CHAPTER 16
STRUCTURAL LOADS

SECTION 1601
GENERAL

1601.1 Scope. Provisions of this chapter shall govern the structural design of buildings, structures and portions thereof.

Exception: Buildings and structures located within the High Velocity Hurricane Zone shall comply with the provisions of Sections 1611 through 1626.

1601.2 Structural safety

1601.2.1 Every building and structure shall be of sufficient strength to support the loads and forces encountered, or combinations thereof, without exceeding in any of its structural elements the stresses prescribed elsewhere in this code.

1601.2.2 Buildings and structural systems shall possess general structural integrity to reduce the hazards associated with progressive collapse to levels consistent with good engineering practice. The structural system shall be able to sustain local damage or failure with the overall structure remaining stable. Compliance with the applicable provisions of ASCE 7 shall be considered as meeting the requirements of this section.

1601.3 Restrictions on loading. It shall be unlawful to place, or cause or permit to be placed, on any floor or roof of a building or other structure a load greater than is permitted by these requirements.

1601.4 Occupancy permits for changed loading. Plans for other than residential buildings filed with the building official with applications for permits shall show on each drawing the live loads per sq ft of area covered, for which the building is designed, and occupancy permits for buildings hereafter erected shall not be issued until the floor load signs, required by 106.4, have been installed.

1601.5 Items not specifically covered. Loads and forces for occupancies or uses not covered in this chapter shall be subject to the approval of the building official.

SECTION 1602
DEFINITIONS

For definitions, see Chapter 2.

SECTION 1603
DEAD LOADS

1603.1 Weights of materials and construction. In estimating dead loads for purposes of design, the actual weights of materials and constructions shall be used, provided that in the absence of definite information, values satisfactory to the building official may be assumed. For information on dead loads, see Appendix A.

1603.2 Provision for partitions. The actual weight of all permanent partitions shall be included in the dead load. Where partitions are likely to be used, although not definitely located, or where they are likely to be shifted, 20 psf (958 Pa) shall be added to the dead load in the areas supporting them, except in the case of light partitioning.

1603.3 Weight of fixed service equipment. In estimating dead loads for purpose of design, the weight of fixed service equipment, such as plumbing stacks and risers; electrical feeders and heating, ventilating, and air conditioning systems, shall be included whenever such equipment is supported by structural elements.

SECTION 1604
LIVE LOADS

1604.1 Uniform floor live loads. The live loads assumed for purposes of design shall be the greatest loads that probably will be produced by the intended uses and occupancies, provided that the minimum live loads to be considered as uniformly distributed shall be as given in Table 1604.1.

1604.2 Reduction of uniform floor live load. Floor live loads in 1604.1 may be reduced in accordance with the following provisions. Such reductions shall apply to slab systems designed for flexure in more than one direction, beams, girders, columns, piers, walls and foundations.

1. A reduction shall not be permitted in Group A occupancies.

2. A reduction shall not be permitted when the live load exceeds 100 psf (4.8 kPa) except that the design live load for columns may be reduced 20%.

3. For live loads not exceeding 100 psf (4.8 kPa), the design live load for any structural member supporting 150 sq ft (14 m²) or more may be reduced at the rate of 0.08% per sq ft of the area supported. Such reduction shall not exceed 40% for horizontal members, 60% for vertical members, nor R as determined by the following formula:

\[ R = 23.1 \left(1 + \frac{D}{L}\right) \]

where:

- \( R \) = Reduction in percent
- \( D \) = Dead load per sq ft of area supported
- \( L \) = Live load per sq ft of area supported
**TABLE 1604.1**
MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS

<table>
<thead>
<tr>
<th>OCCUPANCY OR USE</th>
<th>LIVE LOAD (psf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apartments (see Residential)</td>
<td>150</td>
</tr>
<tr>
<td>Armories and drill rooms</td>
<td>100</td>
</tr>
<tr>
<td>Assembly halls and other places of assembly:</td>
<td></td>
</tr>
<tr>
<td>Fixed seats</td>
<td>50</td>
</tr>
<tr>
<td>Movable seats</td>
<td>100</td>
</tr>
<tr>
<td>Balcony and decks (exterior) same as occupancy</td>
<td>60</td>
</tr>
<tr>
<td>but not less than</td>
<td></td>
</tr>
<tr>
<td>On one and two family dwellings</td>
<td>40</td>
</tr>
<tr>
<td>Bowling alleys, poolrooms and similar</td>
<td></td>
</tr>
<tr>
<td>recreational areas</td>
<td>75</td>
</tr>
<tr>
<td>Corridors:</td>
<td></td>
</tr>
<tr>
<td>First floor</td>
<td>100</td>
</tr>
<tr>
<td>Other floors, same as occupancy served except</td>
<td></td>
</tr>
<tr>
<td>as indicated</td>
<td>100</td>
</tr>
<tr>
<td>Dance halls and ballrooms</td>
<td>100</td>
</tr>
<tr>
<td>Dining rooms and restaurants</td>
<td>100</td>
</tr>
<tr>
<td>Dwellings (see Residential)</td>
<td></td>
</tr>
<tr>
<td>Fire escapes</td>
<td>100</td>
</tr>
<tr>
<td>On multi- or single-family residential buildings only</td>
<td>40</td>
</tr>
<tr>
<td>Garages (passenger cars only)</td>
<td>50</td>
</tr>
<tr>
<td>For trucks and buses use AASHTO1 lane loads</td>
<td></td>
</tr>
<tr>
<td>Gymnasiums, main floors and balconies</td>
<td>100</td>
</tr>
<tr>
<td>Hospitals:</td>
<td></td>
</tr>
<tr>
<td>Operating rooms, laboratories</td>
<td>60</td>
</tr>
<tr>
<td>Private rooms</td>
<td>40</td>
</tr>
<tr>
<td>Wards</td>
<td>40</td>
</tr>
<tr>
<td>Corridors, above first floor</td>
<td>80</td>
</tr>
<tr>
<td>Hotels (see Residential)</td>
<td></td>
</tr>
<tr>
<td>Libraries:</td>
<td></td>
</tr>
<tr>
<td>Reading rooms</td>
<td>60</td>
</tr>
<tr>
<td>Stack rooms (books and shelving at 65 pcf)</td>
<td>125</td>
</tr>
<tr>
<td>Corridors, above first floor</td>
<td>80</td>
</tr>
<tr>
<td>Manufacturing:</td>
<td></td>
</tr>
<tr>
<td>Light</td>
<td>100</td>
</tr>
<tr>
<td>Heavy</td>
<td>150</td>
</tr>
<tr>
<td>Marquees</td>
<td>75</td>
</tr>
<tr>
<td>Office Buildings:</td>
<td></td>
</tr>
<tr>
<td>Offices</td>
<td>50</td>
</tr>
<tr>
<td>Lobbies</td>
<td>100</td>
</tr>
<tr>
<td>Corridors, above first floor</td>
<td>80</td>
</tr>
<tr>
<td>File and computer rooms require heavier loads based upon anticipated occupancy</td>
<td></td>
</tr>
<tr>
<td>Penal institutions:</td>
<td></td>
</tr>
<tr>
<td>Cell blocks</td>
<td>40</td>
</tr>
<tr>
<td>Corridors</td>
<td>100</td>
</tr>
<tr>
<td>Residential:</td>
<td></td>
</tr>
<tr>
<td>Multifamily houses:</td>
<td></td>
</tr>
<tr>
<td>Private apartments</td>
<td>40</td>
</tr>
<tr>
<td>Public rooms</td>
<td>100</td>
</tr>
<tr>
<td>Corridors</td>
<td>80</td>
</tr>
<tr>
<td>Dwellings:</td>
<td></td>
</tr>
<tr>
<td>Sleeping rooms</td>
<td>30</td>
</tr>
<tr>
<td>Attics with storage</td>
<td>30</td>
</tr>
<tr>
<td>Attics without storage</td>
<td>10</td>
</tr>
<tr>
<td>All other rooms</td>
<td>40</td>
</tr>
<tr>
<td>Hotels:</td>
<td></td>
</tr>
<tr>
<td>Guest rooms</td>
<td>40</td>
</tr>
</tbody>
</table>

(continued)

**TABLE 1604.3**
MINIMUM CONCENTRATED LOADS

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>LOAD (lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elevator machine room grating (on area of 4 sq in.)</td>
<td>300</td>
</tr>
<tr>
<td>Finish light floor plate construction (on area of 1 sq in.)</td>
<td>200</td>
</tr>
<tr>
<td>Garages</td>
<td>Note 2</td>
</tr>
<tr>
<td>Office floors</td>
<td>2,000</td>
</tr>
<tr>
<td>Scuttles, skylight ribs, and accessible ceilings</td>
<td>200</td>
</tr>
<tr>
<td>Stair treads (on area of 4 sq in. at center of tread)</td>
<td>300</td>
</tr>
</tbody>
</table>

For SI: 1 lb = 4.4482 N, 1 sq in. = 645.16 mm², 1 sq ft = 0.0929 m².

Notes:
1. Load distributed uniformly over an area of 2½ sq ft unless noted otherwise.

1604.3 Concentrated floor live loads. In the design of floors, probable concentrated loads shall be considered. Where such loads may occur, the supporting beams, girders and slabs shall be designed to carry either the concentrated loads or the live load described in 1604.1, whichever produces the greater stresses. Concentrated loads shall be equal to the machinery, vehicle, equipment or apparatus anticipated but shall be not less than the loads specified in Table 1604.3.

**TABLE 1604.3 (continued)**
MINIMUM CONCENTRATED LOADS

<table>
<thead>
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<th>LOCATION</th>
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<td>200</td>
</tr>
<tr>
<td>Stair treads (on area of 4 sq in. at center of tread)</td>
<td>300</td>
</tr>
</tbody>
</table>

For SI: 1 lb = 4.4482 N, 1 sq in. = 645.16 mm², 1 sq ft = 0.0929 m².

Notes:
1. Load distributed uniformly over an area of 2½ sq ft unless noted otherwise.

(continued)
2. Floors in garages or portions of buildings used for the storage of motor vehicles shall be designed for the uniformly distributed live loads of Table 1604.1 or the following concentrated loads: (1) for passenger cars accommodating not more than nine passengers, 2,000 lb acting on an area of 20 sq in; (2) mechanical parking structures without slab or deck, passenger cars only, 1,500 lb per wheel; (3) for trucks or buses, maximum wheel load on an area of 20 sq in.

1604.4 Distribution of live loads. Where structural members are arranged so as to create continuity, the distribution of the live loads, such as on adjacent spans or alternate spans, which would cause maximum design conditions shall be used, except that roof live loads shall be distributed uniformly as provided in 1604.6.

Exception: The distribution of live loads on reinforced concrete structures shall be in accordance with ACI 318.

1604.5 Interior wall loads. Interior walls, permanent partitions and temporary partitions shall be designed to resist all loads to which they are subjected but not less than 5 psf (240 Pa) applied perpendicular to the walls, except for decorative screen walls.

1604.6 Roof live loads

1604.6.1 The design roof live loads shall take into account the effects of occupancy and water but shall be not less than the minimum roof live loads as set forth in Table 1604.6.

<table>
<thead>
<tr>
<th>TRIBUTARY LOADED AREA (sq ft) FOR ANY STRUCTURAL MEMBER</th>
<th>0 to 200</th>
<th>201 to 600</th>
<th>Over 600</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flat or rise less than 4-in. per ft</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arch or dome with rise less than 1/8 of span</td>
<td>20</td>
<td>16</td>
<td>12</td>
</tr>
<tr>
<td>Rise 4 in. per ft to less than 12 in. per ft</td>
<td>16</td>
<td>14</td>
<td>12</td>
</tr>
<tr>
<td>Arch or dome with rise 1/8 of span to less than 3/8 of span</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rise 12 in. per ft and greater</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Arch or dome with rise 3/8 of span or greater</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Awnings except cloth covered</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Greenhouses, lath houses, screen enclosures and agricultural buildings</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
</tbody>
</table>

For SI: 1 in/ft = 83.33 mm/m, 1 psf = 47.8803 Pa, 1 sq ft = 0.0929 m².

1604.6.2 Rain loads shall be designed for in accordance with the following:
1. Roof drainage systems shall be designed in accordance with the Florida Building Code, Plumbing.
2. Roofs shall be designed to preclude instability from ponding loads.
3. Each portion of a roof shall be designed to sustain the load of all rainwater that could accumulate on it if the primary drainage system for that portion is blocked. In determining the load that could result should the primary drainage system be blocked, the load caused by the depth of water (i.e., head) needed to cause the water to flow out of the secondary drainage system at the rate required by Chapter 11 of the Florida Building Code, Plumbing shall be included. Ponding instability shall be considered in this situation. If the overflow drainage provisions contain drain lines, such lines shall be independent of any primary drain lines.
4. Roofs equipped with controlled drainage provisions shall be equipped with a secondary drainage system at a higher elevation which prevents ponding on the roof above the design water depth. Such roofs shall be designed to sustain all rainwater loads on them to the elevation of the secondary drainage system, plus the load caused by the depth of water (i.e., head) needed to cause the water to flow out of the secondary drainage system. Ponding instability shall be considered in this situation.

1604.6.3 Roofs designed as future floors for the parking of automobiles or for other occupancy loadings shall comply with the provisions of 1604.1 and 1604.3.

1604.6.4 Wind loads shall comply with the provisions of 1606.

1604.7 Impact loads

1604.7.1 For structures carrying live loads which induce unusual impact, the assumed live load shall be increased sufficiently to provide for same. If not otherwise specified, the increase shall be:
1. For supports of elevators ..................... 100%
2. For cab operated traveling crane support girders and their connections* .................. 25%
3. For pendant operated traveling crane support girders and their connections* ... 10%
4. For supports of light machinery, shaft or motor driven, not less than ................ 20%
5. For supports of reciprocating machinery or power-driven units, not less than .... 50%
6. For hangers supporting floors and balconies 33%

*Live loads on crane support girders shall be taken as the maximum crane wheel loads.

1604.7.2 The lateral force on crane runways to provide for the effect of moving crane trolleys shall, if not otherwise specified, be 20% of the sum of the weights of the lifted load and of the crane trolley exclusive of other parts of the.
1604.8 Supports for walkway. Where walkways are to be installed above ceilings, supports shall be designed to carry a load of 200 lb (890 N) occupying a space 2½ sq ft (0.23 m²), so placed as to produce maximum stresses in the affected members.

1604.9 Sidewalks. Sidewalks shall be designed to carry either a uniformly distributed load of 200 psf (9.6 kPa) or a concentrated load of 8,000 lb (35.6 kN) on a space 2½ sq ft (0.58 m²) and placed in any position, whichever will produce the greater stresses. This does not apply to sidewalks on grade.

SECTION 1605
SNOW LOADS

All buildings and structures are exempt from snow load provisions.

SECTION 1606
WIND LOADS

1606.1 Applications. Buildings, structures and parts thereof shall be designed to withstand the minimum wind loads prescribed herein. Decreases in wind loads shall not be made for the effect of shielding by other structures. Wind pressures shall be assumed to come from any horizontal direction and to act normal to the surfaces considered.

1606.1.1 Determination of wind forces. Wind forces on every building or structure shall be determined by the provisions of Chapter 6 of ASCE 7.

Exceptions:
1. Provisions of 1606.2 shall be permitted for buildings 60 ft (18.3 m) high or less.
2. Wind tunnel tests together with applicable sections of 1606.2.
3. Subject to the limitations of 1606.1.1.1, 1606.1.4, and 1606.1.6, the provisions of SBCI SSTD 10 shall be permitted for applicable Group R2 and R3 buildings for a basic wind speed of 130 mph (58 m/s) or less in Exposure B and 110 mph (49 m/s) or less in Exposure C in accordance with Figure 1606 and Section 1606.1.8.
4. Subject to the limitations of 1606.1.1.1, 1606.1.4, and 1606.1.6, Provisions of AF&PA Wood Frame Construction Manual for One- and Two-Family Dwellings - 1996 SBC High Wind Edition 1996 shall be permitted for applicable wood framed buildings of Group R3 occupancy for a basic wind speed of 146 mph (65 m/s) or less in Exposure B and 124 mph (55 m/s) or less in Exposure C in accordance with Figure 1606 and Section 1606.1.8.
6. Subject to the limitations of 1606.1.1.1, 1606.1.4, and 1606.1.6, the provisions of the FC&PA Guide to Concrete Masonry Residential Construction in High Wind Areas shall be permitted for applicable concrete masonry buildings of Group R3 occupancy for a basic wind speed of 130 mph (58 m/s) or less in Exposure B and 110 mph (49 m/s) or less in Exposure C in accordance with Figure 1606 and Section 1606.1.8.
7. ANSI/TIA/EIA 222 shall be permitted for communication tower and steel antenna support structures and shall meet the wind loads of ASCE 7 and shall be designed by a qualified engineer.
8. Subject to the limitations of 1606.1.1.1, 1606.1.4, and 1606.1.6, the provisions of the WPPC Guide to Wood Construction in High Wind Areas shall be permitted for applicable wood-frame buildings of Group R3 occupancy for a basic wind speed of 130 mph (58 m/s) or less in Exposure B and 110 mph (49 m/s) or less in Exposure C in accordance with Figure 1606 and Section 1606.1.8.

1606.1.1.1 Applicability. The provisions of SSTD 10, the AF&PA Wood Frame Construction Manual for One- and Two-Family Dwellings, High Wind Edition, the Guide to Concrete Masonry Residential Construction in High Wind Areas, and the WPPC Guide to Wood Construction in High Wind Areas are applicable only to buildings located within Exposure A, B or C as defined in 1606.1.8. The provisions shall not apply to buildings sited on the upper half of an isolated hill, ridge, or escarpment meeting the following conditions:
1. The hill, ridge or escarpment is 60 feet (18.3 m) or higher if located in exposure B or 30 feet (9.1 m) or higher if located in exposure C;
2. The maximum average slope of the hill exceeds 10 percent; and
3. The hill, ridge or escarpment is unobstructed upwind by other such topographic features for a distance from the high point of 50 times the height of the hill or 1 mile (1.6 km), whichever is greater.

1606.1.2 Minimum wind loads. The wind loads used in the design of the main wind-force-resisting system shall not be less than 10 pounds per square foot (0.479 kN/m²) multiplied by the area of the building or structure projected on a vertical plane normal to the wind direction. In the calculation of design wind loads for components and cladding for buildings, the algebraic sum of the pressures acting on opposite faces shall be taken into account. The design pressure for components and cladding of buildings shall not be less than 10 pounds per square foot (0.479 kN/m²) acting in either direction normal to the surface. The design force for open buildings and other structures shall not be less than 10 pounds per square foot (0.479 kN/m²) multiplied by the area A_f.
1606.1.3 Anchorage against overturning, uplift and sliding. Structural members and systems, and components and cladding in a building or structure shall be anchored to resist wind-induced overturning, uplift and sliding and to provide continuous load paths for these forces to the foundation. Where a portion of the resistance to these forces is provided by dead load, the minimum dead load likely to be in place during a design wind event shall be used.

1606.1.4 Protection of openings. In windborne debris regions, exterior glazing that receives positive pressure in the lower 60 feet (18.3 m) in buildings shall be assumed to be openings unless such glazing is impact resistant or protected with an impact resistant covering meeting the requirements of SSTD 12, ASTM E 1886 and ASTM E 1996, or Miami-Dade PA 201, 202 and 203 referenced therein as follows:

1. Glazed openings located within 30 feet (9.1 m) of grade shall meet the requirements of the Large Missile Test.
2. Glazed openings located more than 30 feet (9.1 m) above grade shall meet the provisions of the Small Missile Test.
3. Storage sheds that are not designed for human habitation and that have a floor area of 720 square feet or less are not required to comply with the mandatory windborne debris impact standards of this Code.

Exception: Wood structural panels with a minimum thickness of 7/16 inch (11.1 mm) and maximum panel span of 8 feet (2438 mm) shall be permitted for opening protection in one- and two-story buildings. Panels shall be precut to cover the glazed openings with attachment hardware provided. Attachments shall be designed to resist the components and cladding loads determined in accordance with Table 1606.2B.

Attachment in accordance with Table 1606.1.4 is permitted for buildings with mean roof height of 33 feet (10 m) or less where wind speeds do not exceed 130 mph (58 m/s).

1606.1.4.1 Buildings with openings. Where exterior glazing is assumed to be an opening, in accordance with 1606.1.4, the building shall be evaluated to determine whether the openings are of sufficient area to constitute an open or partially enclosed building as defined in 1606.1.5. Open and partially enclosed buildings shall comply with the applicable provisions of ASCE 7.

1606.1.4.2 The wind-borne debris regions requirement shall not apply landward of the designated contour line in Figure 1606. A geographical boundary that coincides with the contour line shall be established.

1606.1.5 Definitions. The following definitions apply only to the provisions of 1606.

Building, Enclosed. A building that does not comply with the requirements for open or partially enclosed buildings.

Building And Other Structure, Flexible. Slender buildings and other structures that have a fundamental natural frequency less than 1 Hz.

Building, Low-rise. Enclosed or partially enclosed buildings which comply with the following conditions:
1. mean roof height, h, less than or equal to 60 ft (18 m);
2. mean roof height, h, does not exceed least horizontal dimension.

Building, Open. A building having each wall at least 80% open. This condition is expressed for each wall by the formula \( A_o \geq 0.8 A_g \) where:

\[ A_o = \text{total area of openings in a wall that receive positive external pressure, in sq ft (m}^2) \]

<table>
<thead>
<tr>
<th>TABLE 1606.1.4</th>
<th>WIND-BORNE DEBRIS PROTECTION FASTENING SCHEDULE FOR WOOD STRUCTURAL PANELS</th>
</tr>
</thead>
<tbody>
<tr>
<td>FASTENER TYPE</td>
<td>FASTENER SPACING (in.)(^{1,2})</td>
</tr>
<tr>
<td></td>
<td>Panel Span ( \leq 2 \text{ ft} )</td>
</tr>
<tr>
<td>2 1/2 #6 Wood Screw(^3)</td>
<td>16</td>
</tr>
<tr>
<td>2 1/2 #8 Wood Screws(^3)</td>
<td>16</td>
</tr>
<tr>
<td>Double-Headed Nails(^4)</td>
<td>12</td>
</tr>
</tbody>
</table>

Notes:
1. This table is based on a maximum wind speed of 130 mph (58 m/s) and mean roof height of 33 feet (10 m) or less.
2. Fasteners shall be installed at opposing ends of the wood structural panel.
3. Where screws are attached to masonry or masonry/stucco, they shall be attached using vibration-resistant anchors having a minimum withdrawal capacity of 490 lb (2180 kN).
4. Nails shall be 10d common or 12d box double-headed nails.
Building, Partially Enclosed. A building which complies with both of the following conditions:

1. the total area of openings in a wall that receives positive external pressure exceeds the sum of the areas of openings in the balance of the building envelope (walls and roof) by more than 10%, and
2. the total area of openings in a wall that receives positive external pressure exceeds 4 sq ft (0.37 m²) or 1% of the area of that wall, whichever is smaller, and the percentage of openings in the balance of the building envelope does not exceed 20%.

These conditions are expressed by the following formulas:

1. \( A_o > 1.10A_{oi} \)
2. \( A_o > 4 \text{ sq ft (0.37 m}^2\) or \( > 0.01A_g \), whichever is smaller, and \( A_{oi}/A_{gi} \leq 0.20 \)

where:

- \( A_o, A_g \) are as defined for Open Building
- \( A_{oi} = \) the sum of the areas of openings in the building envelope (walls and roof) not including \( A_o \), in sq ft (m²)
- \( A_{gi} = \) the sum of the gross surface areas of the building envelope (walls and roof) not including \( A_g \), in sq ft (m²)

Building, simple diaphragm: A building which complies with all of the following conditions:

1. enclosed building,
2. mean roof height, \( h \), less than or equal to 60 ft (18 m),
3. mean roof height, \( h \), does not exceed least horizontal dimension,
4. building has an approximately symmetrical cross section,
5. building has no expansion joints or structural separations within the building,
6. wind loads are transmitted through floor and roof diaphragms to the vertical lateral-force-resisting systems, and
7. if the building has moment-resisting frames, roof slopes do not exceed 30 degrees.

Components and Cladding. Elements of the building envelope that do not qualify as part of the main wind-force resisting system.

Effective Wind Area. For component and cladding elements, the effective wind area in Tables 1606.2B and 1606.2C is the span length multiplied by an effective width that need not be less than one-third the span length. For cladding fasteners, the effective wind area shall not be greater than the area that is tributary to an individual fastener.

1606.6 Basic wind speed. The basic wind speed in miles per hour, for the development of wind loads, shall be determined from Figure 1606. Basic wind speed for the special wind regions indicated, near mountainous terrain and near gorges shall be in accordance with local jurisdiction requirements. The exact location of wind speed lines shall be established by local ordinance using recognized physical landmarks such as major roads, canals, rivers and lake shores, wherever possible.

1606.1.6.1 Wind speed conversion. When referenced documents are based on fastest mile wind speeds, the three second gust wind velocities of Figure 1606 shall be converted to fastest mile wind velocities using Table 1606.1.6.1.

<table>
<thead>
<tr>
<th>3 sec. gust</th>
<th>85</th>
<th>90</th>
<th>100</th>
<th>105</th>
<th>110</th>
<th>120</th>
<th>125</th>
<th>130</th>
<th>140</th>
<th>145</th>
<th>150</th>
</tr>
</thead>
<tbody>
<tr>
<td>fastest mile</td>
<td>70</td>
<td>75</td>
<td>80</td>
<td>85</td>
<td>90</td>
<td>100</td>
<td>105</td>
<td>110</td>
<td>120</td>
<td>125</td>
<td>130</td>
</tr>
</tbody>
</table>

1 mph = 0.447 m/s

1606.1.7 Information on drawings. The following information related to wind loads shall be shown on the construction drawings:

1. Basic wind speed, mph (m/s).
2. Wind importance factor (I) and building category.
3. Wind exposure - if more than one wind exposure is used, the wind exposure and applicable wind direction shall be indicated.
4. The applicable internal pressure coefficient.
5. Components and Cladding. The design wind pressures in terms of psf (kN/m²), to be used for the design of exterior component and cladding materials not specifically designed by the registered design professional.

1606.1.8 Exposure Category. For each wind direction considered, an exposure category that adequately reflects the characteristics of ground surface irregularities shall be determined for the site at which the building or structure is to be constructed. For a site located in the transition zone between categories, the category resulting in the largest wind forces shall apply. Account shall be taken of variations in ground surface roughness that arise from natural topography and vegetation as well as from constructed features. For any given wind direction, the exposure in which a specific building or other structure is sited shall be assessed as being one of the following categories:

1. Exposure A. Large city centers with at least 50% of the buildings having a height in excess of 70 feet (21.3 m). Use of this exposure category shall be limited to those areas for which terrain representative of Exposure A prevails in the upwind direction for a distance of at least one-half mile (0.8 km) or 10 times the height of the building or other structure, whichever is greater. Possible channeling effects or increased velocity pressures caused by the building or structure being located in the wake of adjacent buildings shall be taken into account.

2. Exposure B. Urban and suburban areas, wooded areas, or other terrain with numerous closely spaced obstructions having the size of single-family dwellings or larger. Exposure B shall be assumed unless the site meets the definition of another type exposure.

3. Exposure C. Means, except in the high velocity hurricane zone, that area which lies within 1500 feet of the coastal construction control line, or within 1500 feet of the mean high tide line, whichever is less. On barrier islands, exposure category C shall be applicable in the coastal building zone set forth in s. 161.55(5), Florida Statutes.

4. Exposure D. Flat, unobstructed areas exposed to wind flowing over open water (excluding shorelines in hurricane prone regions) for a distance of at least 1 mile (1.61 km). Shorelines in Exposure D include inland waterways, the Great Lakes and coastal areas of California, Oregon, Washington and Alaska. This exposure shall apply only to those buildings and other structures exposed to the wind coming from over the water. Exposure D extends inland from the shoreline a distance of 1500 feet (460 m) or 10 times the height of the building or structure, whichever is greater.

1606.2 Simplified provisions for Low Rise Buildings

1606.2.1 Scope. Procedures in 1606.2 shall be used for determining and applying wind pressures in the design of simple diaphragm buildings with flat, hipped and gable-shaped roofs having a mean roof height not exceeding the least horizontal dimension of the building or 60 ft (18.3 m), whichever is less.

The provisions of 1606.2 shall not be used if any of the following conditions exist:

1. Buildings on which exterior glazing is considered to be openings in accordance with 1606.1.4.
2. Buildings sited on the upper half of an isolated hill or escarpment meeting all the following conditions:
   2.1 The hill or escarpment is 60 feet (18.3 m) or higher if located in exposure B or 30 feet (9.1 m) or higher if located in Exposure C.
   2.2 The maximum average slope of the hill exceeds 10 percent.
   2.3 The hill or escarpment is unobstructed upwind by other such topographic features for a distance from the high point of 50 times the height of the hill or 1 mile (1.6 km), whichever is less.

1606.2.2 Wind pressures

1606.2.2.1 Structural members, cladding, fasteners and systems providing for the structural integrity of the building shall be designed for the loads from Tables 1606.2A, 1602.2B and 1602.2C using Figure 1606, multiplied by the appropriate height and exposure coefficient from Table 1606.2D and the importance factor from Table 1606.
FIGURE 1606

Basic Wind Speed
Section 1606.1.6

1) Values are nominal design, 3-second gust, wind speeds in miles per hour (mph) at 33 feet (10 m) above ground for Exposure C Category.

2) This map is accurate to the county. Local governments establish specific wind speed/wind-borne debris lines using physical landmarks such as major roads, canals, rivers, and shorelines.

3) Islands and coastal areas outside the last contour shall use the last wind-speed contour of the coastal area.

4) Mountainous terrain, gorges, ocean promontories, and special wind regions shall be examined for unusual wind conditions.

5) Wind speeds are American Society of Civil Engineers Standard (ASCE 7-98) 50-100-year peak gusts.

FIGURE 1606
STATE OF FLORIDA
WIND-BORNE DEBRIS REGION & BASIC WIND SPEED
TABLE 1606 IMPORTANCE FACTORS FOR BUILDINGS AND OTHER STRUCTURES

<table>
<thead>
<tr>
<th>Nature of Occupancy</th>
<th>Importance Factor ( I_w )</th>
</tr>
</thead>
<tbody>
<tr>
<td>All buildings and structures except those listed below</td>
<td>1.0</td>
</tr>
<tr>
<td>Buildings and structures where the occupant load is 300 or more in any one room.</td>
<td>1.15</td>
</tr>
<tr>
<td>Buildings and structures designated as essential facilities, including, but not limited to:</td>
<td></td>
</tr>
<tr>
<td>(1) Hospital and other medical facilities having surgery or emergency treatment areas</td>
<td></td>
</tr>
<tr>
<td>(2) Fire or rescue and police stations</td>
<td></td>
</tr>
<tr>
<td>(3) Primary communication facilities and disaster operation centers</td>
<td></td>
</tr>
<tr>
<td>(4) Power stations and other utilities required in an emergency</td>
<td>1.15</td>
</tr>
<tr>
<td>Buildings and structures that represent a low hazard to human life in the event of failure, such as agricultural buildings, screen enclosures, certain temporary facilities, and minor storage facilities</td>
<td>0.87*</td>
</tr>
</tbody>
</table>

* In hurricane-prone regions with \( V > 100 \) mph (45 m/s), \( I_w \) shall be 0.77.

1606.2.2.2 Members that act as both part of the main wind-force-resisting system and as components and cladding shall be designed for each separate load case.

1606.2.3 Edge strips and end zones. The width of the edge strips \((a)\), as shown in Figure 1606.2 (c), shall be 10% of the least horizontal dimension or 40% of the eave height, whichever is less but not less than either 4% of the least horizontal dimension or 3 feet (914 mm). End zones as shown in Figure 1606.2b shall be twice the width of the edge strip \((a)\).

1606.2.4 Main wind force resisting system (MWFRS). All elements and connections of the MWFRS shall be designed for vertical and horizontal loads based on the combined leeward and windward wall pressures and roof pressures determined from Table 1606.2A. Pressures shall be applied in accordance with the loading diagrams shown in Figure 1606.2a to the end zone and interior zone as shown in Figure 1606.2b. The building shall be designed for all wind directions. For buildings having flat roofs, a ridge line normal to the wind direction shall be assumed at the mid-length dimension of the roof for all directions considered. Each corner shall be considered in turn as the windward corner.

1606.2.4.1 Overhang loads. The pressures to be used for the effects of roof overhangs on MWFRS shall be taken from Table 1606.2A and include the effect of the wind on both the bottom and top surfaces.

1606.2.5 Components and cladding. Pressure for wind loading actions on components and cladding shall be determined from Table 1606.2B for enclosed portions of the building and Table 1606.2C for overhangs, based on the effective area for the element under consideration. The pressures in Table 1606.2C include internal pressure. The pressure shall be applied in accordance with the loading diagrams in Figure 1606.2c.

1606.3 Roof systems

1606.3.1 Roof deck. The roof deck shall be designed to withstand the wind pressures determined from the provisions of 1606.2 for buildings with a mean roof height not exceeding 60 ft (18.3 m) in height or 1606.1.1 for buildings of any height.

1606.3.2 Roof coverings. Roof coverings shall comply with 1606.3.1. Rigid tile roof coverings that are air-permeable and installed over a roof deck shall be permitted to be designed in accordance with 1606.3.3.

1606.3.3 Rigid tile. Wind loads on rigid tile roof coverings shall be determined in accordance with the following formula:

\[
M_a = q_h C_L b L a [1.0 - G C_f ]
\]

where:

- \( M_a \) = aerodynamic uplift moment acting to raise the tail of the tile, foot-pounds (N-mm).
- \( q_h \) = wind velocity pressure determined from Equation 6-1 of ASCE 7 (psf).
- \( C_L \) = The lift coefficient shall be 0.2 or shall be determined by testing in accordance with 1707.5.
- \( b \) = exposed width of the roof tile, feet (mm).
- \( L \) = length of the roof tile, feet (mm).
- \( L_a \) = moment arm [feet (mm)] from the axis of rotation to the point of uplift on the roof tile. The point of uplift shall be taken at 0.76 L from the head of the tile and the middle of the exposed width. For roof tiles with nails or screws (with or without a tail clip), the axis of rotation shall be taken as the head of the tile for direct deck applications and as the top edge of the batten for battened applications. For roof tiles fastened only by a nail or screw along the side of the tile, the axis of rotation shall be determined by testing. For roof tiles installed with battens and fastened only by a clip near the tail of the tile, the moment arm shall be determined about the top edge of the batten with consideration given for the point of rotation of the tiles.
<table>
<thead>
<tr>
<th>Wind Velocity (mph)</th>
<th>Load Direction</th>
<th>Roof angle (degrees)</th>
<th>Wall</th>
<th>Roof</th>
<th>Windward Roof</th>
<th>Leeward Roof</th>
<th>Windward Overhang</th>
<th>Max. Horizontal Wall Loads</th>
<th>Zone</th>
</tr>
</thead>
<tbody>
<tr>
<td>90</td>
<td>Transverse</td>
<td>0 - 5</td>
<td>12.8</td>
<td>-6.7</td>
<td>-9.5</td>
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<td>-15.4</td>
<td>-10.7</td>
<td>10.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20</td>
<td>17.8</td>
<td>-4.7</td>
<td>11.9</td>
<td>-2.6</td>
<td>-15.4</td>
<td>-10.7</td>
<td>12.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>30 &lt; angle ≤ 45</td>
<td>14.4</td>
<td>9.9</td>
<td>11.5</td>
<td>7.9</td>
<td>5.6</td>
<td>-8.8</td>
<td>11.0</td>
</tr>
<tr>
<td></td>
<td>Longitudinal</td>
<td>All angles</td>
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<td>-6.7</td>
<td>8.5</td>
<td>-4.0</td>
<td>-15.4</td>
<td>-8.8</td>
<td>10.0</td>
</tr>
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<td>-8.2</td>
<td>10.5</td>
<td>-4.9</td>
<td>-19.1</td>
<td>-10.8</td>
<td>12.0</td>
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<td></td>
<td>20</td>
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<td>-5.8</td>
<td>14.6</td>
<td>-3.2</td>
<td>-19.1</td>
<td>-13.3</td>
<td>15.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>30 &lt; angle ≤ 45</td>
<td>17.8</td>
<td>12.2</td>
<td>14.2</td>
<td>9.8</td>
<td>6.9</td>
<td>-10.8</td>
<td>13.0</td>
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<td>-4.9</td>
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<td>-10.8</td>
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<td>30 &lt; angle ≤ 45</td>
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<td>24.0</td>
<td>16.5</td>
<td>11.6</td>
<td>-18.3</td>
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<tr>
<td></td>
<td>Longitudinal</td>
<td>All Angles</td>
<td>26.8</td>
<td>-13.9</td>
<td>17.8</td>
<td>-8.2</td>
<td>-32.2</td>
<td>-18.3</td>
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<td>140</td>
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<td>0 - 5</td>
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<td>-16.1</td>
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<td>-9.6</td>
<td>-37.3</td>
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<td>30 &lt; angle ≤ 45</td>
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<td>27.8</td>
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<td>All Angles</td>
<td>31.1</td>
<td>-16.1</td>
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<td>-37.3</td>
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<td>0 - 5</td>
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<td>-11.0</td>
<td>-42.9</td>
<td>-24.4</td>
<td>27.0</td>
</tr>
</tbody>
</table>

Table 1606.2A: Main Wind Force Resisting System Wind Loads for a Building with a Mean Roof Height of 30 Feet Located in Exposure B Note 1

For SI: 1 ft² = 0.0929 m², 1 mph = 0.447 m/s, 1 degree of angle = 0.01745 rad, 1 psf = 47.88 N/m².

Notes:
1. Pressures for roof angles from 5 to 20 degrees shall be interpolated from the table.
2. Pressures are the sum of the windward and leeward pressures and shall be applied to the windward elevation of the building in accordance with Figure 1606.2(a).
3. If pressure is less than 0, use 0.
4. Pressures shall be applied in accordance with Figure 1606.2(b).
<table>
<thead>
<tr>
<th>Roof Angle</th>
<th>85</th>
<th>90</th>
<th>100</th>
<th>110</th>
<th>120</th>
<th>130</th>
<th>140</th>
<th>150</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 0-10 degrees</td>
<td>10.0</td>
<td>10.0</td>
<td>-13.0</td>
<td>10.0</td>
<td>-14.6</td>
<td>10.0</td>
<td>-18.0</td>
<td>10.0</td>
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<td>10.0</td>
<td>-17.5</td>
<td>10.0</td>
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<tr>
<td>&gt; 0-45 degrees</td>
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<td>10.0</td>
<td>-13.7</td>
<td>10.0</td>
<td>-16.9</td>
<td>10.0</td>
</tr>
<tr>
<td>&gt; 0-30 degrees</td>
<td>10.0</td>
<td>10.0</td>
<td>-12.7</td>
<td>10.0</td>
<td>-14.2</td>
<td>10.0</td>
<td>-17.5</td>
<td>10.0</td>
</tr>
<tr>
<td>&gt; 0-45 degrees</td>
<td>10.0</td>
<td>10.0</td>
<td>-11.9</td>
<td>10.0</td>
<td>-13.7</td>
<td>10.0</td>
<td>-16.9</td>
<td>10.0</td>
</tr>
<tr>
<td>&gt; 0-30 degrees</td>
<td>10.0</td>
<td>10.0</td>
<td>-12.7</td>
<td>10.0</td>
<td>-14.2</td>
<td>10.0</td>
<td>-17.5</td>
<td>10.0</td>
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<tr>
<td>&gt; 0-45 degrees</td>
<td>10.0</td>
<td>10.0</td>
<td>-11.9</td>
<td>10.0</td>
<td>-13.7</td>
<td>10.0</td>
<td>-16.9</td>
<td>10.0</td>
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<tr>
<td>&gt; 0-30 degrees</td>
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<td>-12.7</td>
<td>10.0</td>
<td>-14.2</td>
<td>10.0</td>
<td>-17.5</td>
<td>10.0</td>
</tr>
<tr>
<td>&gt; 0-45 degrees</td>
<td>10.0</td>
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<td>-11.9</td>
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<td>-13.7</td>
<td>10.0</td>
<td>-16.9</td>
<td>10.0</td>
</tr>
</tbody>
</table>

For SI: 1 ft² = 0.0929 m², 1 mph = 0.447 m/s, 1 psf = 47.88 N/m².
1 For effective areas or wind speeds between those given above the load may be interpolated, otherwise use the load associated with the lower effective area.
2 Table values shall be adjusted for height and exposure by multiplying by adjustment coefficients in Table 1606.2D.
3 See Figure 1606.2(c) for location of zones.
4 Plus and minus signs signify pressures acting toward and away from the building surfaces.
<table>
<thead>
<tr>
<th>Zone</th>
<th>Basic Wind Speed v (mph - 3 second gust)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>90</td>
</tr>
<tr>
<td>Roof Angle &gt; 0-10 degrees</td>
<td></td>
</tr>
<tr>
<td>2</td>
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</tr>
<tr>
<td>2</td>
<td>-20.6</td>
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<td>3</td>
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</tr>
<tr>
<td>Roof Angle &gt; 10 - 30 degrees</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>-27.2</td>
</tr>
<tr>
<td>2</td>
<td>-27.2</td>
</tr>
<tr>
<td>3</td>
<td>-45.7</td>
</tr>
<tr>
<td>3</td>
<td>-40.5</td>
</tr>
<tr>
<td>Roof Angle &gt; 30 - 45 degrees</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>-24.7</td>
</tr>
<tr>
<td>2</td>
<td>-24.0</td>
</tr>
<tr>
<td>3</td>
<td>-22.2</td>
</tr>
</tbody>
</table>

For SI: 1 psf = 47.88 N/m², 1 ft² = 0.0929 m², 1 mph = 0.447 m/s.

Note: For effective areas between those given above the load may be interpolated, otherwise use the load may be interpolated, otherwise use the load associated with the lower effective area.

<table>
<thead>
<tr>
<th>Mean Roof Height</th>
<th>Exposure</th>
<th>Exposure</th>
<th>Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>15</td>
<td>1.00</td>
<td>1.21</td>
<td>1.47</td>
</tr>
<tr>
<td>20</td>
<td>1.00</td>
<td>1.29</td>
<td>1.55</td>
</tr>
<tr>
<td>25</td>
<td>1.00</td>
<td>1.35</td>
<td>1.61</td>
</tr>
<tr>
<td>30</td>
<td>1.00</td>
<td>1.40</td>
<td>1.66</td>
</tr>
<tr>
<td>35</td>
<td>1.05</td>
<td>1.45</td>
<td>1.70</td>
</tr>
<tr>
<td>40</td>
<td>1.09</td>
<td>1.49</td>
<td>1.74</td>
</tr>
<tr>
<td>45</td>
<td>1.12</td>
<td>1.53</td>
<td>1.78</td>
</tr>
<tr>
<td>50</td>
<td>1.16</td>
<td>1.56</td>
<td>1.81</td>
</tr>
<tr>
<td>55</td>
<td>1.19</td>
<td>1.59</td>
<td>1.84</td>
</tr>
<tr>
<td>60</td>
<td>1.22</td>
<td>1.62</td>
<td>1.87</td>
</tr>
</tbody>
</table>

Note: All table values shall be adjusted for other exposures and heights by multiplying by the above coefficients.
FIGURE 1606.2a
APPLICATION OF MAIN WIND FORCE RESISTING SYSTEM
LOADS FOR SIMPLE DIAPHRAGM BUILDINGS

FIGURE 1606.2b
MAIN WIND FORCE LOADING DIAGRAM
For SI: 1 degree = 0.01745 rad.

FIGURE 1606.2(c)
COMPONENT AND CLADDING LOADING DIAGRAMS
based on straight bond or broken bond and the tile profile.

\[ GC_p = \text{roof coefficient for each applicable zone determined from ASCE 7. Roof coefficient shall not be adjusted for internal pressure.} \]

Concrete and clay roof tiles complying with the following limitations shall be designed to withstand the wind loads prescribed in this section.

1. The roof tiles shall be either loose laid on battens or mechanically fastened or mortar set or adhesive set.
2. The roof tiles shall be installed on solid sheathing which has been designed as components and cladding in accordance with 1606.2.
3. An underlayment shall be installed in accordance with 1507.4.
4. The tile shall be single lapped interlocking with a minimum head lap of not less than 2 inches (51 mm).
5. The length of the tile shall be between 1.0 and 1.75 ft (305 and 533 mm).
6. The exposed width of the tile shall be between 0.67 and 1.25 ft (203 and 381 mm).
7. Maximum thickness of the tail of the roof tile shall not exceed 1.3 inches (33 mm).
8. Roof tiles using mortar set or adhesive set systems shall have at least 2/3 of the tile's area free of mortar or adhesive contact.

### SECTION 1607 (Reserved)

### SECTION 1608 SPECIAL LOADS

#### 1608.1 Soil Pressures

**1608.1.1 Foundation and retaining walls.** Foundation walls and retaining walls shall be designed to resist applicable lateral soil loads and applicable fixed or moving surcharge loads. When a geotechnical soil analysis is not available, the soil loads of Table 1608.1.1 shall be the design lateral soil load. The design lateral soil loads given in Table 1608.1.1 are for moist conditions for the specified soils at their optimum densities. Submerged or saturated soil pressures shall include the weight of the buoyant soil plus the hydrostatic loads.

**1608.1.2 Basement floors.** In the design of basement floors and similar approximately horizontal constructions below grade, the upward pressure of water, if any, shall be taken as the full hydrostatic pressure applied over the entire area. The hydrostatic head shall be measured from the underside of the construction.

#### 1608.2 Railing

**1608.2.2 Guardrail system design and construction**

**1608.2.2.1 Guardrail systems shall be designed and constructed for a concentrated load of 200 lb (890 N) applied at any point and in any direction.**

**1608.2.2.2 Guardrail systems located other than within dwelling units shall be designed and constructed for a load of 50 plf (730 N/m) applied horizontally at the.

---

**TABLE 1608.1.1 SOIL LATERAL LOADS**

<table>
<thead>
<tr>
<th>SOIL DESCRIPTION</th>
<th>UNIFIED SOIL CLASSIFICATION</th>
<th>DESIGN LATERAL SOIL LOAD, PSF PER FOOT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Well-graded, clean gravels; gravel-sand mixes</td>
<td>GW</td>
<td>30</td>
</tr>
<tr>
<td>Poorly graded clean gravels; gravel-sand mixes</td>
<td>GP</td>
<td>30</td>
</tr>
<tr>
<td>Silty gravels, poorly graded gravel-sand mixes</td>
<td>GM</td>
<td>45</td>
</tr>
<tr>
<td>Clayey gravels, poorly graded gravel-sand-clay mixes</td>
<td>GC</td>
<td>45</td>
</tr>
<tr>
<td>Well-graded, clean sands; gravelly-sand mixes</td>
<td>SW</td>
<td>30</td>
</tr>
<tr>
<td>Poorly graded clean sands; sand-gravel mixes</td>
<td>SP</td>
<td>30</td>
</tr>
<tr>
<td>Silty sands, poorly graded sand-silt mixes</td>
<td>SM</td>
<td>45</td>
</tr>
<tr>
<td>Sand-silt clay mix with plastic fines</td>
<td>SM-SC</td>
<td>45</td>
</tr>
<tr>
<td>Clayey sands, poorly graded sand-clay mixes</td>
<td>SC</td>
<td>60</td>
</tr>
<tr>
<td>Inorganic silts and clayey silts</td>
<td>ML</td>
<td>45</td>
</tr>
<tr>
<td>Mixture of inorganic silt and clay</td>
<td>ML-CL</td>
<td>60</td>
</tr>
<tr>
<td>Inorganic clays of low to medium plasticity</td>
<td>CL</td>
<td>60</td>
</tr>
<tr>
<td>Organic silts and silt-clays, low plasticity</td>
<td>CL</td>
<td>Note 1</td>
</tr>
<tr>
<td>Inorganic clayey silts, elastic silts</td>
<td>MH</td>
<td>60</td>
</tr>
<tr>
<td>Inorganic clays of high plasticity</td>
<td>CH</td>
<td>Note 1</td>
</tr>
<tr>
<td>Organic clays and silt clays</td>
<td>CH</td>
<td>Note 1</td>
</tr>
</tbody>
</table>

For SI: 1 psf = 47.8803 Pa, 1 ft = 0.305 m.

Notes:
1. Compliance with 1804.3 is required.

---

1608.2 Railing

1608.2.1 Handrail design and construction

1608.2.1.1 Handrails shall be designed and constructed for a concentrated load of 200 lb (890 N) applied at any point and in any direction.

1608.2.1.2 Handrails located other than within dwelling units shall also be designed and constructed for a load of 50 plf (730 N/m) applied in any direction.

1608.2.1.3 Loading conditions in 1608.2.1.1 and 1608.2.1.2 shall not be applied simultaneously, but each shall be applied to produce maximum stress in each of the respective components or any of the supporting components.

1608.2.2 Guardrail system design and construction

1608.2.2.1 Guardrail systems shall be designed and constructed for a concentrated load of 200 lb (890 N) applied at any point and in any direction at the top of the guardrail.

1608.2.2.2 Guardrail systems located other than within dwelling units shall be designed and constructed for a load of 50 plf (730 N/m) applied horizontally at the...
required guardrail height and a simultaneous load of 100 plf (1459 N/m) applied vertically downward at the top of the guardrail.

**1608.2.2.3** The guardrail system shall also be designed and constructed to resist a 200 lb (890 N) concentrated horizontal load applied on a 1 sq ft area (0.093 m²) at any point in the system including intermediate rails or other elements serving this purpose.

**1608.2.2.4** Loading conditions in 1608.2.2.1, 1608.2.2.2 and 1608.2.2.3 shall not be applied simultaneously, but each shall be applied to produce maximum stress in each of the respective components or any of the supporting components.

**1608.2.3 Parking guardrails.** Impact guardrails and walls acting as impact guardrails in automobile parking garages shall be designed for a minimum horizontal ultimate load of 10,000 lb (44.5 kN) applied 18 inches (457 mm) above the floor at any point along the guardrail.

**1608.3 Helistops/Heliports.** In addition to other design requirements of this chapter, heliport and helistop landing or touchdown areas shall be designed for the maximum stress induced by the following:
1. Dead load plus actual gross weight of the helicopter plus snow load.
2. Dead load plus two single concentrated impact loads approximately 8 ft (2438 mm) apart anywhere on the touchdown pad (representing each of the helicopter’s two main landing gear, whether skid type or wheeled type), with each concentrated load covering 1 sq ft (0.093 m²) and having a magnitude of 0.75 times the gross weight of the helicopter. Both loads acting together total 1.5 times the gross weight of the helicopter.
3. The dead load plus a uniform live load of 60 psf (2.9 kN/m²).

---

**SECTION 1609 LOAD COMBINATIONS**

**1609.1 General.** Buildings and other structures shall be designed using the provisions of either 1609.3 or 1609.4. Either 1609.3 or 1609.4 shall be used exclusively for proportioning elements of a particular construction material throughout the structure.

**1609.2 Symbols**
- D = dead load
- L = live load
- Fa = flood load
- Lr = roof live load
- W = wind load

**1609.3 Combining factored loads using strength design**

**1609.3.1 Applicability.** The load combinations and load factors given in 1609.3.2 shall be used only in those cases in which they are specifically authorized by the applicable material design standard.

**1609.3.2 Basic combinations.** Structures, components and foundations shall be designed so that their design strength equals or exceeds the effects of the factored loads in the following combinations:
1. 1.4D
2. 1.2D + 1.6L + 0.5Lr
3. 1.2D + 1.6Lr + 0.5L
4. 1.2D + 1.6W + 0.5L + 0.5Lr
5. 1.2D + 0.5L
6. 0.9D + 1.6W

**Exceptions:**
1. The load factor, L, in combinations 3, 4 and 5 shall equal 1.0 for garages, areas occupied as places of public assembly and all areas where the live load is greater than 100 psf (4.79 kN/m²).

Each relevant strength limit state shall be investigated. Effects of one or more loads not acting shall be investigated. The unfavorable effects from wind loads shall be investigated.

**1609.3.3 Load combinations including flood load.** When a structure is located in a flood zone, the following load combinations shall be considered:
1. In V-Zones or Coastal A-Zones, 1.6W in combinations 4 and 6 shall be replaced by 1.6W + 2.0Fa.
2. In Non-coastal A-Zones, 1.6W in combinations 4 and 6 shall be replaced by 0.8W + 1.0Fa.

**1609.4 Combining nominal loads using allowable stress design**

**1609.4.1 Basic combinations.** Loads listed herein shall be considered to act in the following combinations, whichever produces the most unfavorable effect in the building, foundation or structural member being considered. Effects of one or more loads not acting shall be considered.
1. D
2. D + L +Lr
3. D + W + L +Lr
4. 0.6D + W

The most unfavorable effects from wind loads shall be considered.

**1609.4.2 Load combinations including flood load.** When a structure is located in a flood zone, the following load combinations shall be considered:
1. In V-Zones or Coastal A-Zones, 1.5Fa shall be added to other loads in combinations 3 and 4.
2. In Non-coastal A-Zones, 0.75Fa shall be added to combinations 3 and 4.

**1609.4.3 Load reduction.** When structural effects due to two or more loads in combination with dead load are investigated in load combinations of 1609.4.1 or 1609.4.2, the combined effects due to the two or more loads multiplied by 0.75 plus effects due to dead loads shall not be less than the effects from the load combination of the dead load plus the load producing the largest effects. Increases in allowable stress specified in the materials sec-
tions of this code or a referenced standard shall not be used with these load combinations except that a duration of load increase shall be permitted in accordance with Chapter 23.

**Exception:** Increases in allowable stress shall be permitted in accordance with ACI 530/ASCE 5/TMS 402 provided the load reduction of 1609.4.3 shall not be applied.

## SECTION 1610 DEFLECTIONS

Deflections of structural members shall not exceed those shown in Table 1610.1.

### TABLE 1610.1 DEFLECTION LIMITS

<table>
<thead>
<tr>
<th>CONSTRUCTION</th>
<th>LL</th>
<th>DL + LL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roof member supporting plaster, or floor member</td>
<td>L/360</td>
<td>L/240</td>
</tr>
<tr>
<td>Roof members supporting nonplastered ceilings</td>
<td>L/240</td>
<td>L/180</td>
</tr>
<tr>
<td>Roof members not supporting ceilings with brittle finishes</td>
<td>L/180</td>
<td>L/120</td>
</tr>
<tr>
<td>Exterior and interior walls and partitions with flexible finishes</td>
<td>L/120</td>
<td>-</td>
</tr>
<tr>
<td>Farm buildings</td>
<td>-</td>
<td>L/180</td>
</tr>
<tr>
<td>Greenhouses</td>
<td>-</td>
<td>L/120</td>
</tr>
<tr>
<td>Members supporting screen surfaces only</td>
<td>-</td>
<td>L/60</td>
</tr>
</tbody>
</table>

**Notes:**

1. Concrete structural members shall be governed by ACI 318.
2. For structural roofing and siding made of formed metal sheets, the total load deflection shall not exceed L/60. For secondary structural members to which formed metal roofing or siding is attached, the live load deflection shall not exceed L/150 for roofs and L/90 for walls. For roofs, this exception applies only when the metal sheets have no roof covering.
3. The above deflections do not ensure against ponding. Roofs not having sufficient slope or camber to assure adequate drainage shall be investigated for ponding.
4. Flexible, folding, and portable partitions under 6 ft in height are not governed by the provisions of this section.
5. See 2406 for glass supports.
6. Screen surfaces shall be permitted to include a maximum of 25% solid flexible finishes.

## SECTION 1611 HIGH VELOCITY HURRICANE ZONES

### 1611.1 General design requirements

1611.1.1 Any system, method of design or method of construction shall admit of a rational analysis in accordance with well-established principles of mechanics and sound engineering practices.

1611.1.2 Buildings, structures and all parts thereof shall be designed and constructed to be of sufficient strength to support the estimated or actual imposed dead, live, wind, and any other loads, both during construction and after completion of the structure, without exceeding the allowable materials stresses specified by this code.

1611.1.3 No building structure or part thereof shall be designed for live loads less than those specified in this Chapter or ASCE 7 with commentary, except as otherwise noted in this code.

1611.1.4 The live loads set forth herein shall be assumed to include the ordinary impact but where loading involves unusual impact, provision shall be made by increasing the assumed live load.

1611.1.5 In the design of floors, not less than the actual live load to be imposed shall be used. Special provisions shall be made for machine or apparatus loads where applicable.

1611.1.6 Floor and roof systems shall be designed and constructed to transfer horizontal forces to such parts of the structural frame as are designed to carry these forces to the foundation. Where roofs or floors are constructed of individual prefabricated units and the transfer of forces to the building frame and foundation is totally or partially dependent on such units, the units and their attachments shall be capable of resisting applied loads in both vertical and both horizontal directions. Where roofs or floors are constructed of individual prefabricated units and the transfer of forces to the building frame and foundation is wholly independent of such units, the units and their attachments shall be capable of resisting applied loads normal to the surface, in and out.

1611.1.7 In any conflict between ASCE 7 with commentary and this code, the more stringent requirement shall apply.

### 1611.2 General design for specific occupancies and structures.

1611.2.1 Fences. Fences not exceeding 6'-0" in height from grade may be designed for 75 mph (33 m/s) fastest mile wind speed or 90 mph (40 m/s) 3-second gust.

1611.2.1.1 Wood fences. Wood fence design shall be as specified by 2328.

1611.2.2 Sway forces in stadiums.

1. The sway force applied to seats in stadiums, grandstands, bleachers and reviewing stands shall be not less than 24 pounds per lineal foot (350 N/m), applied perpendicularly and along the seats.
2. Sway forces shall be applied simultaneously with gravity loads.
3. Sway forces need not be applied simultaneously with other lateral forces.

**FLORIDA BUILDING CODE — BUILDING**
SECTION 1612
HIGH VELOCITY HURRICANE ZONES
DEFLECTION

1612.1 Allowable deflections. The deflection of any structural member or component when subjected to live, wind and other superimposed loads set forth herein shall not exceed the following:

1. Roof and ceiling or components supporting plaster L/360
2. Roof members or components not supporting plaster under L/240
3. Floor members or components L/360
4. Vertical members and wall members or components consisting of or supporting material that hardens in place, is brittle or lacks resistance to cracking caused by bending strains L/360
5. Vertical members and wall members or components not required to meet the conditions of 1612.1, item 4. L/180
6. Roof and vertical members, wall members and panels of carports, canopies, marquees, patio covers, utility sheds and similar minor structures not to be considered living areas, where the roof projection is greater than 12'-0" (3.7 m) in the direction of the span, for free-standing roofs and roofs supported by existing structures. Existing structures supporting such roofs shall be capable of supporting the additional loading L/180
7. For Group R3 Occupancies only, roof and vertical members, wall members and panels of carports, canopies, marquees, patio covers, utility sheds and similar minor structures not to be considered living areas, where the roof projection is 12'-0" (3.7 m) or less in the direction of the span and for free standing roofs and roofs supported by existing structures L/80
8. Members supporting screens only L/80
9. Storm shutters and fold-down awnings, which in the closed position shall provide a minimum clear separation from the glass of 1 inch (25 mm) but not to exceed 2 inches (51 mm) when the shutter or awning is at its maximum point of permissible deflection L/30
10. Roofs and exterior walls of utility sheds having maximum dimensions of 10'-0" (3 m) length, 10'-0" (3 m) width, and 7'-0" (2.1 m) height L/80
11. Roofs and exterior walls of storage buildings larger than utility sheds L/180

SECTION 1613
HIGH VELOCITY HURRICANE ZONES
VOLUME CHANGES

1613.1 Volume change. In the design of any building, structure or portion thereof, consideration shall be given to the relief of stresses caused by expansion, contraction and other volume changes.

SECTION 1614
HIGH VELOCITY HURRICANE ZONES
MINIMUM LOADS

1614.1 Live loads. Minimum uniformly distributed live loads shall not be less than as set forth in and Table 4-1 of ASCE 7 with Commentary, except as otherwise noted in this code.

1614.2 Concentrated loads. Minimum concentrated loads shall not be less than as set forth in Table 4-1 of ASCE 7 with Commentary, except as otherwise noted.

1614.2.1 Concentrated loads on trusses. Any single panel point of the lower chord of roof trusses or any point of other primary structural members supporting roofs over manufacturing, commercial storage and warehousing, and commercial garage floors shall be capable of safely carrying a suspended, concentrated load of not less than 2000 lb (8896 N) in addition to dead load. For all other occupancies, a minimum load of 200 lb (890 N) shall be used.
TABLE 1614
MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS
See Tables 4-1 of ASCE 7 with Commentary, except as otherwise noted below

<table>
<thead>
<tr>
<th>OCCUPANCY OR USE</th>
<th>LIVE LOAD</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASSEMBLY PROJECTION ROOM</td>
<td>100</td>
</tr>
<tr>
<td>BALCONIES, EXTERIOR (see also assembly)</td>
<td></td>
</tr>
<tr>
<td>Serving private units of group R occupancies</td>
<td>60</td>
</tr>
<tr>
<td>and not for assembly use</td>
<td></td>
</tr>
<tr>
<td>BALCONIES SERVING OCCUPANCIES 80 psf OR LESS</td>
<td>80</td>
</tr>
<tr>
<td>ALL OTHER BALCONIES</td>
<td>100</td>
</tr>
<tr>
<td>CABANAS AND BATH HOUSE</td>
<td>50</td>
</tr>
<tr>
<td>PATH OF EGRESS SERVING OCCUPANCIES 80 psf OR LESS</td>
<td>80</td>
</tr>
<tr>
<td>PATH OF EGRESS SERVING OCCUPANCIES OVER 80 psf</td>
<td>100</td>
</tr>
<tr>
<td>RECREATIONAL FACILITIES</td>
<td></td>
</tr>
<tr>
<td>Including bowling centers, pool rooms and similar uses</td>
<td>75</td>
</tr>
<tr>
<td>STORAGE:</td>
<td></td>
</tr>
<tr>
<td>Light</td>
<td>75</td>
</tr>
<tr>
<td>Medium</td>
<td>125</td>
</tr>
<tr>
<td>Heavy</td>
<td>250 (1)(2)</td>
</tr>
</tbody>
</table>

(1) Use actual equipment weight when greater
(2) Increase when occupancy exceeds this amount

SECTION 1615
HIGH VELOCITY HURRICANE ZONES
ROOF LIVE LOADS

1615.1 Minimum roof live loads. Roofs shall be designed for a live load of not less than 30 pounds per square foot (1436 Pa), except as set forth herein.

Exceptions.
1. Glass areas of greenhouse roofs shall be designed for a live load of not less than 15 pounds per square foot (718 Pa).
2. Ordinary pitched and curved roofs, with a slope of 1-1/2:12, or greater, where water is not directed to the interior of the roof, without parapet or other edge of roof drainage obstructions, may be designed for an allowable live load of not less than 20 pounds per square foot (958 Pa).
3. Utility sheds shall be designed for a live load of not less than 15 pounds per sq foot (718 Pa).

1615.2 Special purpose roofs. Roofs used for assembly, roof gardens, promenade or walkway purposes shall be designed for a minimum live load of 100 pounds per square foot (4788 Pa). Other special purpose roofs shall be designed for appropriate loads as directed or approved by the building official.

1615.3 Roof decking. Roof decking shall be designed to support the live load set forth in 1615.1 or a load of 100 pounds per foot (445 N) applied as a 1'-0" (305 mm) wide strip perpendicular to, and at the center of, the span of the decking between supports, whichever is more critical.

SECTION 1616
HIGH VELOCITY HURRICANE ZONES
ROOF DRAINAGE

1616.1 Roof drainage. Where parapets or curbs are constructed above the level of the roof, provision shall be made to prevent rain water from accumulating on the roof in excess of that considered in the design, in the event the rain water drains or leaders become clogged.

1616.2 Where roofs are not designed in accordance with 1616.1, overflow drains or scuppers shall be placed to prevent an accumulation of more than 5 inches (927 mm) of water on any portion of the roof. In determining the load that could result should the primary drainage system be blocked, the loads caused by the depth of water (i.e., head) needed to cause the water to flow out the scuppers or secondary drainage system shall be included.

1616.3 Drains or scuppers installed to provide overflow drainage shall be not less in aggregate area than as shown in Figure 1616.3, but not less than 4 inches (102 mm) dimension in any direction and shall be placed in parapets not less than 2 inches (51 mm) nor more than 4 inches (102 mm) above the roof deck and shall be located as close as practical to required vertical leaders or downspouts. The roof area to be taken in the sizing of the scuppers is the horizontal projection, except that, where a building wall extends above the roof in such a manner as to drain into the area considered, the one-half of the area of the vertical wall shall be added to the horizontal projection.

FIGURE 1616.3
REQUIRED AREA OF OVERFLOW SCUPPERS
1616.4 All roofs shall be designed with sufficient slope or camber to assure adequate drainage after the long term deflection from dead load, or shall be designed to support maximum loads including possible ponding of water caused by deflection.

1616.5 Ponding loads. Roofs shall be designed to preclude instability from ponding loads.

1616.6 Each portion of a roof shall be designed to sustain the loads of all rainwater that could accumulate on it if the primary drainage system for that portion is obstructed. Ponding instability shall be considered in this situation. If the overflow drainage provisions contain drain lines, such lines shall be independent of any primary drain lines.

SECTION 1617
HIGH VELOCITY HURRICANE ZONES
SPECIAL LOAD CONSIDERATIONS

1617.1 Floors. In the design of floors, consideration shall be given to the effect of known or probable concentration of loads, partial concentrations of loads, partial load, vibratory, transitory, impact and machine loads. Design shall be based on the load or combination of loads that produces the higher stresses.

1617.2 Below grade structures.
1617.2.1 In the design of basements, tanks, swimming pools and similar below grade structures, provisions shall be made for the forces resulting from hydrostatic pressure and lateral pressure of adjacent soil.

1617.2.2 For the lateral loads of soil on below grade structures, unless substantiated by more specific information, the angle of repose of fragmental rock and natural confined sand shall be 30 degrees and the angle of repose of filled soil and muck shall be 15 degrees to a horizontal line.

1617.2.3 For the hydrostatic pressure on any floor below a ground water level, calculations shall be based on full hydrostatic pressure, and such floors shall be designed for live load without hydrostatic uplift, and hydrostatic uplift without live load.

1617.2.4 Private swimming pools may be designed with an approved hydrostatic relief valve or other device capable of preventing the pool water from being pumped to a level lower than the surrounding ground water but such device shall not be credited for more than 2'-0-inch (610 mm) of the difference of head between the pool bottom and the flood criteria.

1617.3 Helistops/Heliports. In addition to other design requirements of this chapter, heliport and helistop loading or touchdown areas shall be designed for the maximum stress induced by the following:
1. Dead load plus actual weight of the helicopter.
2. Dead load plus two single concentrated impact loads approximately 8 feet (2.4 m) apart anywhere on the touchdown pad (representing each of the helicopter’s two main landing gear, whether skid type or wheeled type), with each concentrated load covering 1 square foot (0.09 m²) and having a minimum magnitude of 0.75 times the gross weight of the helicopter. Both loads acting together total a minimum of 1.5 times the gross weight of the helicopter.
3. The dead load plus a uniform live load of 60 psf (2873 Pa).

1617.4 Safeguards. Safeguards shall be required in and around buildings and structures such as covers, railings, stair-railings, handrails or other safeguards as defined in the regulations of the Occupational Safety and Health Administration (OSHA) 29CFR Part 1910 as applied to permanent structures and as specified herein.

1617.4.1 Open or glazed wall openings; open or glazed sides of balconies, landings and other walking surfaces; unenclosed floor and roof openings; roofs used for other than services for the building or structure and any other abrupt differences in level exceeding 30 inches (762 mm), including yard areas, shall be provided with safeguards not less than 42 inches (1067 mm) in height.

1617.4.2 Safeguards may be omitted at loading docks, truck wells and similar locations where it is apparent that the edge of the higher level is for loading, and on docks, seawalls and decorative fountains where the lower level is the water surface.

1617.4.3 Safeguards in and around buildings of other than Group R Occupancies shall be provided with additional rails, vertical pickets or ornamental filler below the top rail that will reject a 6-inch (152 mm) diameter object.

1617.4.4 Safeguards in and around buildings of Group R Occupancies shall provide protection for children by providing additional rails, vertical pickets or an ornamental filler below the top rail which will reject a 4-inch (102 mm) diameter object; permitting, however, such ornamental fillers to have individual openings not exceeding 64 sq inches (413 cm²) in area.

1617.4.5 Where a balustrade is used to comply with the requirements of this paragraph, the maximum clearance between the bottom rail of the balustrade and the adjacent surface shall not exceed 2 inches (51 mm). For safeguards on stairs, the 2 inch clearance shall be measured from the bottom rail of the balustrade to a line passing through the tread nosings.

1617.4.6 Railing
1617.4.6.1 Railings, stair-railings and other similar safeguards shall be designed to resist a load of 50 pounds per lineal foot (74 kg/m) or a concentrated load of 200 pounds (690 N) applied in any direction at the top of such barriers at any location on the safeguard, whichever condition produces the maximum stresses. The reactions and stresses caused by the above refer-
enced uniform and concentrated loads shall be consid-
ered not be acting simultaneously.

1617.4.6.2 Intermediate rails, balusters and panel fillers shall be designed for a uniform horizontal load of not less than 25 pounds per square foot (1197 Pa) over the gross area of the guard, including the area of any openings in the guard, of which they are a part without restriction by deflection. Reactions resulting from this loading need not be added to the loading specified in 1617.4.6.1 in designing the main supporting members of guards.

1617.4.6.3 Safety glazing will be permitted as an equal alternate to pickets, if tested by an accredited laboratory to satisfy the resistance requirements of this code for wind, live and kinetic energy impact loading conditions. The kinetic energy impact loading shall comply with ANSI Z97.1-1984 using a 400 ft-lb (542 N-m) energy impact. The safety requirements of the impact test shall be judged to have been satisfactorily met if breakage does not occur or numerous cracks and fissures occur but no shear or opening through which a 3-in. (76 mm) diameter sphere may freely pass. The glass panel shall remain within the supporting frame.

1617.4.7 Areas in all occupancies from which the public is excluded requiring such protection may be provided with vertical barriers having a single rail midway between a top rail and the walking surface.

1617.4.8 The last sentence of the first paragraph in 4.4.2 of ASCE 7 is hereby deleted.

1617.5 Vehicle safeguard barriers. Vehicle safeguard barriers are required in parking garages whenever there is a difference in level exceeding 1'- 0" (305 mm).

1617.5.1 Unless separate pedestrian safeguards are provided vehicle safeguard barriers shall, in addition to the requirements of this section, meet all other requirements of Section 1617.4.

1617.5.2 The requirement of 1617.4.3 for the rejection of a 6-inch (152 mm) diameter object shall be met when the barrier is subjected to a horizontal load of 25 pounds per square foot (1197 Pa), applied as specified in 1617.4.6.2.

1617.5.3 Vehicle safeguard barriers shall be capable of resisting a minimum horizontal ultimate load of 10,000 lb (44.5 kN) applied 18 inches (457 mm) above the floor at any point in the barrier system. This load need not be applied in combination with loads specified in 1617.4.6.1 and 1617.4.6.2. Vehicle safeguard barrier systems of metal framing, concrete or masonry may be designed by allowable stress design for a concentrated horizontal load of 7500 lb (33 361 N) in lieu of the 10,000 lb (44.5 kN) ultimate load specified above.

1617.6 Special requirements for cable safeguard barriers

1617.6.1 Horizontal deflection under design load shall not exceed 18 inches (457 mm).

1617.6.2 The design load shall be assumed to be resisted by not more than two cables.

1617.6.3 The cable system including anchors shall be protected against corrosion.

1617.6.4 Cable tension under design load shall not exceed 90% of the yield strength of the cable.

1617.6.5 The uppermost cable shall be at least 42 inches (1067 mm) above the adjacent surface. Cables shall not be spaced more than 6 inches (152 mm) apart.

1617.6.6 An installation plan prepared by the structural engineer of record shall be submitted to the building official for his or her approval.

1617.6.7 Installation shall be witnessed by the structural engineer of record who shall certify the following:
1. That the installation has been in accordance with the approved installation plan.
2. That the initial tension designated by the structural engineer of record has been provided in all cables.
3. That all anchors have been seated at a total load, including initial tension, equal to 85% of the yield strength of the cable, unless a positive locking device is provided that does not require a tension jack for the tensioning of the barrier strand.

1617.6.8 Drawings shall indicate the initial tension, the expected increase in tension under vehicular impact and the required maximum capacity of the strand barrier system.

1617.7 Ornamental projections. Ornamental cantilevered projections on the exterior of buildings shall be designed for not less than 60 pounds per square foot live load (2873 Pa) or 200 pounds per lineal foot (2919 N/m) applied at the outer edge, whichever is more critical.

1617.8 Interior wall and partitions. Permanent, full-height interior walls and partitions shall be designed to resist a lateral live load not less than 5 pounds per square foot (239 Pa) and if sheathed with lath and plaster, deflection at this load shall not exceed L/360.

1617.9 Load combination. The safety of structures shall be checked using the provisions of 2.3 and 2.4 of ASCE 7 with commentary.

Exception: Increases in allowable stress shall be permitted in accordance with ACI 530/ASCE 5/TMS 402 provided the load reduction of ASCE 7 Section 2.4.3 shall not be applied.

SECTION 1618
HIGH VELOCITY HURRICANE ZONES
LIVE LOAD REDUCTIONS

1618.1 Application. No reduction in assumed live loads set
forth in this section shall be allowed in the design of columns, walls, beams, girders and foundations, except as permitted by the provisions of Section 4.8 ASCE 7 with Commentary.

Exceptions
1. No reduction of the assumed live loads shall be allowed in the design of any slabs, joists or other secondary members, except as set forth herein.
2. No reduction in roof live loads shall be permitted except as set forth by 1615.1.

1618.2 Allowable live load reductions.
1618.2.1 Permissible reduction in live loads shall be as provided in Section 4.8.1 of ASCE 7 with Commentary.
1618.2.2 Limitations on live load reduction shall be as noted in Section 4.8.2 of ASCE 7 with Commentary.
1618.2.3 No reduction in live loads shall be permitted for buildings or structures of Group A assembly occupancy.

SECTION 1619
HIGH VELOCITY HURRICANE ZONES
WIND LOADS

1619.1 Buildings and structures, and every portion thereof, shall be designed and constructed to meet the requirements of Section 6 of ASCE 7, as more specifically defined in this section, based on a 50-year mean recurrence interval.
1619.2 Wind velocity (3-second gust) used in structural calculations shall be 140 miles per hour (63 m/s) in Broward County and 146 miles per hour (65 m/s) in Miami-Dade County.
1619.3 All buildings and structures shall be considered to be in Exposure Category C as defined in Section 6.5.6.1 of ASCE 7.
1619.4 For wind force calculations, roof live loads shall not be considered to act simultaneously with the wind load.
1619.5 Utility sheds shall be designed for a wind load of not less than 15 pounds per sq foot (718 Pa).

SECTION 1620
HIGH VELOCITY HURRICANE ZONES
OVERTURNING MOMENT AND UPLIFT

1620.1 Computations for overturning moment and uplift shall be based on the building as a whole and shall include appropriate vertical surface shape factors.
1620.2 Overturning stability of any building, structure or part thereof taken as a whole shall be provided, and shall not less than 150 percent of its wind load overturning moment.
1620.3 Uplift stability shall be provided for any building, structure, part thereof or isolated component thereof and shall be not less than 150 percent of the wind load uplift thereon.

1620.4 Stability may be provided by dead loads, anchors, attachments, the weight of earth superimposed over footings or anchors, the withdrawal resistance of piles or the resisting moment of vertical members embedded in the ground.

SECTION 1621
HIGH VELOCITY HURRICANE ZONES
ALLOWABLE STRESS INCREASE

1621.1 For members carrying wind stresses only, and for combined stresses caused by wind and other loads, the allowable stresses and the allowable loads on connections may be increased 33-1/3 percent from the maximums set forth in this code for the materials used.

Exceptions.
1. Such increased stresses shall not apply to foundations except as provided in 1624.2.
2. Such increased stresses shall not apply to towers, cantilevered projections or metal sheathing where vibrations or fluttering action could be anticipated.
3. Glass areas shall not be increased from those set forth in Chapter 24.
4. Such increased stresses shall not apply to glazing materials other than glass.

1621.2 In no case shall the cross-section properties be less than required for dead load plus live load without wind load.

SECTION 1622
HIGH VELOCITY HURRICANE ZONES
SCREEN ENCLOSURES

1622.1 Screen Enclosures.
1622.1.1 The wind loads on screen surfaces shall be per ASCE 7 Table 6-12 based on the ratio of solid to gross area.
1622.1.2 Design shall be based on such loads applied horizontally inward and outward to the walls with a shape factor of 1.3 and applied vertically upward and downward on the roof with a shape factor of 0.7.

SECTION 1623
HIGH VELOCITY HURRICANE ZONES
LIVE LOADS POSTED AND OCCUPANCY PERMITS

1623.1 Live loads posted. The live loads in every building, structure or part thereof of Group F, M or S Storage Occupancy approved by the building official shall be shown on plates supplied by the owner or his authorized agent, in that part of each space to which such loads apply.
1623.1.1 Such plates shall be of approved durable materials displaying letters and figures not less than 3/8 inch (9.5 mm) in height, and shall be securely affixed to the structure in conspicuous places.
1623.1.2 Such notices shall not be removed or defaced and where defaced, removed or lost, it shall be the responsibility of the owner to cause replacement as soon as possible.

1623.2 Occupant loads. Plans for proposed buildings or structures of Group F, M or S storage Occupancy areas in buildings of any occupancy shall show the allowable loading for each portion of the floor and roof areas and Certificates of Use and Occupancy, as defined in Section 106 of this code, shall not be issued until such loads are posted as set forth in 1623.1.

1623.2.1 Change in occupant load. No change in the occupancy of any building shall be made until a Certificate of Occupancy has been issued certifying that the building official has approved the building as suitable for the loads characteristic of the proposed occupancy.

1623.2.2 Maximum floor and roof loads observed. It shall be unlawful at any time to place, or permit to be placed, on any floor or roof of a building or structure, a load greater than that for which the floor or roof is approved by the building official.

SECTION 1624
HIGH VELOCITY HURRICANE ZONES
FOUNDATION DESIGN

1624.1 Design procedure. The minimum area of a footing or number of piles under a foundation shall be determined in the following manner:

1624.1.1 The total load of the column that has the largest percentage of the live load to the total load shall be divided by the allowable soil pressure or pile capacity.

1624.1.2 The balance soil pressure or pile capacity shall be determined by dividing the total dead load by the area of the footing or the number of piles.

1624.1.3 The minimum number of other footings or number of piles shall be designed on the basis of their respective dead loads only.

1624.1.4 In no case shall the total load of the combined dead, live, wind and any other loads exceed the allowable bearing pressure of the soil for capacity of any pile upon which the foundation is supported.

1624.1.5 The live load used in the above calculations may be the total reduced live load in the member immediately above the foundation.

1624.1.6 The building official may require submittal of design computations employed in foundation design.

1624.2 Wind effects. Where the pressure on the foundation from wind is less than 25 percent of that resulting from dead or other live loads, wind pressure may be neglected in the footing design.

1624.2.1 Where this percentage exceeds 25 percent, foundations shall be so designed that the pressure resulting from combined dead, live and wind loads shall not exceed the allowable soil bearing values or allowable loads per pile by more than 25 percent.

SECTION 1625
HIGH VELOCITY HURRICANE ZONES
LOAD TESTS

1625.1 Application. Whenever there is insufficient evidence of compliance with the provisions of this code or evidence that any material or any construction does not conform to the requirements of this code, or in order to substantiate claims for alternate materials or methods of construction, the building official may require testing by an approved agency, at the expense of the owner or his agent, as proof of his compliance. Testing methods shall be as specified by this code for the specific material.

1625.2 Testing method. Such testing shall follow a nationally recognized standard test, or when there is no standard test procedure for the material or assembly in question, the building official shall require that the material or assembly under dead plus live load shall deflect not more than as set forth in 1612, and that the material or assembly shall sustain dead load plus twice the live load for a period of 24 hours, with a recovery of at least 80 percent or a 100 percent recovery after 1/2 test load.

1625.3 Alternate test methods. When elements, assemblies or details of structural members are such that their load-carrying capacity, deformation under load, or deflection cannot be calculated by rational analysis, their structural performance shall be established by test in accordance with test procedures as approved by the building official based on consideration of all probable conditions of loading.

1625.4 Fatigue load testing. Where cladding assemblies (including cladding and connections) or roofing framing assemblies (including portions of roof structure and connections) are such that their load-carrying capacity or deformation under load cannot be calculated by rational analysis, the assemblies may be tested to resist the fatigue loading sequence given by Table 1625.4.
TABLE 1625.4 - 1626.2.5.1.1

<table>
<thead>
<tr>
<th>Range of test</th>
<th>Number of cycles</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 0.5p²</td>
<td>600</td>
</tr>
<tr>
<td>0 to 0.6p</td>
<td>70</td>
</tr>
<tr>
<td>0 to 1.3p</td>
<td>1</td>
</tr>
</tbody>
</table>

¹ Each cycle shall have minimum duration of 1 second and a maximum duration of 3 seconds and must be performed in a continuous manner.
² p = the design wind load for the height and location, when the assembly will be used. For wall and roof components, shape factors given in ASCE 7 shall be used.

Assemblies shall be tested with no resultant failure or distress and shall have a recovery of at least 90 percent over maximum deflection.

Any cladding assembly not incorporated into the Florida Building Code, Building after successfully completing the impact test outlined in 1626, shall be subject to fatigue loading testing and shall obtain product approval by the building official.

SECTION 1626
HIGH VELOCITY HURRICANE ZONES
IMPACT TESTS FOR WINDBORNE DEBRIS

1626.1 All parts or systems of a building or structure envelope such as, but not limited to, exterior walls, roof, outside doors, skylights, glazing and glass block shall meet impact test criteria or be protected with an external protection device that meets the impact test criteria. Test procedures to determine resistance to windborne debris of wall cladding, outside doors, skylights, glazing, glass block, shutters and any other external protection devices shall be performed in accordance with this section.

Exception. The following structures or portion of structures shall not be required to meet the provisions of this section:

a. Roof assemblies for screen rooms, porches, canopies, etc. attached to a building that do not breach the exterior wall or building envelope and have no enclosed sides other than screen.

b. Soffits, soffit vents and ridge vents. Size and location of such vents shall be detailed by the designer and shall not compromise the integrity of the diaphragm boundary.

c. Vents in a garage with four or fewer cars. Size and location of such vents shall be detailed by the designer and shall not exceed the minimum required area by more than 25 percent.

d. Exterior wall or roof openings for wall or roof mounted HVAC equipment.

e. Openings for roof-mounted personnel access roof hatches.

f. Storage sheds that are not designed for human habitation and that have a floor area of 720 square feet or less are not required to comply with the mandatory windborne debris impact standards of this code.

g. Louvers as long as they properly considered ASCE-7 in the design of the building.

h. Buildings and structures for marinas, cabanas, swimming pools, solariums and greenhouses.

1626.2 Large missile impact tests.

1626.2.1 This test shall be conducted on three test specimens. This test shall be applicable to the construction units, assemblies and materials to be used up to and including 30 feet (9.1 m) in height in any and all structures.

1626.2.2 The test specimens shall consist of the entire assembled unit, including frame and anchorage as supplied by the manufacturer for installation in the building, or as set forth in a referenced specification, if applicable. Fasteners used in mounting the test specimen shall be identical in size and spacing to what is used in field installations.

1626.2.3 The large missile shall be comprised of a piece of timber having nominal dimensions of 2 in. x 4 in. weighing 9 lb (4.1 kg).

1626.2.4 The large missile shall impact the surface of each test specimen at a speed of 50 ft/sec (15.2 m/s).

1626.2.5 Each test specimen shall receive two impacts except as noted in 1626.2.5.1 and 1626.2.5.2, the first within a 5-inch (127 mm) radius circle having its center on the midpoint of the test specimen and the second within a 5-inch (127 mm) radius circle in a corner having its center in a location 6 inches (152 mm) away from any supporting members.

1626.2.5.1 For window, glass block, fixed glass and skylight assemblies, both impacts shall be to glass or other glazing infill. For test specimens with more than one light of glass, a single light closest to the center of the assembly shall be selected and impacted twice in accordance with 1626.2.5. If a light of glass is sufficiently small to cause the 5-inch (127 mm) radius circle to overlap, two separate lights shall be impacted one time each.

1626.2.5.1.1 For window, fixed glass and skylight assemblies comprised of different glass thickness,
types of glass or different types of glazing infill, each separate thickness or type shall be impacted twice in accordance with 1626.2.5.

1626.2.5.2 For doors, wall cladding and external protection devices, both impacts shall be to the thinnest section through the assembly. For doors, wall cladding and external protection devices with horizontal and/or vertical bracing, both impacts shall be within a single area that is not reinforced and shall be in accordance with 1626.2.5.

1626.2.5.2.1 For doors with glass, the glass shall be impacted twice and the thinnest section through the assembly that is not glass shall be impacted twice in accordance with 1626.2.5.

1626.2.6 In the case of glazing, if the three test specimens that comprise a test successfully reject the two missile impacts, they shall then be subjected to the cyclic pressure loading defined in Table 1626.

1626.2.6.1 If external protection devices are employed to protect windows, fixed doors or skylights, they must resist the large missile impacts specified in 1626.2.3 and 1626.2.4 without deformations which result in contact with the windows, fixed glass, glass block, and doors or skylights they are intended to protect.

1626.2.6.2 If external protection devices are not designed to be air tight, following the large missile impact test, they must resist an application of force corresponding to those listed in Table 1625.4 (fatigue load testing) without detaching from their mountings. The acting pressure cycles shall be simulated with loads applied through a mechanical system attached to the shutter specimen to apply uniformly around the shutter perimeter a force equal to the product of the required pressure and the area of the shutter specimen.

1626.2.7 If air leakage through the test specimen is excessive, tape may be used to cover any cracks and joints through which leakage is occurring. Tape shall not be used when there is a probability that it may significantly restrict differential movement between adjoining members. It is also permissible to cover both sides of the entire specimen and mounting panel with a single thickness of polyethylene film no thicker than 0.050 mm (2 mils). The technique of application is important in order that the full load is transferred to the specimen and that the membrane does not prevent movement or failure of the specimen. Apply the film loosely with extra folds of material at each corner and at all offsets and recesses. When the load is applied, there shall be no fillet caused by tightness of plastic film.

1626.2.8 A particular system of construction shall be deemed to comply with this recommended practice if three test specimens reject the two missile impacts without penetration and resist the cyclic pressure loading with no crack forming longer than 5 inches (127 mm) and 1/16 inch (1.6 mm) wide through which air can pass.

1626.2.9 If only one of the three test specimens in a test fails to meet the above listed criteria, one retest of this system of construction (another test sequence with three specimens) shall be permitted.

1626.3 Small missile impact test.

1626.3.1 This test shall be conducted on three test specimens. This test shall be applicable to the construction units, assemblies, and materials to be used above 30 feet (9.1 m) in height in any and all structures.

1626.3.2 Each test specimen shall consist of the entire assembled unit, including frame and anchorage as supplied by the manufacturer for installation in the building, or as set forth in a referenced specification, if applicable. The fasteners used in mounting the test specimen shall be identical in size and spacing to those to be used in field installations.

1626.3.3 The missiles shall consist of solid steel balls each having a mass of 2 grams (0.07 oz) (± 5 percent) with a 5/16-in. (7.9 mm) nominal diameter.

1626.3.4 Each missile shall impact the surface of each test specimen at a speed of 130 ft/sec (40 m/s).

1626.3.5 Each test specimen shall receive 30 small missile impacts except as noted in 1626.3.5.1 and 1626.3.5.2 delivered in groups of 10 at a time: the first 10 distributed uniformly over a 2 square foot (0.19 m²) area located at the center of the test specimen, the second 10 distributed uniformly over a 2 square foot area (0.19 m²) located at the center of the long dimension of the specimen near the edge, and the third 10 distributed uniformly over a 2 square foot (0.19 m²) area located at a corner of the specimen.

1626.3.5.1 For window and skylight assemblies, all impacts shall be to glass or other glazing infill. For test specimens with more than one light of glass, a single light closest to the center of the assembly shall be selected and impacted in accordance with 1626.3.5. If a light of glass is sufficiently small to cause the 5-inch (127 mm) radius circles to overlap, separate lights may be impacted; however, there must be a total of 30 impacts within the assembly.

1626.3.5.1.1 For window, fixed glass and skylight assemblies comprised of glass with different thickness, types of glass or different types of glazing infill, each separate thickness or type shall be impacted in accordance with 1626.3.5.

1626.3.5.2 For doors, wall cladding and external protection devices, all impacts shall be to the thinnest section through the assembly. For doors, wall cladding and external protection devices with horizontal and/or vertical bracing, all impacts shall be within a single
area that is not reinforced and shall be impacted in accordance with 1626.3.5.

1626.3.5.2.1 For doors with glass, the glass shall be impacted in accordance with 1626.3.5 and the thinnest section through the assembly that is not glass shall be impacted in accordance with 1626.3.5.

1626.3.6 In the case of glazing, after completion of the small missile impacts, each test specimen shall then be subjected to the cyclic pressure loading defined in Table 1626.

1626.3.6.1 If external protection devices are employed to protect windows, doors or skylights, they must resist the small missile impacts specified in 1626.3.3 and 1626.3.4 without deformations that result in contact with the windows, glass, doors or skylights they are intended to protect.

1626.3.6.2 If external protection devices are not designed to be air tight, following the small missile impact test, they must resist an application of force corresponding to those listed in Table 1625.4 (fatigue load testing) without detaching from their mountings. The acting pressure cycles shall be simulated with loads applied through a mechanical system attached to the shutter specimen to apply uniformly around the shutter perimeter a force equal to the product of the required pressure and the area of the shutter specimen.

1626.3.7 If air leakage through the test specimen is excessive, tape may be used to cover any cracks and joints through which leakage is occurring. Tape shall not be used when there is a probability that it may significantly restrict differential movement between adjoining members. It is also permissible to cover both sides of the entire specimen and mounting panel with a single thickness of polyethylene film no thicker than 0.050 mm (2 mils). The technique of application is important for the full load to be transferred to the specimen and to insure the membrane does not prevent movement or failure of the specimen. Apply the film loosely with extra folds of material at each corner and at all offsets and recesses. When the load is applied, there shall be no fillet caused by tightness of plastic film.

1626.3.8 A particular system of construction shall be deemed to comply with this test if three test specimens reject the small missile impacts without penetration and resist the cyclic pressure loading with no crack forming longer than 5 inches (127 mm) and 1/16 inch (1.6 mm) in width through which air can pass.

1626.3.9 If only one of the three test specimens in a test fails to meet the above listed criteria, one retest of the system (another test sequence with three specimens) of construction shall be permitted.

1626.4 Construction assemblies deemed to comply with Section 1626

1. Exterior concrete masonry walls of minimum nominal 8-inch (203 mm) thickness, constructed in accordance with Chapter 21 (High Velocity Hurricane Zones) of this code.

2. Exterior frame walls or gable ends constructed in accordance with Chapters 22 and 23 (High Velocity Hurricane Zones) of this code, sheathed with a minimum 19/32-inch (15 mm) CD exposure 1 plywood and clad with wire lath and stucco installed in accordance with Chapter 25 of this code.

3. Exterior frame walls and roofs constructed in accordance with Chapter 22 (High Velocity Hurricane Zones) of this code sheathed with a minimum 24-gage rib deck type material and clad with an approved wall finish.

4. Exterior reinforced concrete elements constructed of solid normal weight concrete (no voids), designed in accordance with Chapter 19 (High Velocity Hurricane Zones) of this code and having a minimum 2-in. (51 mm) thickness.

5. Roof systems constructed in accordance with Chapter 22 or 23 (High Velocity Hurricane Zones) of this code, sheathed with a minimum 19/32-inch (15 mm) CD exposure 1 plywood or minimum nominal 1-inch (25 mm) wood decking and surfaced with an approved roof system installed in accordance with Chapter 15 of this code.

All connectors shall be specified by the building designer of record for all loads except impact.
### TABLE 1626
CYCLIC WIND PRESSURE LOADING

<table>
<thead>
<tr>
<th>Range</th>
<th>Number of cycles</th>
<th>Range</th>
<th>Number of cycles</th>
</tr>
</thead>
<tbody>
<tr>
<td>$0.2 \ P_{\text{MAX}}$ to $0.5 \ P_{\text{MAX}}$</td>
<td>3,500</td>
<td>$0.3 \ P_{\text{MAX}}$ to $1.0 \ P_{\text{MAX}}$</td>
<td>50</td>
</tr>
<tr>
<td>$0.0 \ P_{\text{MAX}}$ to $0.6 \ P_{\text{MAX}}$</td>
<td>300</td>
<td>$0.5 \ P_{\text{MAX}}$ to $0.8 \ P_{\text{MAX}}$</td>
<td>1,050</td>
</tr>
<tr>
<td>$0.5 \ P_{\text{MAX}}$ to $0.8 \ P_{\text{MAX}}$</td>
<td>600</td>
<td>$0.0 \ P_{\text{MAX}}$ to $0.6 \ P_{\text{MAX}}$</td>
<td>50</td>
</tr>
<tr>
<td>$0.3 \ P_{\text{MAX}}$ to $1.0 \ P_{\text{MAX}}$</td>
<td>100</td>
<td>$0.2 \ P_{\text{MAX}}$ to $0.5 \ P_{\text{MAX}}$</td>
<td>3,350</td>
</tr>
</tbody>
</table>

**Notes:**

1. Each cycle shall have minimum duration of 1 second and a maximum duration of 3 seconds and must be performed in a continuous manner.
2. $P_{\text{MAX}}$ denotes maximum design load in accordance with ASCE 7. The pressure spectrum shall be applied to each test specimen beginning with inward acting pressures followed by the outward acting pressures in the order from the top of each column to the bottom of each column.