed walls with shear panels of all other materials	2306.4.5/2211 <sup>p</sup>	2	2-1/2	2	35	35	NP
N. Light-framed wall systems using flat strap bracing	2306.4/2211	4	2	3-1/2	NL	NL	65
O. Ordinary plain prestressed masonry shear walls	N/A	N/A	N/A	N/A	NP	NP	NP
P. -Prestressed masonry shear walls	2106.1.1.2, 1.13.2.2.4 <sup>o</sup>	2-1/2	2-1/2	2-1/2	NL	NP	NP
Q. Special prestressed masonry shear walls	N/A	N/A	N/A	N/A	NP	NP	NP
<b>2. Building Frame Systems</b>							
A. Steel eccentrically braced frames, moment-resisting connections at columns away from links	(15) <sup>j</sup>	8	2	4	NL	NL	160
B. Steel eccentrically braced frames, non-moment-resisting connections at columns away from links	(15) <sup>j</sup>	7	2	4	NL	NL	160
C. Special steel concentrically braced frames	(13) <sup>j</sup>	6	2	5	NL	NL	160
D. Ordinary steel concentrically braced frames	(14) <sup>j</sup>	3-1/4	2	3-1/4	NL	NL	35 <sup>n</sup>
E. Special reinforced concrete shear walls	1910.2.4	6	2-1/2	5	NL	NL	160
F. Ordinary reinforced concrete shear walls	1910.2.3	5	2-1/2	4-1/2	NL	NL	NP
G. Detailed plain concrete shear walls	N/A	N/A	N/A	N/A	NP	NP	NP
H. Ordinary plain concrete shear walls	N/A	N/A	N/A	2	NP	NP	NP

(continued)

**TABLE 9.5.2.2 -- continued**  
**DESIGN COEFFICIENTS AND FACTORS FOR BASIC SEISMIC-FORCE-RESISTING SYSTEMS**

BASIC SEISMIC-FORCE-RESISTING SYSTEM	DETAILING REFERENCE SECTION	RESPONSE MODIFICATION COEFFICIENT, R <sup>2</sup>	SYSTEM OVERSTRENGTH FACTOR, W <sub>o</sub> <sup>9</sup>	DEFLECTION AMPLIFICATION FACTOR, C <sub>d</sub> <sup>b</sup>	STRUCTURAL SYSTEM LIMITATIONS AND BUILDING HEIGHT (ft) LIMITATIONS BY SEISMIC DESIGN CATEGORY <sup>c</sup>		
					B	C	D <sup>d</sup>
I. Composite eccentrically braced frames	(14) <sup>k</sup>	8	2	4	NL	NL	160
J. Composite concentrically braced frames	(13) <sup>k</sup>	5	2	4-1/2	NL	NL	160
K. Ordinary composite braced frames	(12) <sup>k</sup>	3	2	3	NL	NL	NP
L. Composite steel plate shear walls	(17) <sup>k</sup>	6-1/2	2-1/2	5-1/2	NL	NL	160
M. Special composite reinforced concrete shear walls with steel elements	(16) <sup>k</sup>	6	2-1/2	5	NL	NL	160
N. Ordinary composite reinforced concrete shear walls with steel elements	(15) <sup>k</sup>	5	2-1/2	4-1/2	NL	NL	NP
O. Special reinforced masonry shear walls	1.13.2.2.5 <sup>o</sup>	5-1/2	2-1/2	4	NL	NL	160
P. Intermediate reinforced masonry shear walls	1.13.2.2.4 <sup>o</sup>	4	2-1/2	4	NL	NL	NP
Q. Ordinary reinforced masonry shear walls	N/A	N/A	N/A	N/A	NP	NP	NP
R. Detailed plain masonry shear walls	N/A	N/A	N/A	N/A	NP	NP	NP
S. Ordinary plain masonry shear walls	N/A	N/A	N/A	N/A	NP	NP	NP
T. Light-framed walls sheathed with wood structural panels rated for shear resistance or steel sheets	2306.4.1/2211	6-1/2	2-1/2	4-1/4	NL	NL	65
U. Light-framed walls with shear panels of all other materials	2306.4.5/2211 <sup>p</sup>	2-1/2	2-1/2	2-1/2	35	35	NP
V. Ordinary plain prestressed masonry shear walls	N/A	N/A	N/A	N/A	NP	NP	NP
W. Prestressed masonry shear walls	2106.1.1.2, 1.13.2.2.4 <sup>o</sup>	3	2-1/2	2-1/2	NL	NP	NP
X. Special prestressed masonry shear walls	N/A	N/A	N/A	4	NP	NP	NP
<b>3. Moment-Resisting Frame Systems</b>							
A. Special steel moment frames	(9) <sup>j</sup>	8	3	5-1/2	NL	NL	NL
B. Special steel truss moment frames	(12) <sup>j</sup>	7	3	5-1/2	NL	NL	160
C. Intermediate steel moment frames	(10) <sup>j</sup>	4-1/2	3	4	NL	NL	35 <sup>h</sup>
D. Ordinary steel moment frames	(11) <sup>j</sup>	3-1/2	3	3	NL	NL	NP <sup>h,i</sup>
E. Special reinforced concrete moment frames	(21.1) <sup>i</sup>	8	3	5-1/2	NL	NL	NL
F. Intermediate reinforced concrete moment frames	(21.1) <sup>i</sup>	5	3	4-1/2	NL	NL	NP
G. Ordinary reinforced concrete moment frames	N/A	N/A	3	N/A	NP	NP	NP
H. Special composite moment frames	(9) <sup>k</sup>	8	3	5-1/2	NL	NL	NL

*(continued)*

**TABLE 9.5.2.2 -- continued**  
**DESIGN COEFFICIENTS AND FACTORS FOR BASIC SEISMIC-FORCE-RESISTING SYSTEMS**

BASIC SEISMIC-FORCE-RESISTING SYSTEM	DETAILING REFERENCE SECTION	RESPONSE MODIFICATION COEFFICIENT, $R^a$	SYSTEM OVERSTRENGTH FACTOR, $W_o^9$	DEFLECTION AMPLIFICATION FACTOR, $C_d^b$	STRUCTURAL SYSTEM LIMITATIONS AND BUILDING HEIGHT (ft) LIMITATIONS BY SEISMIC DESIGN CATEGORY <sup>c</sup>		
					B	C	D <sup>d</sup>
I. Intermediate composite moment frames	(10) <sup>k</sup>	5	3	4-1/2	NL	NL	NP
J. Composite partially restrained moment frames	(8) <sup>k</sup>	6	3	5-1/2	160	160	100
K. Ordinary composite moment frames	(11) <sup>k</sup>	3	3	2-1/2	NL	NP	NP
L. Special masonry moment frames	2106	5-1/2	3	5	NL	NL	160
<b>4. Dual Systems with Special Moment Frames Capable of Resisting at Least 25% of Prescribed Seismic Forces</b>							
A. Steel eccentrically braced frames, moment-resisting connections at columns away from links	(15) <sup>j</sup>	8	2-1/2	4	NL	NL	NL
B. Steel eccentrically braced frames, non-moment-resisting connections at columns away from links	(15) <sup>j</sup>	7	2-1/2	4	NL	NL	NL
C. Special steel concentrically braced frames	(13) <sup>j</sup>	8	2-1/2	6-1/2	NL	NL	NL
D. Special reinforced concrete shear walls	1910.2.4	8	2-1/2	6-1/2	NL	NL	NL
E. Ordinary reinforced concrete shear walls	1910.2.3	7	2-1/2	6	NL	NL	NP
F. Composite eccentrically braced frames	(14) <sup>k</sup>	8	2-1/2	4	NL	NL	NL
G. Composite concentrically braced frames	(13) <sup>k</sup>	6	2-1/2	5	NL	NL	NL
H. Composite steel plate shear walls	(17) <sup>k</sup>	8	2-1/2	6-1/2	NL	NL	NL
I. Special composite reinforced concrete shear walls with steel elements	(16) <sup>k</sup>	8	2-1/2	6-1/2	NL	NL	NL
J. Ordinary composite reinforced concrete shear walls with steel elements	(15) <sup>k</sup>	7	2-1/2	6	NL	NL	NP
K. Special reinforced masonry shear walls	1.13.2.2.5 <sup>o</sup>	7	3	6-1/2	NL	NL	NL
L. Intermediate reinforced masonry shear walls	1.13.2.2.4 <sup>o</sup>	6	3	5	NL	NL	NP
M. Ordinary steel concentrically braced frames	N/A	6	N/A	N/A	NP	NP	NP
<b>5. Dual Systems with Intermediate Moment Frames Capable of Resisting at Least 25% of Prescribed Seismic Forces<sup>m</sup></b>							
A. Special steel concentrically braced frames <sup>§</sup>	(13) <sup>j</sup>	4-1/2	2-1/2	4-1/2	NL	NL	35 <sup>h</sup>
B. Special reinforced concrete shear walls	1910.2.4	6	2-1/2	5	NL	NL	160
C. Ordinary reinforced concrete shear walls	1910.2.3	5-1/2	2-1/2	4-1/2	NL	NL	NP
D. Ordinary reinforced masonry shear walls	N/A	3	N/A	N/A	NP	NP	NP
E. Intermediate reinforced masonry shear walls	1.13.2.2.4 <sup>o</sup>	5	3	4-1/2	NL	NL	NP
F. Composite concentrically braced frames	(13) <sup>k</sup>	5	2-1/2	4-1/2	NL	NL	160
G. Ordinary composite braced frames	(12) <sup>k</sup>	4	2-1/2	3	NL	NL	NP
H. Ordinary composite reinforced concrete shear walls with steel elements	(15) <sup>k</sup>	5	3	4-1/2	NL	NL	NP

*(continued)*

**TABLE 9.5.2.2 -- continued**  
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BASIC SEISMIC-FORCE-RESISTING SYSTEM	DETAILING REFERENCE SECTION	RESPONSE MODIFICATION COEFFICIENT, $R^a$	SYSTEM OVERSTRENGTH FACTOR, $W_o^g$	DEFLECTION AMPLIFICATION FACTOR, $C_d^b$	STRUCTURAL SYSTEM LIMITATIONS AND BUILDING HEIGHT (ft) LIMITATIONS BY SEISMIC DESIGN CATEGORY <sup>c</sup>		
					B	C	D <sup>d</sup>
I. Ordinary steel concentrically braced frames	N/A	5	N/A	N/A	NP	NP	NP
<b>6. Shear Wall-Frame Interactive System with Ordinary Reinforced Concrete Moment Frames and Ordinary Reinforced Concrete Shear Walls</b>	N/A	N/A	N/A	5	NP	NP	NP
<b>7. Inverted Pendulum Systems</b>							
A. Cantilevered column systems		2-1/2	2	2-1/2	NL	NL	35
B. Special steel moment frames	(9) <sup>j</sup>	2-1/2	2	2-1/2	NL	NL	NL
C. Ordinary steel moment frames	(11) <sup>j</sup>	1-1/4	2	2-1/2	NL	NL	NP
D. Special reinforced concrete moment frames	21.1 <sup>l</sup>	2-1/2	2	1-1/4	NL	NL	NL
<b>8. Structural Steel Systems Not Specifically Detailed For Seismic Resistance</b>	AISC--335 AISC--LRFD AISI AISC--HSS	3	3	3	100	65	NP

For SI: 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kN/m<sup>2</sup>.

- a. Response modification coefficient,  $R$ , for use throughout the standard. Note  $R$  reduces forces to a strength level, not an allowable stress level.
- b. Deflection amplification factor,  $C_d$ , for use in Sections 9.5.3.7.1 and 9.5.3.7.2.
- c. N/A = Not Applicable in Massachusetts; NL = Not Limited; NP = Not Permitted in Massachusetts. For metric units use 30 m for 100 ft and use 50 m for 160 ft. Heights are measured from the base of the structure at d. See Section 9.5.2.2.4.1 for a description of building systems limited to buildings with a height of 240 ft (75 m) or less.
- e. *RESERVED*
- f. Ordinary moment frame is permitted to be used in lieu of intermediate moment frames in Seismic Design Categories B and C.
- g. The tabulated value of overstrength factor,  $W_o$ , may be reduced by subtracting  $1/2$  for structures with flexible diaphragms, but shall not be taken as less than 2.0 for any structure.
- h. Steel ordinary moment frames and intermediate moment frames are permitted in single story buildings up to a height of 60 ft, when the moment joints of field connections are constructed and bolted end plates and the dead load of the roof does not exceed 15 psf. The dead weight of the portion of walls more than 35 feet above the base shall not exceed 15 psf.
- i. Steel ordinary moment frames are permitted in buildings up to a height of 35 feet, where the dead load of the walls, floors and roof does not exceed 15 psf.
- j. AISC 341 Seismic Part I or Part III, Section number.
- k. AISC 341 Seismic Part II, Section number.
- l. ACI 318, Section number.
- m. Steel intermediate moment resisting frames as part of a dual system are not permitted in Seismic Design Category D.
- n. Steel ordinary concentrically braced frames are permitted in penthouse structures and in single-story buildings up to a height of 60 feet when the dead load of the roof does not exceed 15 pounds per square foot.
- o. ACI 530/ASCE 5/TMS 402 section number
- p. Light-framed walls with shear panels of all other materials are permitted only at exterior walls and at fire-rated interior walls.







s defined in Section 4