780 CMR: MASSACHUSETTS AMENDMENTS TO THE *INTERNATIONAL BUILDING CODE 2009*

CHAPTER 16: STRUCTURAL DESIGN

1603.1 Add a third sentence as follows:

When structural components, assemblies, or systems are designed by a *registered design professional* under the control of the contractor, and said designs are not included with the application for permit, said designs shall be submitted to the *building official* with an application for amendment to the permit.

1603.1.7 Replace 'on the community's Flood Insurance Rate Map (FIRM)' with 'of the *base flood elevation*'.

1604.11 Add subsection:

1604.11 Snow, Wind and Earthquake Design Factors. Ground snow load, p_g, basic wind speed (three second gust speed), V, and earthquake response accelerations for the maximum considered earthquake, S_S and S_1, for each city and town in Massachusetts shall be as given in Table 1604.11.

Exception. For ground snow load and basic wind speeds for R-3 one- and two-family dwellings of three stories or less, *see* 780 CMR One- and Two-family Dwellings.

TABLE 1604.11 GROUND SNOW LOADS; BASIC WIND SPEEDS; EARTHQUAKE DESIGN FACTORS

City/Town	p_g	V	Ss	S_1	City/Town	p_g	V	Ss	S_1
Abington	45	110	0.26	0.064	Medford	45	105	0.29	0.070
Acton	55	100	0.29	0.071	Medway	55	100	0.25	0.065
Acushnet	45	110	0.23	0.058	Melrose	45	105	0.30	0.070
Adams	65	90	0.22	0.068	Mendon	55	100	0.24	0.064
Agawam	55	100	0.23	0.065	Merrimac	55	110	0.35	0.077
Alford	65	90	0.22	0.066	Methuen	55	110	0.34	0.076
Amesbury	55	110	0.35	0.077	Middleborough	45	110	0.24	0.061
Amherst	55	100	0.23	0.067	Middlefield	65	100	0.22	0.066
Andover	55	110	0.32	0.075	Middleton	45	110	0.32	0.073
Aquinnah (*see* Gay Head)					Milford	55	100	0.24	0.065
Arlington	45	105	0.29	0.069	Millbury	55	100	0.24	0.065
Ashburnham	65	100	0.27	0.072	Millis	55	100	0.25	0.065
Ashby	65	100	0.28	0.072	Millville	55	100	0.24	0.064
Ashfield	65	100	0.22	0.068	Milton	45	105	0.27	0.066
Ashland	55	100	0.25	0.066	Monroe	65	100	0.22	0.069
Athol	65	100	0.25	0.070	Monson	55	100	0.23	0.065
Attleboro	55	110	0.24	0.062	Montague	65	100	0.23	0.068
Auburn	55	100	0.23	0.065	Monterey	65	90	0.22	0.066
Avon	55	100	0.26	0.064	Montgomery	65	100	0.23	0.066
Ayer	65	100	0.28	0.071	Mnt Washington	65	90	0.23	0.066
Barnstable	35	120	0.20	0.054	Nahant	45	110	0.30	0.070
Barre	55	100	0.24	0.068	Nantucket	35	120	0.15	0.047
Becket	65	90	0.22	0.066	Natick	55	100	0.26	0.067
Bedford	55	100	0.29	0.071	Needham	55	100	0.27	0.067
Belchertown	55	100	0.23	0.066	New Ashford	65	90	0.22	0.068
Bellingham	55	100	0.24	0.064	New Bedford	45	110	0.23	0.058
Belmont	45	105	0.28	0.069	New Braintree	55	100	0.23	0.067
Berkley	55	110	0.24	0.061	New Marlborough	65	90	0.23	0.066
Berlin	55	100	0.26	0.068	New Salem	65	100	0.24	0.068
Bernardston	65	100	0.23	0.070	Newbury	55	110	0.35	0.076
Beverly	45	110	0.32	0.072	Newburyport	55	110	0.35	0.077
Billerica	55	100	0.30	0.072	Newton	55	105	0.27	0.068
Blackstone	65	100	0.24	0.064	Norfolk	55	100	0.25	0.065
Blandford	65	100	0.23	0.066	N. Adams	65	90	0.22	0.069
Bolton	55	100	0.26	0.069	N. Andover	55	110	0.33	0.075

16.00: continued

TABLE 1604.11 GROUND SNOW LOADS; BASIC WIND SPEEDS; EARTHQUAKE DESIGN FACTORS - continued

City/Town	p_g	V	Ss	S_1	City/Town	p_g,	V	Ss	S_1
Boston	45	105	0.29	0.068	N. Attleborough	55	110	0.24	0.063
Bourne	35	120	0.21	0.056	N. Brookfield	55	100	0.23	0.066
Boxborough	55	100	0.28	0.070	N. Reading	55	105	0.32	0.073
Boxford		110	0.33	0.075	Northampton	55	100	0.22	0.066
Boylston	55	100	0.25	0.067	Northborough	55	100	0.25	0.067
Braintree	45	105	0.27	0.066	Northbridge	55	100	0.24	0.065
Brewster	35	120	0.18	0.052	Northfield	65	100	0.24	0.070
Bridgewater	45	110	0.24	0.062	Norton	55	110	0.24	0.063
Brimfield	55	100	0.23	0.065	Norwell	45	110	0.26	0.064
Brockton	45	110	0.25	0.064	Norwood	55	100	0.26	0.065
Brookfield	55	100	0.23	0.065	Oak Bluffs	35	120	0.18	0.051
Brookline	45	105	0.28	0.068	Oakham	55	100	0.24	0.067
Buckland	65	100	0.22	0.068	Orange	65	100	0.24	0.070
Burlington	55	105	0.30	0.071	Orleans	35	120	0.18	0.051
Cambridge	45	105	0.28	0.068	Otis	65	90	0.23	0.066
Canton	55	100	0.26	0.066	Oxford	55	100	0.23	0.065
Carlisle	55	100	0.29	0.071	Palmer	55	100	0.23	0.066
Carver	45	110	0.24	0.060	Paxton	55	100	0.24	0.067
Charlemont	65	100	0.22	0.068	Peabody	45	110	0.31	0.072
Charlton	55	100	0.23	0.065	Pelham	55	100	0.23	0.067
Chatham	35	120	0.17	0.050	Pembroke	45	110	0.25	0.063
Chelmsford	55	100	0.30	0.073	Pepperell	65	100	0.30	0.073
Chelsea	45	105	0.29	0.069	Peru	65	90	0.22	0.067
Cheshire	65	90	0.22	0.068	Petersham	65	100	0.24	0.068
Chester	65	100	0.22	0.066	Phillipston	65	100	0.24	0.069
Chesterfield	65	100	0.22	0.067	Pittsfield	65	90	0.22	0.067
Chicopee	55	100	0.23	0.066	Plainfield	65	100	0.22	0.068
Chilmark	35	120	0.18	0.051	Plainville	55	100	0.24	0.063
Clarksburg	65	90	0.22	0.069	Plymouth	45	110	0.24	0.060
Clinton	55	100	0.26	0.068	Pympton	45	110	0.24	0.061
Cohasset	45	110	0.27	0.066	Princeton	65	100	0.25	0.069
Colrain	65	100	0.23	0.069	Provincetown	35	120	0.22	0.058
Concord	55	100	0.29	0.070	Quincy	45	105	0.27	0.067
Conway	65	100	0.22	0.068	Randolph	45	105	0.26	0.065
Cummington	65	100	0.22	0.067	Raynham	55	110	0.24	0.062
Dalton	65	90	0.22	0.067	Reading	55	105	0.31	0.072
Danvers	45	110	0.32	0.073	Rehoboth	55	110	0.24	0.062
Dartmouth	45	110	0.23	0.058	Revere	45	105	0.30	0.070
Dedham	55	100	0.26	0.066	Richmond	65	90	0.22	0.067
Deerfield	65	100	0.23	0.068	Rochester	45	110	0.23	0.059
Dennis	35	120	0.19	0.052	Rockland	45	110	0.26	0.064
Dighton	55	110	0.24	0.061	Rockport	45	110	0.33	0.073
Douglas	55	100	0.23	0.064	Rowe	65	100	0.22	0.069
Dover	55	100	0.26	0.066	Rowley	55	110	0.34	0.075
Dracut	55	100	0.33	0.075	Royalston	65	100	0.25	0.070
Dudley	55	100	0.23	0.064	Russell	65	100	0.23	0.066
Dunstable	65	100	0.31	0.074	Rutland	55	100	0.24	0.068
Duxbury	45	110	0.25	0.062	Salem	45	110	0.31	0.071
E. Bridgewater	45	110	0.25	0.063	Salisbury	55	110	0.35	0.077
E. Brookfield	55	100	0.23	0.066	Sandisfield	65	90	0.23	0.066
E. Longmeadow	55	100	0.23	0.065	Sandwich	35	120	0.22	0.058
Eastham	35	120	0.19	0.052	Saugus	45	110	0.30	0.070
Easthampton	55	100	0.23	0.066	Savoy	65	90	0.22	0.068

16.00: continued

TABLE 1604.11 GROUND SNOW LOADS; BASIC WIND SPEEDS; EARTHQUAKE DESIGN FACTORS - continued

City/Town	p_g	V	Ss	S_1	City/Town	p_g,	V	Ss	S_1
Easton	55	110	0.25	0.064	Scituate	45	110	0.27	0.065
Edgartown	35	120	0.18	0.050	Seekonk	55	110	0.24	0.062
Egremont	65	90	0.23	0.066	Sharon	55	100	0.25	0.065
Erving	65	100	0.23	0.069	Sheffield	65	90	0.23	0.066
Essex	45	110	0.33	0.073	Shelburne	65	100	0.23	0.068
Everett	45	105	0.29	0.069	Sherborn	55	100	0.26	0.066
Fairhaven	45	110	0.22	0.057	Shirley	65	100	0.28	0.072
Fall River	45	110	0.23	0.059	Shrewsbury	55	100	0.25	0.067
Falmouth	35	120	0.20	0.054	Shutesbury	65	100	0.23	0.068
Fitchburg	65	100	0.27	0.071	Somerset	55	110	0.23	0.060
Florida	65	90	0.22	0.069	Somerville	45	105	0.28	0.069
Foxborough	55	100	0.25	0.064	South Hadley	55	100	0.23	0.066
Framingham	55	100	0.26	0.067	Southampton	55	100	0.23	0.066
Franklin	55	100	0.24	0.064	Southborough	55	100	0.26	0.067
Freetown	45	110	0.23	0.060	Southbridge	55	100	0.23	0.064
Gardner	65	100	0.26	0.070	Southwick	55	100	0.23	0.065
Gay Head (Aquinnah)	35	120	0.18	0.051	Spencer	55	100	0.23	0.066
Georgetown	55	110	0.34	0.075	Springfield	55	100	0.23	0.065
Gill	65	100	0.23	0.069	Sterling	55	100	0.26	0.069
Gloucester	45	110	0.33	0.073	Stockbridge	65	90	0.22	0.066
Goshen	65	100	0.22	0.067	Stoneham	45	105	0.30	0.071
Grafton	55	100	0.24	0.066	Stoughton	55	100	0.26	0.065
Gosnold	35	120	0.19	0.053	Stow	55	100	0.27	0.069
Granby	55	100	0.23	0.066	Sturbridge	55	100	0.23	0.065
Granville	65	100	0.23	0.066	Sudbury	55	100	0.27	0.069
Great Barrington	65	90	0.22	0.066	Sunderland	65	100	0.23	0.068
Greenfield	65	100	0.23	0.069	Sutton	55	100	0.24	0.065
Groton	65	100	0.30	0.073	Swampscott	45	110	0.30	0.070
Groveland	55	110	0.34	0.076	Swansea	55	110	0.24	0.061
Hadley	55	100	0.23	0.067	Taunton	55	110	0.24	0.062
Halifax	45	110	0.25	0.062	Templeton	65	100	0.25	0.070
Hamilton	45	110	0.33	0.074	Tewksbury	55	100	0.31	0.073
Hampden	55	100	0.23	0.065	Tisbury	35	120	0.18	0.052
Hancock	65	90	0.22	0.068	Tolland	65	100	0.23	0.066
Hanover	45	110	0.26	0.064	Topsfield	45	110	0.33	0.074
Hanson	45	110	0.25	0.063	Townsend	65	100	0.28	0.072
Hardwick	55	100	0.23	0.067	Truro	35	120	0.22	0.057
Harvard	55	100	0.28	0.070	Tyngsborough	55	100	0.31	0.074
Harwich	35	120	0.18	0.051	Tyringham	65	90	0.22	0.066
Hatfield	55	100	0.22	0.067	Upton	55	100	0.24	0.065
Haverhill	55	110	0.35	0.077	Uxbridge	55	100	0.24	0.064
Hawley	65	100	0.22	0.068	Wakefield	45	105	0.31	0.071
Heath	65	100	0.22	0.069	Wales	55	100	0.23	0.065
Hingham	45	110	0.27	0.066	Walpole	55	100	0.25	0.065
Hinsdale	65	90	0.22	0.067	Waltham	55	105	0.28	0.069
Holbrook	45	105	0.26	0.065	Ware	55	100	0.23	0.066
Holden	55	100	0.25	0.068	Wareham	45	110	0.23	0.058
Holland	55	100	0.23	0.064	Warren	55	100	0.23	0.066
Holliston	55	100	0.25	0.066	Warwick	65	100	0.24	0.070
Holyoke	55	100	0.23	0.066	Washington	65	90	0.22	0.067
Hopedale	55	100	0.24	0.065	Watertown	45	105	0.28	0.068
Hopkinton	55	100	0.25	0.066	Wayland	55	100	0.27	0.068
Hubbardston	65	100	0.25	0.069	Webster	55	100	0.23	0.064

16.00: continued

TABLE 1604.11 GROUND SNOW LOADS; BASIC WIND SPEEDS; EARTHQUAKE DESIGN FACTORS - continued

City/Town	p_g	V	Ss	S_1	City/Town	p_g,	V	Ss	S_1
Hudson	55	100	0.26	0.068	Wellesley	55	100	0.27	0.067
Hull	45	110	0.28	0.067	Wellfleet	35	120	0.20	0.054
Huntington	65	100	0.22	0.066	Wendell	65	100	0.23	0.069
Ipswich	45	110	0.34	0.074	Wenham	45	110	0.32	0.073
Kingston	45	110	0.24	0.061	W. Boylston	55	100	0.25	0.067
Lakeville	45	110	0.24	0.061	W. Bridgewater	45	110	0.25	0.063
Lancaster	55	100	0.27	0.070	W. Brookfield	55	100	0.23	0.066
Lanesborough	65	90	0.22	0.068	W. Newbury	55	110	0.35	0.077
Lawrence	55	110	0.33	0.075	W. Springfield	55	100	0.23	0.065
Lee	65	90	0.22	0.066	W. Stockbridge	65	90	0.22	0.066
Leicester	55	100	0.24	0.066	W. Tisbury	35	120	0.18	0.052
Lenox	65	90	0.22	0.067	Westborough	55	100	0.25	0.067
Leominster	65	100	0.26	0.070	Westfield	55	100	0.23	0.066
Leverett	65	100	0.23	0.068	Westford	55	100	0.30	0.073
Lexington	55	105	0.29	0.070	Westhampton	65	100	0.22	0.066
Leyden	65	100	0.23	0.069	Westminster	65	100	0.26	0.071
Lincoln	55	100	0.28	0.069	Weston	55	100	0.27	0.068
Littleton	55	100	0.29	0.071	Westport	45	110	0.23	0.058
Longmeadow	55	100	0.23	0.065	Westwood	55	100	0.26	0.066
Lowell	55	100	0.31	0.074	Weymouth	45	105	0.27	0.066
Ludlow	55	100	0.23	0.066	Whately	65	100	0.22	0.067
Lunenburg	65	100	0.28	0.071	Whitman	45	110	0.25	0.063
Lynn	45	110	0.31	0.071	Wilbraham	55	100	0.23	0.065
Lynnfield	45	110	0.31	0.072	Willamsburg	65	100	0.22	0.067
Malden	45	105	0.29	0.069	Williamstown	65	90	0.23	0.069
Manchester	45	110	0.32	0.072	Wilmington	55	105	0.31	0.073
Mansfield	55	110	0.25	0.063	Winchendon	65	100	0.26	0.071
Marblehead	45	110	0.31	0.071	Winchester	55	105	0.29	0.070
Marion	45	110	0.22	0.057	Windsor	65	90	0.22	0.067
Marlborough	55	100	0.26	0.068	Winthrop	45	105	0.29	0.068
Marshfield	45	110	0.26	0.064	Woburn	55	105	0.30	0.071
Mashpee	35	120	0.20	0.054	Worcester	55	100	0.24	0.067
Mattapoisett	45	110	0.22	0.057	Worthington	65	100	0.22	0.067
Maynard	55	100	0.27	0.069	Wrentham	55	100	0.24	0.064
Medfield	55	100	0.25	0.065	Yarmouth	35	120	0.19	0.052

1605.3.1 Replace Equation 16-13 as follows:

$$2/3[1.2D + (1.6W \text{ or } 1.0E) + f_1L + 0.5(L_r \text{ or } S \text{ or } R) + 1.6H]$$ where f_1 is defined in section 1605.2.1

1605.3.2 Delete.

Table 1607.1 Item 5. Revise to read as follows:

Balconies (exterior and interior) and decks[h]

Table 1607.1 Item 30. Revise 'Classroom' uniform loading as follows: 50 psf

1607.5 Add a last sentence as follows:

Partition loads are non-reducible live load.

1607.9.1.6 Add section:

1607.9.1.6 Hangers. Live load shall not be reduced for hangers.

16.00: continued

1607.9.1.7 Add subsection:

1607.9.1.7 Concrete Flat Slabs, Grid Slabs, and Plates. Live load shall not be reduced for peripheral (two-way action) shear around columns, capitals, and drop panels of concrete flat slabs, flat plates, and grid (waffle) slabs.

1607.9.2 Delete.

1608.2 Replace as follows:

1608.2 Ground Snow Loads. The ground snow loads to be used in determining the design snow loads for roofs shall be determined in accordance with Table 1604.11.

1608.3 to 1608.11 Add subsections:

1608.3 Concave Curved Roofs. Section 7.4.3 of ASCE 7 applies to convex curved roofs only. The effective loaded area of a concave curved roof shall be that area of the surface of the roof where the tangents to the surface have a slope of 50 degrees or less. The total uniform snow load for concave curved roofs shall be P*f* multiplied by the total horizontal projected area of the roof. This total load shall be applied uniformly over the effective loaded area of the roof.
1608.4 Drifts on Multiple Level Roofs. For multiple stepped roofs similar to that shown in Figure 1608.4.1, the sum of all the roof lengths upwind above the drift under consideration, l_u*, in Figure 1608.4.1, shall replace l_u in Figure 7-8 of ASCE 7. For multiple level roofs similar to that shown in Figure 1608.4.2, if the total calculated height of a drift and the underlying uniform snow layer on the upwind side of a higher roof ($h_d + h_b$) is equal to or greater than $0.7(h_b + h_c)$, then the length, l_u*, as shown in Figure 1608.4.2, shall be used in place of l_u in Figure 7-8 of ASCE 7.

FIGURE 1608.4.1

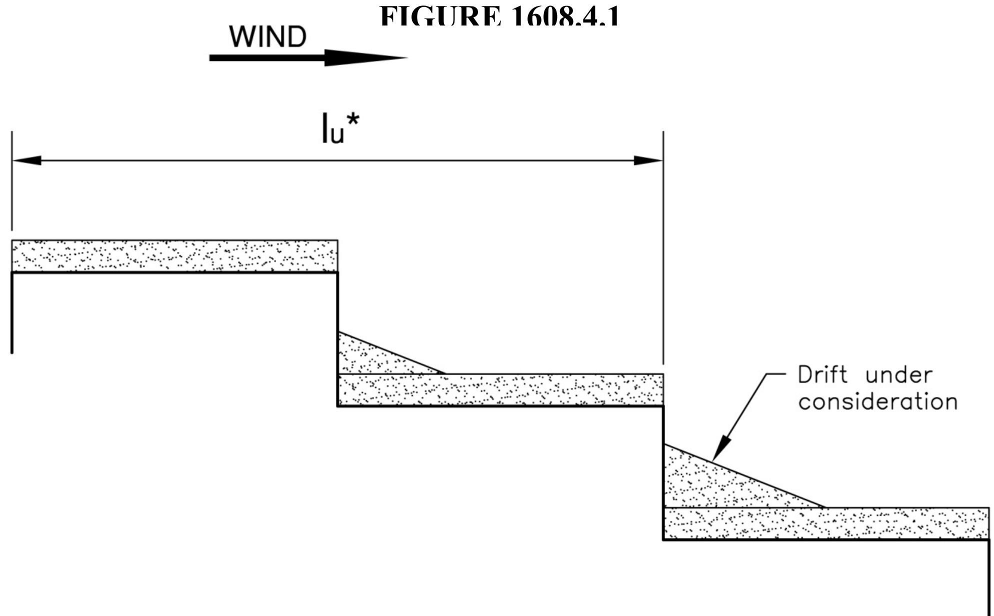
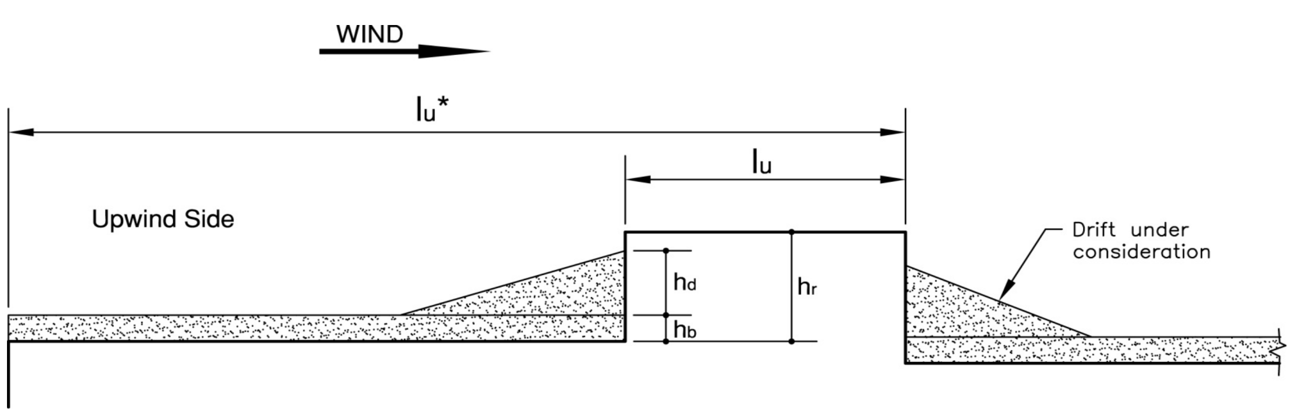


FIGURE 1608.4.2



16.00: continued

1608.5 Very High Roof Separations. When the ratio h_r/L_T is greater than 1.0, where L_T is the dimension in feet of the upper roof perpendicular to the wind flow (perpendicular to l_u in Figure 7-8 of ASCE 7) and $h_r = h_b + h_c$, the drift surcharge load on the lower roof due to drifting of snow from the upper roof may be reduced. The reduced height of the drift surcharge, h_{dr}, shall be not less than: $h_{dr} = h_r(2 - h_r/L_T)$, except that when h_r/L_T is greater than 2.0, h_{dr} shall be equal to zero.

1608.6 Snow Pockets or Wells. Account shall be taken of the load effects of potentially excessive snow accumulation in pockets or wells of roofs or decks.

1608.7 Roof Projections. The term roof projections used herein and in section 7.8 of ASCE 7 shall be interpreted to include screen walls, parapets, fire wall projections, and mechanical equipment. Drift loads at roof projections shall be in accordance with section 7.8 of ASCE 7.

1608.8 Sliding Snow. In addition to the sliding snow load on a lower roof as required in section 7.9 of ASCE 7, the lower roof shall be designed for a windward drift surcharge at the wall separating the upper and lower roofs in accordance with Figure 1608.4.1 and section 7.8 of ASCE 7. The sliding snow load and the windward drift surcharge need not be considered to act concurrently.

1608.9 Snow Guards. Sliding snow from an adjacent sloping high roof need not be considered on the low roof if snow guards, as specified herein, are provided on the high roof. In this case, the sloping roof with snow guards shall be designed for the unit snow loads required for a flat roof. The roof area(s) requiring snow guards shall be indicated on the construction documents. Snow guards shall be designed by a *registered design professional*. The *registered design professional* shall insure that there are adequate load paths from the snow guards into the supporting members and from the supporting members into the primary structure. The structural design of snow guards shall account for the impact of the sliding snow. The effectiveness in preventing the sliding of snow of proprietary snow guard systems shall be demonstrated by tests.

1608.10 Snow Storage and Collection Areas. Consideration of potentially excessive snow accumulation shall be given to portions of structures designated or used as snow collection or storage areas during and after snow removal operations (*e.g*. temporary snow collection areas when mechanically removing snow from a roof; snow storage areas for parking structures).

1609.1.1 Revise the second sentence to read as follows:

The type of opening protection required, and the exposure category for a site is permitted to be determined in accordance with section 1609 or ASCE 7. *See* section 1609.3 for the basic wind speed.

1609.3 Replace the first paragraph with the following:

The basic wind speed, V in mph, shall be determined in accordance with Table 1604.11.

1610 Replace section as follows:

SECTION 1610 LATERAL SOIL AND HYDROSTATIC LOADS

1610.1 General. Basement, foundation, and retaining walls shall be designed to resist lateral loads due to soil and water pressure. Lateral soil pressure on said walls shall be determined in accordance with the principles of soil mechanics and as provided in Chapter 18. Floors or similar elements below the water table shall be designed to resist the upward pressure of the water.

Exception. Uninhabitable spaces with concrete floors on the ground with an under-slab drainage system, including sump pits and sump pumps, designed to keep the water level a minimum of 1 foot below the bottom of the floor slab need not be designed to resist water pressure.

1610.2 Seismic Loads on Foundation Walls and Retaining Walls. Exterior foundation walls and retaining walls shall be designed to resist an earthquake force, F_w, for horizontal backfill surface, equal to:

$F_w = 0.100(S_S)(F_a)(\gamma_t)(H)^2$

16.00: continued

where S_S is the maximum considered earthquake spectral response acceleration from Table 1604.11, F_a is the site coefficient from Table 1613.5.3(1), γ_t is the total unit weight of the soil, and H is the height of the wall measured as the difference in elevation of finished ground surface or floor in front of and behind the wall. The earthquake force from the backfill shall be distributed as an inverted triangle over the height of the wall.

Surcharges that are applied over extended periods of time shall be included in the total static lateral soil pressure and their earthquake lateral force shall be computed and added to the force determined above. The point of application of the earthquake force from extended duration surcharge shall be determined on an individual case basis.

If the backfill or the existing soil behind the backfill consists of loose saturated granular soil, the potential for liquefaction of the backfill or existing soil adjacent to the wall during seismic loading shall be evaluated in accordance with the requirements of section 1806.4. If the backfill or existing soil beyond the backfill is potentially subject to liquefaction, the increase in design lateral load on the foundation wall or retaining wall shall be determined by a *registered design professional*.

For wall strength design, a load factor of 1.43 shall be applied to the earthquake force calculated above.

1612.1 At the end of the first sentence add this text: 'in accordance with this section and Appendix G.'

1612.2 Add or revise definitions as follows:

BASE FLOOD ELEVATION. The elevation of the *base flood*.

BASEMENT. Add after 'section 1612' the text 'and Appendix G'

COASTAL WETLAND RESOURCE AREA. Any coastal wetland resource are a subject to protection under the Wetlands Protection Act, M.G.L. c. 131, § 40, and the Wetlands Protection Act regulations, 310 CMR 10.21 through 10.35. Coastal Wetland Resource Areas include barrier beaches, coastal beaches, coastal dunes, rocky intertidal shores, tidal flats, land subject to 100 year coastal storm flowage, coastal banks, land containing shellfish, lands subject to tidal action, and lands under an estuary, salt pond or certain streams, ponds, rivers, lakes or creeks within the coastal zone that are anadromous/catadromous fish runs.

DESIGN FLOOD. *See base flood*.

DESIGN FLOOD ELEVATION. *See base flood elevation*.

FLOOD HAZARD AREA. The greater of the flowing two areas:

1. The area within a flood plain subject to a 1-percent or greater chance of flooding in any year
2. The area designated as a *flood hazard area* on a community's flood hazard map, such as a Flood Hazard Boundary Map or Flood Insurance Rate Map, or otherwise legally designated.

Note. A *flood hazard area subject to high-velocity wave action* is also considered a *flood hazard area*.

1612.3 Replace text with '*See* section 1612.2 for *flood hazard areas*'.

1612.3.1 Replace '*design flood*' with '*base flood*'.

1612.3.2 Delete subsection.

1612.4 Add last sentence and Note as follows:

Plans shall be prepared by a *registered design professional*.

Note. In using ASCE 24, delete Tables 1-1, 2-1, 4-1, 5-1, 6-1 and 7-1. For elevation requirements use section 1612 and Chapter 115 Appendix G. Also, delete references to Coastal A zones and instead use requirements for A zones in section 1612 and Appendix G.

16.00: continued

1612.5 At the end of this section add items 3. and 4. as follows:

Notes:

3. For construction in a *coastal wetland resource area:*

3.1 For buildings or structures, including new or replacement manufactured homes, lateral additions, foundations that are replaced in total, replaced so as to constitute new construction or substantially repaired or improved of a building or structure that has incurred substantial damage as a result of flooding and/or storms, proposed on a parcel of land that is located wholly or partially within a *coastal wetland resource area* shown on the map entitled "Map of Coastal Wetland Resources For Building Officials", the *building official* shall require submission of one of the construction documents specified in (a) through (d) along with a notarized statement by the applicant that the Order, Determination or Notice is in effect and is not the subject of any administrative appeals before the Department of Environmental Protection or the Division of Administrative Law Appeals. No building permit shall be issued unless and until a construction document that conforms to the requirements this section is submitted.

(a) An Order of Conditions establishing the boundaries of all *coastal wetland resource areas* in a plan referenced in and accompanying the Order. The Order shall determine whether the *coastal wetland resource areas* are significant to any of the interests identified in the Wetlands Protection Act, M.G.L. c. 131, § 40 including the interests of flood control and storm damage prevention. If the Order indicates that the proposed construction work is located within a *coastal dune* that is significant to the interests of flood control and/or storm damage prevention, the Order of Conditions must allow the proposed construction.

(b) An Order of Resource Area Delineation stating that the proposed construction work is outside the boundaries of all *coastal wetland resource areas* as shown on a plan referenced in and accompanying the Order.

(c) A Determination of Applicability stating that the proposed construction work is outside the boundaries of all *coastal wetland resource areas* as shown on a plan referenced in and accompanying the Determination or will not fill, dredge or alter a *coastal wetland resource area*.

(d) A Notice of Non-significance evidencing that the proposed construction work is within a *coastal wetland resource area* as shown on a plan referenced in and accompanying the Notice and stating that the *coastal wetland resource area* is not significant to any of the interests identified in the Wetlands Protection Act.

3.2 The elevation of the bottom of the lowest horizontal structural member, as required by the lowest floor elevation inspection in section 110.3.3

4. Documentation for buildings located in more than one zone shall meet the requirements of all zones.

1613.1 Replace the first paragraph with the following:

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 ASCE 7, excluding Chapter 14 and Appendix 11A, but including Massachusetts Amendments to Tables 12.2-1 and 12.14-1.

16.00: continued

Note. Seismic design category A shall not be used in Massachusetts. Any structure that could satisfy the requirements of seismic design category A in section 1613 or ASCE 7 shall be assigned to seismic design category B for purposes of implementing this Code.

1613.1 Add, after the exceptions, this text:

Section 1613 presents criteria for the design and construction of buildings and nonbuilding structures subject to earthquake ground motion. The specified earthquake loads rely on post-elastic energy dissipation in the structure, and because of this fact, the provisions for design, detailing and construction shall be satisfied even for structures and members for which load combinations containing earthquake load produce lesser effects than other load combinations.

The purpose of section 1613 is to minimize the hazard to life of occupants of all buildings and nonbuilding structures, to increase the expected performance of high occupancy assembly and education buildings as compared to ordinary buildings, and to improve the capability of essential facilities to function during and after an earthquake. Because of the complexity of and the great number of variables involved in seismic design (*e.g.* variability in ground motion, soil types, dynamic characteristics of the structure, material strength properties, and construction practice), section 1613 presents only minimum criteria in general terms. These minimum criteria are considered to be prudent and economically justified for the protection of life safety in buildings subject to earthquakes and for improved capability of essential facilities to function immediately following an earthquake.

Absolute safety and prevention of damage, even in an earthquake event with a reasonable probability of occurrence, cannot be achieved economically in most buildings. The "design earthquake" ground motion specified in section 1613 may result in both structural and non-structural damage. For most buildings designed and constructed according to the minimum requirements of section 1613, it is expected that structural damage from a major earthquake may be repairable, but the repair may not be economically feasible. For ground motions larger than the design earthquake, the intent of section 1613 is that there will be a low likelihood of building collapse.

1613.5.1 Replace as follows:

1613.5.1 Mapped Acceleration Parameters. The parameters S_S and S_1 shall be determined from Table 1604.11.

Note to reader: The following amendments pertain to ASCE 7

ASCE 7, TABLE 12.2-1 Revise as follows:

Note f. Replace 'ordinary moment frame' with 'ordinary steel moment frame'

Limitations: Amend as follows:

Seismic Force-Resisting System	Seismic Design Category
A.3	B is NP
A.4	B is NP
A.9	B and C are NP
A.10	B is NP.
A.11	B is NP
A.14	B and C are limited to 35 ft. and note 1.
B.4	B and C are NP for K-type configuration only.
B.7	B is NP
B.8	B is NP
B.19	B and C are NP
B.20	B is NP
B.21	B is NP
B.24	B and C are limited to 35 ft. and note 1.
C.7	B is NP
E.3	B and C are NP
F	B is NP
H	B and C are limited to 100 ft. and 65 ft., respectively and note 2

16.00: continued

Note 1. Permitted only at exterior walls and fire-rated walls and not permitted for buildings in Occupancy Category IV and not permitted for buildings where the dead load of any laterally supported floor or roof exceeds 25 psf.

Note 2. Connections shall be designed for two times the computed forces and moments resulting from seismic loads, in combination with other loads, as applicable, but need not be designed for forces greater than the expected nominal yield strength ($R_yF_yA_g$) of diagonal braces in braced frames or 1.1 times the expected flexural capacity of beams ($1.1R_yM_p$) in moment frames. Columns that are part of the seismic force-resisting system shall satisfy the requirements of section 8.3 Column Strength of ANSI/AISC 341 Seismic Provisions for Structural Steel Buildings. K-Braced Frames shall not be permitted. Beams in V-Type and Inverted V-Type Braced Frames shall meet the following additional requirements:

a. A beam that is intersected by braces shall be continuous between columns.

b. A beam that is intersected by braces shall be designed to support the effects of all tributary dead and live loads from load combinations stipulated by the Building Code, assuming that braces are not present.

c. Top and bottom flanges of the beam at the point of intersection of braces shall be designed to support a horizontal force perpendicular to the longitudinal axis of the beam that is equal to 2% of the nominal beam flange strength: $F_yb_f\,t_{bf}$.

ASCE 7, TABLE 12.14-1 Revise as follows:

Limitations: Amend as follows:

Seismic Force-Resisting System	Seismic Design Category
A.3	B is NP
A.4	B is NP
A.9	B is NP
A.10	B is NP.
A.11	B is NP
A.14	*See* note 1.
B.4	B and C are NP for K-type configuration only.
B.7	B is NP
B.8	B is NP
B.19	B is NP
B.20	B is NP
B.21	B is NP
B.24	*See* note 1.

Note 1. Permitted only at exterior walls and fire-rated walls and not permitted for buildings in Occupancy Category IV and not permitted for buildings where the dead load of any laterally supported floor or roof exceeds 25 psf.