# PDH NOW

## A Four-Hour Advanced Internet Course on Chapter 16, Florida Building Code - Building 8th Edition (2023)

## Building Structural Design

**Approved by the Florida Board of Professional Engineers**
**Course #881.2**

**with supplementary information on**
**Chapter 471, F.S. The Engineer Registration Law and**
**Rules 61G15-19, 30, and 31, F.A.C.**
**The Rules of the Florida Board of Professional Engineers**




**As offered by**

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## Couse Description

This FBC Building Structural Design course satisfies the 4-hour continuing education requirement for Professional Engineer license renewal.

The course is designed as an advanced distance learning interactive course that enables the practicing professional engineer to review the Florida Building Code Chapter 16 Building Structural Design, 8th Edition, 2023.

## Objectives

The primary objective of this course is to review and test the student on knowledge pertaining to the Florida Building Code Chapter 16 Building Structural Design, 8th Edition, 2023.

Upon successful completion of the course, the student will be well versed in 2023 8th Edition of the code.

## How to Read this Course

The student is required to thoroughly read and comprehend the subject code.

In order to complete the course, the student must pass the quiz in the final chapter of the course. It is recommended that the student keep these questions in mind as the course is read.

## Topics Covered

Changes to Florida Building Code Chapter 16 Building Structural Design, 8th Ed., 2023.

## Grading

Students must achieve a minimum score of 70% on the online quiz to pass this course.

The quiz may be taken three times.

The student will be asked at the end of the quiz to attest that he or she has personally and successfully completed all chapters of instruction.

The quiz may be viewed in the final chapter of this course.

## *Couse Inquiry*

This course is designed to be interactive. The student is encouraged to contact us to discuss any questions that arise while taking this course. All inquiries will be answered within two days or less. The reader can contact PDH*Now* as follows:

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# Table of Contents

# Part I

# CHAPTER16
# STRUCTURAL DESIGN

## SECTION 1601
## GENERAL

### 1601.1 Scope.

The provisions of this chapter shall govern the structural design of buildings, structures and portions thereof regulated by this code.

**Exception:** Buildings and structures located within the high-velocity hurricane zone shall comply with the provisions of Sections 1605, 1607, 1611, 1616 through 1626, and, as applicable in flood hazard areas, Section 1612.

## SECTION 1602
## DEFINITIONS AND NOTATIONS

### 1602.1 Definitions.

The following terms are defined in Chapter 2:

**ALLOWABLE STRESS DESIGN.**

**DEAD LOADS.**

**DESIGN STRENGTH.**

**DIAPHRAGM.**

1. **Diaphragm, blocked.**
2. **Diaphragm boundary.**
3. **Diaphragm chord.**

**ESSENTIAL FACILITIES.**

**FABRIC PARTITION.**

**FACTORED LOAD.**

**HELIPAD.**

**ICE-SENSITIVE STRUCTURE.**

**IMPACT LOAD.**

**LIMIT STATE.**

**LIVE LOAD.**

**LIVE LOAD (ROOF).**

**LOAD AND RESISTANCE FACTOR DESIGN (LRFD).**

**LOAD EFFECTS.**

**LOAD FACTOR.**

**LOADS.**

**NOMINAL LOADS.**

**OTHER STRUCTURES.**

**PANEL (PART OF A STRUCTURE).**

**RESISTANCE FACTOR.**

**RISK CATEGORY.**

**STRENGTH, NOMINAL.**

**STRENGTH, REQUIRED.**

**STRENGTH DESIGN.**

**SUSCEPTIBLE BAY.**

**VEHICLE BARRIER.**

**NOTATIONS.**

$D$ = Dead load.

$D_i$ = Weight of ice in accordance with Chapter 10 of ASCE 7.

$F$ = Load due to fluids with well-defined pressures and maximum heights.

$F_a$ = Flood load in accordance with Chapter 5 of ASCE 7.

$H$ = Load due to lateral earth pressures, ground water pressure or pressure of bulk materials.

$L$ = Live Load

$L_r$ = Roof live load

$R$ = Rain load.

$T$ = Cumulative effect of self-straining load forces and effects.

$V_{asd}$ = Nominal design wind speed (3-second gust), miles per hour (mph) (km/hr) where applicable.

$V_T$ = Tornado speed, miles per hour (mph) (m/s) determined from Chapter 32 of ASCE 7.

$V_{ult}$ = Ultimate design wind speeds (3-second gust), miles per hour (mph) (km/hr) determined from Figure 1609.3(1), 1609.3(2), or 1609.3(4) or ASCE 7.

$W$ = Load due to wind pressure.

$W_i$ = Wind-on-ice in accordance with Chapter 10 of ASCE 7.

# SECTION 1603
# CONSTRUCTION DOCUMENTS

### 1603.1 General.

*Construction documents* shall show the size, section and relative locations of structural members with floor levels, column centers and offsets dimensioned. The design loads and other information pertinent to the structural design required by Sections 1603.1.1 through 1603.1.9 shall be indicated on the *construction documents*.

### 1603.1.1 Floor live load.

The uniformly distributed, concentrated and impact floor live load used in the design shall be indicated for floor areas. Use of live load reduction in accordance with Section 1607.11 shall be indicated for each type of live load used in the design.

### 1603.1.2 Roof live load.

The roof live load used in the design shall be indicated for roof areas (Section 1607.13).

### 1603.1.3 Roof snow load data. Reserved.

### 1603.1.4 Wind design data.

The following information related to wind loads shall be shown, regardless of whether wind loads govern the design of the lateral force-resisting system of the structure:

1. Ultimate design wind speed, $V_{ult}$, (3-second gust), miles per hour (km/hr), tornado speed, $V_T$ (mph) and nominal design wind speed, $V_{asd}$ (mph) as determined in accordance with Section 1609.3.1.
2. *Risk category*.
3. Effective plan area, $A_e$, for tornado design in accordance with Chapter 32 of ASCE 7.
4. Wind exposure. Applicable wind direction if more than one wind exposure is utilized.
5. Applicable internal pressure coefficients and applicable tornado internal pressure coefficients.

6. Design wind pressures and their applicable zones with dimensions to be used for exterior component and cladding materials not specifically designed by the *registered design professional* responsible for the design of the structure, psf (kN/m$^2$). Where design for tornado loads is required, the design pressures shown shall be the maximum of wind or tornado pressures.

### 1603.1.5 Earthquake design data. Reserved

### 1603.1.6 Geotechnical information.

The design load-bearing values of soils shall be shown on the *construction documents*.

### 1603.1.7 Flood design data.

For buildings located in whole or in part in *flood hazard areas* as established in Section 1612.3, the documentation pertaining to design, if required in Section 1612.5, shall be included and the following information, referenced to the datum on the community's Flood Insurance Rate Map (FIRM), shall be shown, regardless of whether flood loads govern the design of the building:

1. Flood design class assigned according to ASCE 24.
2. In *flood hazard areas* other than *coastal high hazard areas* or *coastal A zones*, the elevation of the proposed lowest floor, including the basement.
3. In *flood hazard areas* other than *coastal high hazard areas* or *coastal A zones*, the elevation to which any nonresidential building will be dry flood proofed.
4. In *coastal high hazard areas* and *coastal A zones*, the proposed elevation of the bottom of the lowest horizontal structural member of the lowest floor, including the basement.

### 1603.1.8 Special loads.

Special loads that are applicable to the design of the building, structure or portions thereof, including but not limited to the loads of machinery or equipment, that are of greater magnitude than the loads defined in the specified floor and roof loads shall be specified by their descriptions and locations.

#### 1603.1.8.1 Photovoltaic panel systems.

The dead load of rooftop-mounted *photovoltaic panel systems*, including rack support systems, shall be indicated on the construction documents.

### 1603.1.9 Roof rain load data.

Design rainfall intensity, I (in./hr) (cm/hr), shall be shown regardless of whether rain loads govern the design.

# SECTION 1604
# GENERAL DESIGN REQUIREMENTS

## 1604.1 General.

Building, structures and parts thereof shall be designed and constructed in accordance with strength design, *load and resistance factor design*, *allowable stress design*, empirical design or conventional construction methods, as permitted by the applicable material chapters.

## 1604.2 Strength.

Buildings and other structures, and parts thereof, shall be designed and constructed to support safely the factored loads in load combinations defined in this code without exceeding the appropriate strength limit states for the materials of construction. Alternatively, buildings and other structures, and parts thereof, shall be designed and constructed to support safely the *nominal loads* in load combinations defined in this code without exceeding the appropriate specified allowable stresses for the materials of construction.

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

## 1604.3 Serviceability.

Structural systems and members thereof shall be designed to have adequate stiffness to limit deflections and lateral drift.

TABLE 1604.3
DEFLECTION LIMITS[a, b, c, h, i]

| CONSTRUCTION | *L* | *S or W* [f] | *D + L* [d, g] |
|---|---|---|---|
| Roof members:[e] | | | |
| Supporting plaster or stucco ceiling | | | *l*/240 |
| Supporting nonplaster ceiling | *l*/360 | *l*/360 | *l*/180 |
| Not supporting ceiling | *l*/240 | *l*/240 | *l*/120 |
| Members supporting screen surface[j] | *l*/180 | *l*/180 | *l*/60 |
| Floor members | *l*/360 | — | *l*/240 |
| Exterior walls: | | | |
| With plaster or stucco finishes | — | *l*/360 | — |
| With other brittle finishes | — | *l*/240 | — |

| | | | |
|---|---|---|---|
| With flexible finishes | — | *l*/120 | — |
| Interior partitions:[b] | | | |
| With plaster or stucco finishes | *l*/360 | — | — |
| With other brittle finishes | *l*/240 | — | — |
| With flexible finishes | *l*/120 | — | — |
| Farm buildings | — | — | *l*/180 |
| Greenhouses | — | — | *l*/120 |

For SI: 1 foot = 304.8 mm.

a. For structural roofing and siding made of formed metal sheets, the total load deflection shall not exceed *l*/60. For secondary roof structural members supporting formed metal roofing, the live load deflection shall not exceed *l*/150. For secondary wall members supporting formed metal siding, the design wind load deflection shall not exceed *l*/90. For roofs, this exception only applies when the metal sheets have no roof covering.

b. Flexible, folding and portable partitions are not governed by the provisions of this section. The deflection criterion for interior partitions is based on the horizontal load defined in Section 1607.15.

c. See Section 2403 for glass supports.

d. The deflection limit for the D+L load combination only applies to the deflection due to the creep component of long-term dead load deflection plus the short-term live load deflection. For lumber, structural glued laminated lumber, prefabricated wood I-joists and structural composite lumber members that are dry at time of installation and used under dry conditions in accordance with the ANSI/AWC NDS, the creep component of the long-term deflection shall be permitted to be estimated as the immediate dead load deflection resulting from 0.5D. For lumber and glued laminate lumber members installed or used at all other moisture conditions or cross-laminated lumber and wood structure panels that are dry at time of lamination and used under dry conditions in accordance with the ANSI/AWC NDS, the creep component of the long-term deflection is permitted to be estimated as the immediate dead load deflection resulting from D. The value of 0.5D shall not be used in combination with ANSI/AWC NDS provisions for long-term loading.

e. The above deflections do not ensure against ponding. Roofs that do not have sufficient slope or camber to ensure adequate drainage shall be investigated for ponding. See Section 1611 for rain and ponding requirements and Section 1503.4 for roof drainage requirements.

f. The wind load is permitted to be taken as 0.42 times the "component and cladding" loads for the purpose of determining deflection limits herein. Where members support glass in accordance with Section 2403 using the deflection limit therein, the wind load shall be no less than 0.6 times the "component and cladding" loads for the purpose of determining deflection.

g. For steel structural members, the dead load shall be taken as zero.

h. For aluminum structural members or aluminum panels used in skylights and sloped glazing framing, roofs or walls of sunroom additions or patio covers not supporting edge of glass or aluminum sandwich panels, the total load deflection shall not exceed *l*/60. For continuous aluminum structural members supporting edge of glass, the total load deflection shall not exceed *l*/175 for each glass lite or *l*/60 for the entire length of the member, whichever is more stringent. For aluminum sandwich panels used in roofs or walls of sunroom additions or patio covers, the total load deflection shall not exceed *l*/120.

i. For cantilever members, l shall be taken as twice the length of the cantilever.

j. Screen surfaces shall be permitted to include a maximum of 25-percent solid flexible finishes.

### 1604.3.1 Deflections.

The deflections of structural members shall not exceed the more restrictive of the limitations of Sections 1604.3.2 through 1604.3.5 or that permitted by Table 1604.3.

### 1604.3.2 Reinforced concrete.

The deflection of reinforced concrete structural members shall not exceed that permitted by ACI 318.

### 1604.3.3 Steel.

The deflection of steel structural members shall not exceed that permitted by AISC 360, AISI S100, ASCE 8, SJI 100 or SJI 200, as applicable.

### 1604.3.4 Masonry.

The deflection of masonry structural members shall not exceed that permitted by TMS 402.

### 1604.3.5 Aluminum.

The deflection of aluminum structural members shall not exceed that permitted by AA ADM1.

### 1604.3.6 Limits.

The deflection limits of Section 1604.3.1 shall be used unless more restrictive deflection limits are required by a referenced standard for the element or finish material.

### 1604.4 Analysis.

*Load effects* on structural members and their connections shall be determined by methods of structural analysis that take into account equilibrium, general stability, geometric compatibility and both short- and long-term material properties.

Members that tend to accumulate residual deformations under repeated service loads shall have included in their analysis the added eccentricities expected to occur during their service life.

Any system or method of construction to be used shall be based on a rational analysis in accordance with well-established principles of mechanics. Such analysis shall result in a system that provides a complete load path capable of transferring loads from their point of origin to the load-resisting elements.

The total lateral force shall be distributed to the various vertical elements of the lateral force-resisting system in proportion to their rigidities, considering the rigidity of the horizontal bracing system or diaphragm. Rigid elements assumed not to be a part of the lateral force-resisting system are permitted to be incorporated into buildings provided their effect on the action of the system is considered and provided for in the design. A diaphragm is rigid for the purpose of distribution of story shear and torsional moment when the lateral deformation of the diaphragm is less than or equal to two times the average story drift. Where required by ASCE 7, provisions shall be made for the increased forces induced on resisting elements of the structural system resulting from torsion due to eccentricity between the center of application of the lateral forces and the center of rigidity of the lateral force resisting system.

Every structure shall be designed to resist the overturning effects caused by the lateral forces specified in this chapter. See Section 1609 for wind loads and Section 1610 for lateral soil loads.

### 1604.5 Risk category.

Each building and structure shall be assigned a risk category in accordance with Table 1604.5. Where a referenced standard specifies an occupancy category, the risk category shall not be taken as lower than the occupancy category specified therein. Where a referenced standard specifies that the assignment of a risk category be in accordance with ASCE 7, Table 1.5-1, Table 1604.5 shall be used in lieu of ASCE 7, Table 1.5-1.

**TABLE 1604.5**
**RISK CATEGORY OF BUILDINGS AND OTHER STRUCTURES**

| RISK CATEGORY | NATURE OF OCCUPANCY |
|---|---|
| I | Buildings and other structures that represent a low hazard to human life in the event of failure, including but not limited to:<br>•Agricultural facilities.<br>•Certain temporary facilities.<br>•Minor storage facilities.<br>•Screen enclosures. |
| II | Buildings and other structures except those listed in Risk Categories I, III and IV. |
| III | Buildings and other structures that represent a substantial hazard to human life in the event of failure, including but not limited to:<br>•Buildings and other structures whose primary occupancy is public assembly with an occupant load greater than 300.<br>•Buildings and other structures containing one or more public assembly spaces each having an occupant load greater than 300 and a cumulative occupant load of these public assembly spaces of greater than 2,500.<br>•Buildings and other structures containing Group E or Group I-4 occupants or combination thereof, with an occupant load greater than 250<br>•Buildings and other structures containing educational occupancies for students above the 12th grade with an occupant load greater than 500.<br>•Group I-2 occupancies with an occupant load of 50 or more resident care recipients but not having surgery or emergency treatment facilities.<br>•Group I-3 occupancies.<br>•Any other occupancy with an occupant load greater than 5,000.[a]<br>•Power-generating stations, water treatment facilities for potable water, wastewater treatment facilities and other public utility facilities not included in Risk Category IV.<br>•Buildings and other structures not included in Risk Category IV containing quantities of toxic or explosive materials that:<br>Exceed maximum allowable quantities per control area as given in Table 307.1(1) or 307.1(2) or per outdoor control area in accordance with the Florida Fire Prevention Code; and<br>Are sufficient to pose a threat to the public if released.[b] |

| | |
|---|---|
| IV | Buildings and other structures designated as essential facilities, including but not limited to:<br>•Group I-2 occupancies having surgery or emergency treatment facilities.<br>•Fire, rescue, ambulance and police stations and emergency vehicle garages.<br>•Designated earthquake, hurricane or other emergency shelters.<br>•Designated emergency preparedness, communications and operations centers and other facilities required for emergency response.<br>•Power-generating stations and other public utility facilities required as emergency backup facilities for Risk Category IV structures.<br>•Buildings and other structures containing quantities of highly toxic materials that:<br>Exceed maximum allowable quantities per control area as given in Table 307.1(2) or per outdoor control area in accordance with the Florida Fire Prevention Code; and<br>Are sufficient to pose a threat to the public if released.[b]<br>•Aviation control towers, air traffic control centers and emergency aircraft hangars.<br>•Buildings and other structures having critical national defense functions.<br>•Water storage facilities and pump structures required to maintain water pressure for fire suppression. |

1. a.For purposes of occupant load calculation, occupancies required by Table 1004.5 to use gross floor area calculations shall be permitted to use net floor areas to determine the total occupant load.
2. b.Where approved by the building official, the classification of buildings and other structures as Risk Category III or IV based on their quantities of toxic, highly toxic or explosive materials is permitted to be reduced to Risk Category II, provided it can be demonstrated by a hazard assessment in accordance with Section 1.5.3 of ASCE 7 that a release of the toxic, highly toxic or explosive materials is not sufficient to pose a threat to the public.

### 1604.5.1 Multiple occupancies.

Where a building or structure is occupied by two or more occupancies not included in the same *risk category*, it shall be assigned the classification of the highest *risk category* corresponding to the various occupancies. Where buildings or structures have two or more portions that are structurally separated, each portion shall be separately classified. Where a separated portion of a building or structure provides required access to, required egress from or shares life safety components with another portion having a higher *risk category*, both portions shall be assigned to the higher *risk category*.

> **Exceptions:** Where a *storm shelter* designed and constructed in accordance with ICC 500 is provided in a building, structure or portion thereof normally occupied for other purposes, the *risk category* for the normal occupancy of the building shall apply unless the *storm shelter* is designated emergency shelter in accordance with Table 1604.5

### 1604.6 In-situ load tests.

The *building official* is authorized to require an engineering analysis or a load test, or both, of any construction whenever there is reason to question the safety of the construction for the

intended occupancy. Engineering analysis and load tests shall be conducted in accordance with Section 1708.

### 1604.7 Preconstruction load tests.

Materials and methods of construction that are not capable of being designed by *approved* engineering analysis or that do not comply with the applicable referenced standards, or alternative test procedures in accordance with Section 1707, shall be load tested in accordance with Section 1709.

### 1604.8 Anchorage.

Buildings and other structures, and portions thereof, shall be provided with anchorage in accordance with Sections 1604.8.1 through 1604.8.3, as applicable.

### 1604.8.1 General.

Anchorage of the roof to walls and columns, and of walls and columns to foundations, shall be provided to resist the uplift and sliding forces that result from the application of the prescribed loads.

### 1604.8.2 Structural walls.

Walls that provide vertical load-bearing resistance or lateral shear resistance for a portion of the structure shall be anchored to the roof and to all floors and members that provide lateral support for the wall or that are supported by the wall. The connections shall be capable of resisting the horizontal forces specified in Section 1.4.5 of ASCE 7. Required anchors in masonry walls of hollow units or cavity walls shall be embedded in a reinforced grouted structural element of the wall. See Sections 1609 for wind design requirements.

### 1604.8.3 Decks.

Where supported by attachment to an *exterior wall*, decks shall be positively anchored to the primary structure and designed for both vertical and lateral loads as applicable. Such attachment shall not be accomplished by the use of toenails or nails subject to withdrawal. Where positive connection to the primary building structure cannot be verified during inspection, decks shall be self-supporting. Connections of decks with cantilevered framing members to exterior walls or other framing members shall be designed for both of the following:

1. The reactions resulting from the dead load and live load specified in Section 1606 and Table 1607.1, in accordance with Section 1605, acting on all portions of the deck.
2. The reactions resulting from the dead load and live load specified in Section 1606 and Table 1607.1, in accordance with Section 1605, acting on the cantilevered portion of the deck, and no live load on the remaining portion of the deck.

### 1604.9 Counteracting structural actions.

Structural members, systems, components and cladding shall be designed to resist forces due to wind, with consideration of overturning, sliding and uplift. Continuous load paths shall be provided for transmitting these forces to the foundation. Where sliding is used to isolate the elements, the effects of friction between sliding elements shall be included as a force.

## SECTION 1605
## LOAD COMBINATIONS

### 1605.1 General.

Buildings and other structures and portions thereof shall be designed to resist the strength load combinations specified in ASCE 7, Section 2.3, the *allowable stress design* load combinations specified in ASCE 7, Section 2.4, or the alternative *allowable stress design* load combinations of Section 1605.2.

**Exceptions:**

1. The modifications to load combinations of ASCE 7, Section 2.3, ASCE 7, Section 2.4 and Section 1605.2 specified in ASCE 7, Chapters 18 and 19 shall apply.
2. Where the *allowable stress design* load combinations of ASCE 7, Section 2.4 are used, crane hook loads need not be combined with roof *live loads* or with more than one-half of the wind loads.
3. Where design for tornado loads is required, the alternative *allowable stress design* load combinations of Section 1605.2 shall not apply where tornado loads govern the design.

### 1605.1.1 Stability.

Regardless of which load combinations are used to design for strength, where overall structure stability (such as stability against overturning, sliding, or buoyancy) is being verified, use of the load combinations specified in ASCE 7, Section 2.3, ASCE 7, Section 2.4, and in Section 1605.2 shall be permitted. Where the load combinations specified in ASCE 7, Section 2.3 are used, strength reduction factors applicable to soil resistance shall be provided by a *registered design professional*. The stability of retaining walls shall be verified in accordance with Section 1807.2.3.

### 1605.2 Alternative allowable stress design load combinations

In lieu of the load combinations in ASCE 7, Section 2.4, structures and portions thereof shall be permitted to be designed for the most critical effects resulting from the following combinations.

Where using these alternative allowable stress load combinations that include wind load, allowable stresses are permitted to be increased or load combinations reduced where permitted by the material chapter of this code or the referenced standards. For load combinations that include the counteracting effects of dead and wind loads, only two-thirds of the minimum dead load likely to be in place during a design wind event shall be used. Where using these alternative load combinations to evaluate sliding, overturning and soil bearing at the soil-structure interface, the reduction of foundation overturning from Section 12.13.4 in ASCE 7 shall not be used.

$D + L + (L_r \text{ or } R)$ **(Equation 16-1)**

$D + L + 0.6\,wW$ **(Equation 16-2)**

$D + L + 0.6\,wW$ **(Equation 16-3)**

$D + L + 0.6\,wW/2$ **(Equation 16-4)**

$D + L$ **(Equation 16-5)**

$0.9D + E/1.4$ **(Equation 16-6)**

Exception: Crane hook loads need not be combined with roof live loads or one-half of the wind load.

## SECTION 1606
## DEAD LOADS

### 1606.1 General.

Dead loads are those loads defined in Chapter 2 of this code. Dead loads shall be considered permanent loads.

### 1606.2 Weights of materials of construction.

For purposes of design, the actual weights of materials of construction and fixed service equipment shall be used. In the absence of definite information, values used shall be subject to the approval of the *building official*.

### 1606.3 Weight of fixed service equipment.

In determining dead loads for purposes of design, the weight of fixed service equipment, including the maximum weight of the contents of fixed service equipment, shall be included. The components of fixed service equipment that are variable, such as liquid contents and

movable trays, shall not be used to counteract forces causing overturning, sliding, and uplieft conditions in accordance with Section 1.3.6 of ASCE 7.

Exception: Where force effects are the result of the presence of the variable components, the components are permitted to be used to counter those load effects. In such cases, the structure shall be designed for force effects with the variable components present and with them absent.

### 1606.4 Photovoltaic panel systems.

The weight of photovoltaic panel systems, their support system, and ballast shall be considered as dead load.

### 1606.5 Vegetative and landscaped roofs.

The weight of all landscaping and hardscaping materials for vegetative and landscaped roofs shall be considered as dead load. The weight shall be computed considering both fully saturated soil and drainage layer materials and fully dry soil and drawinage layer materials to determine the most severe load effects on the structure.

## SECTION 1607
## LIVE LOADS

### 1607.1 General.

Live loads are those loads defined in Chapter 2 of this code.

TABLE 1607.1
MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS, $L_o$, AND MINIMUM CONCENTRATED LIVE LOADS[g]

| OCCUPANCY OR USE | UNIFORM (psf) | CONCENTRATED (pounds) | ALSO SEE SECTION |
|---|---|---|---|
| 1. Apartments (see residential) | — | — | |
| 2. Access floor systems | | | |
| Office use | 50 | 2,000 | |
| Computer use | 100 | 2,000 | |
| 3. Armories and drill rooms | 150[b] | — | |
| 4. Assembly areas | | — | |
| Fixed seats (fastened to floor) | 60[a] | | |
| Follow spot, projections and control rooms | 50 | | |

| | | | |
|---|---|---|---|
| Lobbies | 100[a] | | |
| Movable seats | 100[a] | | |
| Stage floors | 150[b] | | |
| Platforms (assembly) | 100[a] | | |
| Reviewing stands, grandstands and bleachers | 100[a] See Section 1607.21 | | |
| Stadiums and arenas with fixed seats (fastened to the floor) | 60[a] See Section 1607.21 | | |
| Other assembly areas | 100[a] | | |
| 5. Balconies and decks[h] | 1.5 times the live load for the area served. Not required to exceed 100 psf. | — | |
| 6. Catwalks for maintenance and service access | 40 | 300 | |
| 7. Cornices | 60 | — | |
| 8. Corridors | | | |
| First floor | 100 | — | |
| Other floors | Same as occupancy served except as indicated | | |
| 9. Dining rooms and restaurants | 100[m] | — | |
| 10. Dwellings (see residential) | — | — | |
| 11. Elevator machine room and control room grating(on area of 2 inches by 2 inches) | — | 300 | |
| 12. Finish light floor plate construction(on area of 1 inch by 1 inch) | — | 200 | |
| 13. Fire escapes | 100 | — | |
| On single-family dwellings only | 40 | | |
| 14. Fixed ladders | See Section 1607.16 | | |
| 15. Garages<br>Passenger vehicles only | 40[c] | See Section 1607.7 | |
| Trucks and buses | See Section 1607.8 | | |
| 16. Handrails, guards and | See Section 1607.9 | | |

| | | | |
|---|---|---|---|
| grab bars | | | |
| 17. Helipads | See Section 1607.6 | | |
| 18. Hospitals | | | |
| Corridors above first floor | 80 | 1,000 | |
| Operating rooms, laboratories | 60 | 1,000 | |
| Patient rooms | 40 | 1,000 | |
| 19. Hotels (see residential) | — | — | |
| 20. Libraries | | | See Section 1607.17 |
| Corridors above first floor | 80 | 1,000 | |
| Reading rooms | 60 | 1,000 | |
| Stack rooms | 150[b, n] | 1,000 | |
| 21. Manufacturing | | | |
| Heavy | 250[n] | 3,000 | |
| Light | 125[n] | 2,000 | |
| 22. Marquees, except one- and two-family dwellings | 75 | — | |
| 23. Office buildings | | | |
| Corridors above first floor | 80 | 2,000 | |
| File and computer rooms shall be designed for heavier loads based on anticipated occupancy | — | — | |
| Lobbies and first-floor corridors | 100 | 2,000 | |
| Offices | 50 | 2,000 | |
| 24. Penal institutions | | — | |
| Cell blocks | 40 | | |
| Corridors | 100 | | |
| 25. Recreational uses: | | — | |
| Bowling alleys, poolrooms and similar uses | 75[m] | | |
| Dance halls and ballrooms | 100[m] | | |
| Gymnasiums | 100[m] | | |
| Ice skating rink | 250[n] | | |
| Reviewing stands, grandstands and bleachers | 100[c, m] | | |
| Roller skating rink | 100[m] | | |
| Stadiums and arenas with fixed seats (fastened to floor) | 60[c, m] | | |

| | | | |
|---|---|---|---|
| 26. Residential | | — | See Section 1607.20 |
| One- and two-family dwellings | | | |
| Uninhabitable attics without storage[i] | 10 | | |
| Uninhabitable attics with storage[i, j, k] | 20 | | |
| Habitable attics and sleeping areas[k] | 30 | | |
| Canopies, including marquees | 20 | | |
| All other areas | 40 | | |
| Hotels and multifamily dwellings | | | |
| Private rooms and corridors serving them | 40 | | |
| Public rooms[m] and corridors serving them | 100 | | |
| 27. Roofs | | | |
| Ordinary flat, pitched, and curved roofs (that are not occupiable) | 20 | | |
| Roof areas used for assembly purposes | 100[a] | | |
| Roof areas used for occupancies other than assembly | Same as occupancy served | | |
| Vegetative and landscaped roofs: | | | |
| Roof areas not intended for occupancy | 20 | | |
| Roof areas used for assembly purposes | 100 | | |
| Roof areas used for other occupancies | Same as occupancy served | | |
| Awnings and canopies: | 5[a] | | |
| Fabric construction supported by a skeleton structure | 20 | | |
| All other construction, except one and two-family dwellings | | | |
| Primary roof members exposed to a work floor | | | |
| Single panel point of lower | | 2,000 | |

| | | | |
|---|---|---|---|
| chord of roof trusses or any point along primary structural members supporting roofs over manufacturing, storage warehouses, and repair garages | | | See Section 1607.13.2 |
| All other primary roof members | | 300 | |
| All roof surfaces subject to maintenance workers | | 300 | |
| 28. Schools | | | |
| Classrooms | 40 | 1,000 | |
| Corridors above first floor | 80 | 1,000 | |
| First-floor corridors | 100 | 1,000 | |
| 29. Scuttles, skylight ribs and accessible ceilings | — | 200 | |
| 30. Sidewalks, vehicular driveways and yards, subject to trucking | 250[b] | 8,000 | See Section 1607.18 |
| 30. Stairs and exits | | | See Section 1607.19 |
| One- and two-family dwellings | 40 | 300[f] | |
| All other | 100 | 300[f] | |
| 32. Storage areas above ceilings | 20 | | |
| 33. Storage warehouses (shall be designed for heavier loads if required for anticipated storage) | | — | |
| Heavy | 250[b] | | |
| Light | 125[b] | | |
| 34. Stores | | | |
| Retail | | | |
| First floor | 100 | 1,000 | |
| Upper floors | 75 | 1,000 | |
| Wholesale, all floors | 125[b] | 1,000 | |
| 35. Vehicle barriers | See Section 1607.9.3 | | |
| 36. Walkways and elevated platforms(other than exit ways) | 60 | — | |
| 37. Yards and terraces, pedestrian | 100[a] | — | |

For SI: 1 inch = 25.4 mm, 1 square inch = 645.16 mm$^2$, 1 square foot = 0.0929 m$^2$, 1 pound per square foot = 0.0479 kN/m$^2$, 1 pound = 0.004448 kN, 1 pound per cubic foot = 16 kg/m$^3$.

a. Live load reduction is not permitted.
b. Live load reduction is only permitted in accordance with Section 1607.11.1.2 or Item 1 of Section 1607.11.2
c. Live load reduction is only permitted in accordance with Section 1607.11.1.3 or Item 2 of Section 1607.11.2

### 1607.2 Loads not specified.

For occupancies or uses not designated in Section 1607, the live load shall be determined in accordance with a method *approved* by the *building official*.

### 1607.3 Uniform live loads.

The live loads used in the design of buildings and other structures shall be the maximum loads expected by the intended use or occupancy but shall in no case be less than the minimum uniformly distributed live loads given in Table 1607.1.

### 1607.4 Concentrated live loads.

Floors, roofs and other similar surfaces shall be designed to support the uniformly distributed live loads prescribed in Section 1607.3 or the concentrated live loads, given in Table 1607.1, whichever produces the greater *load effects*. Unless otherwise specified, the indicated concentration shall be assumed to be uniformly distributed over an area of 2$^1$/$_2$feet by 2$^1$/$_2$ feet (762 mm by 762 mm) and shall be located so as to produce the maximum *load effects* in the structural members.

### 1607.5 Partition loads.

In office buildings and in other buildings where partition locations are subject to change, provisions for partition weight shall be made, whether or not partitions are shown on the construction documents, unless the specified live load is 80 psf (3.83 kN/m$^2$) or greater. The partition load shall be not less than a uniformly distributed live load of 15 psf (0.72 kN/m$^2$).

### 1607.6 Helipads.

Helipads shall be designed for the following live loads:

1. A uniform live load, *L*, as specified below. This load shall not be reduced.

1.1. 40 psf (1.92 kN/m$^2$) where the design basis helicopter has a maximum take-off weight of 3,000 pounds (13.35 kN) or less.
1.2. 60 psf (2.87 kN/m$^2$) where the design basis helicopter has a maximum take-off weight greater than 3,000 pounds (13.35 kN).

2. A single concentrated live load, *L*, of 3,000 pounds (13.35 kN) applied over an area of 4.5 inches by 4.5 inches (114 mm by 114 mm) and located so as to produce the maximum load effects on the structural elements under consideration. The concentrated load is not required to act concurrently with other uniform or concentrated live loads.
3. Two single concentrated live loads, *L*, 8 feet (2438 mm) apart applied on the landing pad (representing the helicopter's two main landing gear, whether skid type or wheeled type), each having a magnitude of 0.75 times the maximum take-off weight of the helicopter, and located so as to produce the maximum *load effects* on the structural elements under consideration. The concentrated loads shall be applied over an area of 8 inches by 8 inches (203 mm by 203 mm) and are not required to act concurrently with other uniform or concentrated live loads.

Landing areas designed for a design basis helicopter with maximum take-off weight of 3,000-pounds (13.35 kN) shall be identified with a 3,000 pound (13.34 kN) weight limitation. The landing area weight limitation shall be indicated by the numeral "3" (kips) located in the bottom right corner of the landing area as viewed from the primary approach path. The indication for the landing area weight limitation shall be a minimum 5 feet (1524 mm) in height.

### 1607.7 Passenger vehicle garages.

Floors in garages or portions of a building used for the storage of motor vehicles shall be designed for the uniformly distributed live loads indicated in Table 1607.1 or the following concentrated load:

1. For garages restricted to passenger vehicles accommodating not more than nine passengers, 3,000 pounds (13.35 kN) acting on an area of 4.5 inches by 4.5 inches (114 mm by 114 mm)
2. For mechanical parking structures without slab or deck that are used for storing passenger vehicles only, 2,250 pounds (10 kN) per wheel.

### 1607.8 Heavy vehicle loads.

Floors and other surfaces that are intended to support vehicle loads greater than a 10,000-pound (4536 kg) gross vehicle weight rating shall comply with Sections 1607.8.1through 1607.8.5.

### 1607.8.1 Loads.

Where any structure does not restrict access for vehicles that exceed a 10,000-pound (4536 kg) gross vehicle weight rating, those portions of the structure subject to such loads shall be designed using the vehicular live loads, including consideration of impact and fatigue, in accordance with

the codes and specifications required by the jurisdiction having authority for the design and construction of the roadways and bridges in the same location of the structure.

### 1607.8.2 Fire truck and emergency vehicles.

Where a structure or portions of a structure are accessed and loaded by fire department access vehicles and other similar emergency vehicles, the structure shall be designed for the greater of the following loads:

1. The actual operational loads, including outrigger reactions and contact areas of the vehicles as stipulated and approved by the building official; or
2. The live loading specified in Section 1607.8.1.

### 1607.8.3 Heavy vehicle garages.

Garages designed to accommodate vehicles that exceed a 10,000-pound (4536 kg) gross vehicle weight rating, shall be designed using the live loading specified by Section 1607.8.1. For garages the design for impact and fatigue is not required.

**Exception:** The vehicular live loads and load placement are allowed to be determined using the actual vehicle weights for the vehicles allowed onto the garage floors, provided such loads and placement are based on rational engineering principles and are approved by the building official, but shall not be less than 50 psf (2.9 kN/m$^2$). This live load shall not be reduced.

### 1607.8.4 Forklifts and movable equipment.

Where a structure is intended to have forklifts or other movable equipment present, the structure shall be designed for the total vehicle or equipment load and the individual wheel loads for the anticipated vehicles as specified by the owner of the facility. These loads shall be posted in accordance with Section 1607.8.5.

### 1607.8.4.1 Impact and fatigue.

Impact loads and fatigue loading shall be considered in the design of the supporting structure. For the purposes of design, the vehicle and wheel loads shall be increased by 30 percent to account for impact.

### 1607.8.5 Posting.

The maximum weight of vehicles allowed into or on a garage or other structure shall be posted by the owner or the owner's authorized agent in accordance with Section 106.1.

### 1607.9 Loads on handrails, guards, grab bars, and seats.

Handrails, and guards shall be designed and constructed for the structural loading conditions set forth in section 1607.9.1. Grab bars, shower seats and accessible benches shall be designed and constructed for structural loading conditions set forth in section 1607.9.2.

### 1607.9.1 Handrails and guards.

Handrails and *guards* shall be designed to resist a linear load of 50 pounds per linear foot (plf) (0.73 kN/m) in accordance with Section 4.5.1 of ASCE 7. Glass handrail assemblies and *guards* shall also comply with Section 2407.

**Exceptions:**

1. For one- and two-family dwellings, only the single concentrated load required by Section 1607.9.1.1 shall be applied.
2. In Group I-3, F, H and S occupancies, for areas that are not accessible to the general public and that have an *occupant load* less than 50, the minimum load shall be 20 pounds per foot (0.29 kN/m).

### 1607.9.1.1 Concentrated load.

Handrails and guards shall be designed to resist a concentrated load of 200 pounds (0.89 kN) in accordance with Section 4.5.1 of ASCE 7.

### 1607.9.1.2 Guard component loads.

Balusters, panel fillers, and guard infill components, including all rails except the handrail and the top rail, shal be designed to resist a concentrated load of 50 pounds (0.22 kN) in accordance with Section 4.5.1.2 of ASCE 7.

### 1607.9.2 Grab bars, shower seats and accessible benches

Grab bars, shower seats and accessible benches shall be designed to resist a single concentrated load of 250 pounds (1.11 kN) applied in any direction at any point on the grab bar, shower seat, or seat of the accessible bench so as to produce the maximum load effects.

### 1607.9.3 Vehicle barriers.

Vehicle barriers for passenger vehicles shall be designed to resist a concentrated load of 6,000 pounds (26.70 kN) in accordance with Section 4.5.3 of ASCE 7. Garages accommodating trucks and buses shall be designed in accordance with an *approved* method that contains provisions for traffic railings.

### 1607.10 Impact loads.

The live loads specified in Sections 1607.3 through 1607.9 shall be assumed to include adequate allowance for ordinary impact conditions. Provisions shall be made in the structural design for uses and loads that involve unusual vibration and impact forces.

### 1607.10.1 Elevators.

Members, elements and components subject to dynamic loads from elevators shall be designed for impact loads and deflection limits prescribed by ASME A17.1/CSA B44.

### 1607.10.2 Machinery.

For the purpose of design, the weight of machinery and moving loads shall be increased as follows to allow for impact: (1) light machinery, shaftor motor-driven, 20 percent; and (2) reciprocating machinery or power-driven units, 50 percent. Percentages shall be increased where specified by the manufacturer.

### 1607.10.3 Elements supporting hoists for façade access and building maintenance equipment.

In addition to any other applicable live loads, structural elements that support hoists for façade access and building maintenance equipment shall be designed for a live load of 2.5 times the rated load of the hoist or the stall load of the hoist, whichever is larger.

### 1607.10.4 Fall arrest, lifeline and rope descent system anchorages

In addition to any other applicable live loads, fall arrest, lifeline, and rope descent system anchorages and structural elements that support these anchorages shall be designed for a live load of not less than 3,100 pounds (13.8 kN) for each attached line, in any direction that the load can be applied.

Anchorages of horizontal lifelines and the structural elements that support these anchorages shall be designed for the maximum tension that develops in the horizontal lifeline from these live loads.

### 1607.11 Reduction in uniform live loads.

Except for uniform live loads at roofs, all other minimum uniformly distributed live loads, $L_o$, in Table 1607.1 are permitted to be reduced in accordance with Section 1607.11.1 or 1607.11.2. Uniform live loads at roofs are permitted to be reduced in accordance with Section 1607.13.2.

### 1607.11.1 Basic uniform live load reduction.

Subject to the limitations of Sections 1607.11.1.1 through 1607.11.1.3 and Table 1607.1, members for which a value of $K_{LL}A_T$ is 400 square feet (37.16 m$^2$) or more are permitted to be

designed for a reduced uniformly distributed live load, $L$, in accordance with the following equation:

$$L = L_o\left(0.25 + \frac{15}{\sqrt{K_{LL}A_T}}\right)$$ **(Equation 16-7)**

**For SI:** $$L = L_o\left(0.25 + \frac{4.57}{\sqrt{K_{LL}A_T}}\right)$$

**where:**

***L*** **= Reduced design live load per square foot (m²) of area supported by the member.**

$L_o$ **= Unreduced design live load per square foot (m²) of area supported by the member (see Table 1607.1).**

$K_{LL}$ **= Live load element factor (see Table 1607.11.1).**

$A_T$ **= Tributary area, in square feet (m²).**

***L*** **shall be not less than 0.50$L_o$ for members supporting one floor and *L* shall be not less than 0.40$L_o$ for members supporting two or more floors.**

TABLE 1607.11.1
LIVE LOAD ELEMENT FACTOR, $K_{LL}$

| ELEMENT | $K_{LL}$ |
|---|---|
| Interior columns | 4 |
| Exterior columns without cantilever slabs | 4 |
| Edge columns with cantilever slabs | 3 |
| Corner columns with cantilever slabs | 2 |
| Edge beams without cantilever slabs | 2 |
| Interior beams | 2 |
| All other members not identified above including: | 1 |
| Edge beams with cantilever slabs | |
| Cantilever beams | |
| One-way slabs | |
| Two-way slabs | |
| Members without provisions for continuous shear transfer normal to their span | |

### 1607.11.1.1 One-way slabs.

The tributary area, $A_T$, for use in Equation 16-7 for one-way slabs shall not exceed an area defined by the slab span times a width normal to the span of 1.5 times the slab span.

### 1607.11.1.2 Heavy live loads.

Live loads that exceed 100 psf (4.79 kN/m$^2$) shall not be reduced.

**Exceptions:**

1. 1.The live loads for members supporting two or more floors are permitted to be reduced by a maximum of 20 percent, but the live load shall be not less than $L$ as calculated in Section 1607.11.1.
2. 2.For uses other than storage, where *approved*, additional live load reductions shall be permitted where shown by the *registered design professional* that a rational approach has been used and that such reductions are warranted.

### 1607.11.1.3 Passenger vehicle garages.

The live loads shall not be reduced in passenger vehicle garages.

**Exception:** The live loads for members supporting two or more floors are permitted to be reduced by a maximum of 20 percent, but the live load shall not be less than $L$ as calculated in Section 1607.11.1.

### 1607.11.2 Alternative uniform live load reduction.

As an alternative to Section 1607.11.1 and subject to the limitations of Table 1607.1, uniformly distributed live loads are permitted to be reduced in accordance with the following provisions. Such reductions shall apply to slab systems, beams, girders, columns, piers, walls and foundations.

1. A reduction shall not be permitted where the live load exceeds 100 psf (4.79 kN/m$^2$) except that the design live load for members supporting two or more floors is permitted to be reduced by a maximum of 20 percent.

   **Exception:** For uses other than storage, where approved, additional live load reductions shall be permitted where shown by the *registered design professional* that a rational approach has been used and that such reductions are warranted.

2. A reduction shall not be permitted in passenger vehicle parking garages except that the live loads for members supporting two or more floors are permitted to be reduced by a maximum of 20 percent.
3. For live loads not exceeding 100 psf (4.79 kN/m$^2$), the design live load for any structural member supporting 150 square feet (13.94 m$^2$) or more is permitted to be reduced in accordance with Equation 16-8.
4. For one-way slabs, the area, A, for use in Equation 16-8 shall not exceed the product of the slab span and a width normal to the span of 0.5 times the slab span.

$$R = 0.08(A - 150) \qquad \textbf{(Equation 16-8)}$$

For SI: $R = 0.861(A - 13.94)$

Such reduction shall not exceed the smallest of:

1. 40 percent for members supporting one floor.
2. 60 percent for members supporting two or more floors.
3. $R$ as determined by the following equation:

$$R = 23.1(1 + D/L_o) \qquad \textbf{(Equation 16-9)}$$

**where:**

***A* = Area of floor supported by the member, square feet (m$^2$).**

***D* = Dead load per square foot (m$^2$) of area supported.**

***$L_o$* = Unreduced live load per square foot (m$^2$) of area supported.**

***R* = Reduction in percent.**

## 1607.12 Distribution of floor loads.

Where uniform floor live loads are involved in the design of structural members arranged so as to create continuity, the minimum applied loads shall be the full dead loads on all spans in combination with the floor live loads on spans selected to produce the greatest *load effect* at each location under consideration. Floor live loads are permitted to be reduced in accordance with Section 1607.11.

## 1607.13 Roof loads.

The structural supports of roofs and marquees shall be designed to resist wind and, where applicable, tornado loads, in addition to the dead load of construction and the appropriate live loads as prescribed in this section, or as set forth in Table 1607.1. The live loads acting on a sloping surface shall be assumed to act vertically on the horizontal projection of that surface.

### 1607.13.1 Distribution of roof loads.

Where uniform roof live loads are reduced to less than 20 psf (0.96 kN/m²) in accordance with Section 1607.13.2.1 and are applied to the design of structural members arranged so as to create continuity, the reduced roof live load shall be applied to adjacent spans or to alternate spans, whichever produces the most unfavorable *load effect*. See Section 1607.13.2 for reductions in minimum roof live loads.

### 1607.13.2 Reduction in uniform roof live loads.

The minimum uniformly distributed live loads of roofs and marquees, $L_o$, in Table 1607.1 are permitted to be reduced in accordance with Section 1607.13.2.1.

### 1607.13.2.1 Ordinary roofs, awnings and canopies.

Ordinary flat, pitched and curved roofs, and awnings and canopies other than of fabric construction supported by a skeleton structure, are permitted to be designed for a reduced uniformly distributed roof live load, $L_r$, as specified in the following equations or other controlling combinations of loads as specified in Section 1605, whichever produces the greater *load effect*.

In structures such as greenhouses, where special scaffolding is used as a work surface for workers and materials during maintenance and repair operations, a lower roof load than specified in the following equations shall not be used unless *approved* by the *building official*. Such structures shall be designed for a minimum roof live load of 12 psf (0.58 kN/m²).

$$L_r = L_o R_1 R_2 \qquad \textbf{(Equation 16-10)}$$

where: $12 \le L_r \le 20$

For SI: $L_r = L_o R_1 R_2$

where: $0.58 \le L_r \le 0.96$

$L_o$ = Unreduced roof live load per square foot (m²) of horizontal projection supported by the member (see Table 1607.1).

$L_r$ = Reduced roof live load per square foot (m²) of horizontal projection supported by the member.

The reduction factors $R_1$ and $R_2$ shall be determined as follows:

$R_1$ = 1 for $A_t \le 200$ square feet (18.58 m²) **(Equation 16-11)**

$$R_1 = 1.2 - 0.001A_t \text{ for 200 square feet} < A_t < 600 \text{ square feet} \quad \textbf{(Equation 16-12)}$$

For SI: $1.2 - 0.011A_t$ for 18.58 square meters $< A_t <$ 55.74 square meters

$$R_1 = 0.6 \text{ for } A_t \geq 600 \text{ square feet } (55.74 \text{ m}^2) \quad \textbf{(Equation 16-13)}$$

where:

$A_t$ = Tributary area (span length multiplied by effective width) in square feet ($m^2$) supported by the member, and

$$R_2 = 1 \text{ for } F \leq 4 \quad \textbf{(Equation 16-14)}$$

$$R_2 = 1.2 - 0.05F \text{ for } 4 < F < 12 \quad \textbf{(Equation 16-15)}$$

$$R_2 = 0.6 \text{ for } F \geq 12 \quad \textbf{(Equation 16-16)}$$

where:

$F$ = For a sloped roof, the number of inches of rise per foot (for SI: $F = 0.12 \times$ slope, with slope expressed as a percentage), or for an arch or dome, the rise-to-span ratio multiplied by 32.

### 1607.13.2.2 Occupiable roofs.

Areas of roofs that are occupiable, such as *vegetative roofs*, roof gardens or for assembly or other similar purposes, and marquees are permitted to have their uniformly distributed live loads reduced in accordance with Section 1607.11.

### 1607.13.3 Awnings and canopies.

Awnings and canopies shall be designed for uniform live loads as required in Table 1607.1 as well as for wind and tornado loads as specified in Sections 1609.

### 1607.13.4 Photovoltaic panel systems.

Roof structures that provide support for *photovoltaic panel systems* shall be designed in accordance with Sections 1607.13.4.1 through 1607.13.4.4, as applicable.

### 1607.13.4.1 Roof live load.

Roof structures that support photovoltaic panel systems shall be designed to resist each of the following conditions:

1. Applicable uniform and concentrated roof loads with the photovoltaic panel system dead loads.

***Exception:*** Roof live loads need not be applied to the area covered by photovoltaic panels where the clear space between the panels and the roof surface is 24 inches (610mm) or less.

***2.*** Applicable uniform and concentrated roof loads without the photovoltaic panel system present.

### 1607.13.4.2 Photovoltaic panels or modules.

The structure of a roof that supports solar photovoltaic panels or modules shall be designed to accommodate the full solar photovoltaic panels or modules and ballast dead load, including concentrated loads from support frames in combination with the loads from Section 1607.13.4.1 and other applicable loads.

### 1607.13.4.3 Photovoltaic panels installed on open-grid roof structures.

Structures with open-grid framing and no roof deck or sheathing supporting photovoltaic panel systems shall be designed to support the uniform and concentrated roof live loads specified in Section 1607.13.4.1, except that the uniform roof live load shall be permitted to be reduced to 12psf (0.57kN/$m^2$ ).

### 1607.13.4.4 Ground-mounted photovoltaic (PV) panel systems.

Ground-mounted photovoltaic (PV) panel systems that are independent structures and do not have accessible/occupied space underneath are not required to accommodate a roof photovoltaic live load, provided the area under the structure is restricted to keep the public away. Other loads and combinations in accordance with Section 1605 shall be accommodated.

### 1607.13.4.5 Ballasted photovoltaic panel systems.

Roof structures that provide support for ballasted *photovoltaic panel systems* shall be designed, or analyzed, in accordance with Section 1604.4; checked in accordance with Section 1604.3.6 for deflections; and checked in accordance with Section 1611 for ponding.

### 1607.14 Crane loads.

The crane live load shall be the rated capacity of the crane. Design loads for the runway beams, including connections and support brackets, of moving bridge cranes and monorail cranes shall include the maximum wheel loads of the crane and the vertical impact, lateral and longitudinal forces induced by the moving crane.

### 1607.14.1 Maximum wheel load.

The maximum wheel loads shall be the wheel loads produced by the weight of the bridge, as applicable, plus the sum of the rated capacity and the weight of the trolley with the trolley positioned on its runway at the location where the resulting load effect is maximum.

### 1607.14.2 Vertical impact force.

The maximum wheel loads of the crane shall be increased by the following percentages to account for the effects of vertical impact or vibration:

| | |
|---|---|
| Monorail cranes (powered) | 25 percent |
| Cab-operated or remotely operated bridge cranes (powered) | 25 percent |
| Pendant-operated bridge cranes (powered) | 10 percent |
| Bridge cranes or monorail cranes with hand-geared bridge, trolley and hoist | 0 percent |

### 1607.14.3 Lateral force.

The lateral force on crane runway beams with electrically powered trolleys shall be calculated as 20 percent of the sum of the rated capacity of the crane and the weight of the hoist and trolley. The lateral force shall be assumed to act horizontally at the traction surface of a runway beam, in either direction perpendicular to the beam, and shall be distributed with due regard to the lateral stiffness of the runway beam and supporting structure.

### 1607.14.4 Longitudinal force.

The longitudinal force on crane runway beams, except for bridge cranes with hand-geared bridges, shall be calculated as 10 percent of the maximum wheel loads of the crane. The longitudinal force shall be assumed to act horizontally at the traction surface of a runway beam, in either direction parallel to the beam.

### 1607.15 Interior walls and partitions.

Interior walls and partitions that exceed 6 feet (1829 mm) in height, including their finish materials, shall have adequate strength and stiffness to resist the loads to which they are subjected but not less than a horizontal load of 5 psf (0.240 kN/m$^2$).

### 1607.15.1 Fabric partitions.

Fabric partitions that exceed 6 feet (1829 mm) in height, including their finish materials, shall have adequate strength and stiffness to resist the following load conditions:

1. The horizontal distributed load need only be applied to the partition framing. The total area used to determine the distributed load shall be the area of the fabric face between the

framing members to which the fabric is attached. The total distributed load shall be uniformly applied to such framing members in proportion to the length of each member.

2. A concentrated load of 40 pounds (0.176 kN) applied to an 8-inch-diameter (203 mm) area [50.3 square inches (32 452 $mm^2$)] of the fabric face at a height of 54 inches (1372 mm) above the floor.

### 1607.15.2 Fire walls.

In order to meet the structural stability requirements of Section 706.02 where the structure on either side of the wall has collapsed, fire walls and their supports shall be designed to withstand a minimum horizontal allowable stress load of 5 psf (0.240kN/$m^2$).

### 1607.16 Fixed ladders.

Fixed ladders with rungs shall be designed to resist a single concentrated load of 300 lb (1.33 kN) in accordance with Section 4.5.4 of ASCE 7. Where rails of fixed ladders extend above a floor or platform at the top of the ladder, each side rail extension shall be designed to resist a single concentrated load of 100 lb (0.455 kN) in accordance with Section 4.5.4 of ASCE 7. Ship's ladders shall be designed to resist the stair loads given in Table 1607.1.

### 1607.17 Library stack rooms.

The live loading indicated in Table 1607.1 for library stack rooms applies to stack room floors that support nonmobile, double-faced library book stacks, subject to the following limitations:

1. The nominal book stack unit height shall not exceed 90 inches (2,290 mm).
2. The nominal shelf depth shall not exceed 12 inches (305 mm) for each face.
3. Parallel rows of double-faced book stacks shall be separated by aisles not less than 36 inches (914 mm) wide.

### 1607.18 Sidewalks, vehicular driveways, and yards subject to trucking.

The live loading indicated in Table 1607.1 for sidewalks, vehicular driveways, and yards subject to trucking shall comply with the requirements of this section.

### 1607.18.1 Uniform loads.

In addition to the *loads* indicated in Table 1607.1, other uniform *loads* in accordance with an approved method which contains provisions for truck loading shall be considered where appropriate.

### 1607.18.2 Concentrated loads.

The concentrated wheel load indicated in Table 1607.1 shall be applied on an area of 4.5 inches by 4.5 inches (114 mm by 114 mm).

### 1607.19 Stair treads.

The concentrated *load* indicated in Table 1607.1 for *stair* treads shall be applied on an area of 2 inches by 2 inches (51 mm by 51 mm). This *load* need not be assumed to act concurrently with the uniform *load*.

### 1607.20 Residential attics.

The *live loads* indicated in Table 1607.1 for attics in residential occupancies shall comply with the requirements of this section.

### 1607.20.1 Uninhabitable attics without storage.

In residential occupancies, uninhabitable *attic* areas without storage are those where the maximum clear height between the joists and rafters is less than 42 inches (1067 mm), or where there are not two or more adjacent trusses with web configurations capable of accommodating an assumed rectangle 42 inches (1067 mm) in height by 24 inches (610 mm) in width, or greater, within the plane of the trusses. The *live load* in Table 1607.1 need not be assumed to act concurrently with any other *live load* requirement.

### 1607.20.2 Uninhabitable attics with storage.

In residential occupancies, uninhabitable *attic* areas with storage are those where the maximum clear height between the joist and rafter is 42 inches (1067 mm) or greater, or where there are two or more adjacent trusses with web configurations capable of accommodating an assumed rectangle 42 inches (1067 mm) in height by 24 inches (610 mm) in width, or greater, within the plane of the trusses. The *live load* in Table 1607.1 need only be applied to those portions of the joists or truss bottom chords where both of the following conditions are met:

1. The *attic* area is accessed from an opening not less than 20 inches (508 mm) in width by 30 inches (762 mm) in length that is located where the clear height in the *attic* is not less than 30 inches (762 mm).

2. The slope of the joists or truss bottom chords is not greater than 2 units vertical in 12 units horizontal.

The remaining portions of the joists or truss bottom chords shall be designed for a uniformly distributed concurrent *live load* of not less than 10 pounds per square foot (0.48 kN/m$^2$).

### 1607.20.3 Attics served by stairs.

*Attic* spaces served by *stairways* other than the pull-down type shall be designed to support the minimum *live load* specified for habitable *attics* and sleeping rooms.

### 1607.21 Seating for assembly uses.

*Bleachers, folding and telescopic seating and grandstands* shall be designed for the *loads* specified in ICC 300. Stadiums and arenas with fixed seats shall be designed for the horizontal sway loads in Section 1607.21.1.

### 1607.21.1 Horizontal sway loads.

The design of stadiums and arenas with fixed seats shall include horizontal swaying forces applied to each row of seats as follows:

1. 24 pounds per linear foot (0.35 kN/m) of seat applied in a direction parallel to each row of seats.
2. 10 pounds per linear foot (0.15 kN/m) of seat applied in a direction perpendicular to each row of seats.

The parallel and perpendicular horizontal swaying forces are not required to be applied simultaneously.

## SECTION 1608
## SNOW LOADS – RESERVED

## SECTION 1609
## WIND LOADS

### 1609.1 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. All exterior wall coverings and soffits shall be capable of resisting the design pressures specified for walls for components and cladding loads in accordance with Section 1609.1.1. Manufactured soffits shall be labeled in accordance with Section 1709.10 of this code.

### 1609.1.1 Determination of wind loads.

Wind loads on every building or structure shall be determined in accordance with Chapters 26 to 30 of ASCE 7 or provisions of the alternate all-heights method in Section 1609.6. Wind shall be assumed to come from any horizontal direction and wind pressures shall be assumed to act normal to the surface considered.

**Exceptions:**

1. Subject to the limitations of Section 1609.1.1.1, the provisions of ICC 600shall be permitted for applicable Group R-2 and R-3 buildings.
2. Subject to the limitations of Section 1609.1.1.1, residential structures using the provisions of AWC WFCM.
3. Subject to the limitations of Section 1609.1.1.1, residential structures using the provisions of AISI S230.
4. Designs using NAAMM FP 1001, *Guide specifications for Design of Metal Flagpoles.*
5. Designs using TIA-222 for antenna-supporting structures and antennas, provided the horizontal extent of Topographic Category 2 escarpments in Section 2.6.6.2 of TIA-

222 shall be 16 times the height of the escarpment. Design using this standard shall be permitted for communication tower and steel antenna support structures.

6. Wind tunnel tests in accordance with ASCE 49 and Sections 31.4 and 31.5 of ASCE 7.
7. Wind loads for screen enclosures shall be determined in accordance with Section 2002.4.
8. Exposed mechanical equipment or appliances fastened to a roof or installed on the ground in compliance with the code using rated stands, platforms, curbs, slabs, walls, or other means are deemed to comply with the wind resistance requirements of the 2007 Florida Building Code, as amended. Further support or enclosure of such mechanical equipment or appliances is not required by a state or local official having authority to enforce the Florida Building Code.

The wind speeds in Figures 1609.3(1), 1609.3(2) , 1609.3(3) and 1609.(4) are ultimate design wind speeds, $V_{ult}$, and shall be converted in accordance with Section 1609.3.1 to nominal design wind speeds, $V_{asd}$, when the provisions of the standards referenced in Exceptions 4 and 5 are used.

### 1609.1.1.1 Applicability.

The provisions of ICC 600 are applicable only to buildings located within Exposure B or C as defined in Section 1609.4. The provisions of ICC 600, AWC WFCM and AISI S230 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 (18 288 mm) or higher if located in Exposure B or 30 feet (9144 mm) 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 (1.61 km), whichever is greater.

### 1609.1.2 Protection of openings.

In *wind-borne debris regions*, glazed openings in buildings shall be impact resistant or protected with an impact-resistant covering meeting the requirements of ANSI/DASMA 115 (for garage doors and rolling doors) or TAS 201, 202 and 203, AAMA 506, ASTM E1996 and ASTM E1886 referenced herein, or an approved impact-resistant standard as follows:

1. Glazed openings located within 30 feet (9144 mm) of grade shall meet the requirements of the large missile test of ASTM E1996.
2. Glazed openings located more than 30 feet (9144 mm) above grade shall meet the provisions of the small missile test of ASTM E1996.
3. Storage sheds that are not designed for human habitation and that have a floor area of 720 square feet (67 $m^2$) or less are not required to comply with the mandatory windborne debris impact standards of this code.

4. Openings in sunrooms, balconies or enclosed porches constructed under existing roofs or decks are not required to be protected provided the spaces are separated from the building interior by a wall and all openings in the separating wall are protected in accordance with Section 1609.1.2 above. Such spaces shall be permitted to be designed as either partially enclosed or enclosed structures.

**Exceptions:**

2.Wood structural panels with a minimum thickness of $^{7}/_{16}$ inch (11.1 mm) and maximum span between lines of fasteners of 44 inches (1118 mm) shall be permitted for opening protection in Group R-3 or R-4 occupancy buildings with a mean roof height of 33 feet (10 058 mm) or less where $V_{ult}$is 180 mph (80 m/s) or less. Panels shall be precut to overlap the wall such that they extend a minimum of 2 inches (50.8 mm) beyond the lines of fasteners and are attached to the framing surrounding the opening containing the product with the glazed opening. Panels shall be predrilled as required for the attachment method and secured with corrosion-resistant attachment hardware permanently installed on the building.

1. Attachments shall be designed to resist the components and cladding loads determined in accordance with the provisions of ASCE 7, with corrosion-resistant attachment hardware provided and anchors permanently installed on the building.
2. As an alternative, panels shall be fastened at 16 inches (406.4 mm) on center along the edges of the opposing long sides of the panel.

i. For wood frame construction, fasteners shall be located on the wall such that they are embedded into the wall framing members, nominally a minimum of 1 inch (25.4 mm) from the edge of the opening and 2 inches (50.8 mm) inward from the panel edge. Permanently installed anchors used for buildings with wood frame wall construction shall have the threaded portion that will be embedded into the wall framing based on $^{1}/_{4}$-inch (6.35 mm) lagscrews and shall be long enough to penetrate through the exterior wall covering with sufficient embedment length to provide an allowable minimum 300 pounds ASD design withdrawal capacity.

ii. For concrete or masonry wall construction, fasteners shall be located on the wall a minimum of $1^{1}/_{2}$ inches (37.9 mm) from the edge of the opening and 2 inches (50.8 mm) inward of the panel edge. Permanently installed anchors in concrete or masonry wall construction shall have an allowable minimum 300 pounds ASD design withdrawal capacity and an allowable minimum 525 pounds ASD design shear capacity with a $1^{1}/_{2}$ inch edge distance. Hex nuts, washered wing-nuts, or bolts used to attach the wood structural panels to the anchors shall be minimum $^{1}/_{4}$ -inch (6.4 mm) hardware and shall be installed with or have integral washers with a minimum 1-inch (25 mm) outside diameter.

iii. Vibration-resistant alternative attachments designed to resist the component and cladding loads determined in accordance with provisions of ASCE 7 shall be permitted.

3. Glazing in *Risk Category* I buildings, including greenhouses that are occupied for growing plants on a production or research basis, without public access shall be permitted to be unprotected.
4. Glazing in *Risk Category* II, III or IV buildings located over 60 feet (18 288 mm) above the ground and over 30 feet (9144 mm) above aggregate surface roofs located within 1,500 feet (458 m) of the building shall be permitted to be unprotected.

Table 1609.1.2 Wind-Borne Debris Protection Fastening Schedule for Wood Structural Panels. Reserved.

### 1609.1.2.1 Louvers.

Louvers protecting the exterior wall openings that are located within 30 feet (9144 mm) of grade shall meet the requirements of AMCA 540 or shall be protected by an impact-resistant cover complying with the large missile test of ASTM E1996 or an approved impact-resistance standard. Louvers required to be open for life safety purposes such as providing a breathable atmosphere shall meet the requirements of AMCA 540.

### 1609.1.2.2. Application of ASTM E1996.

The text of Section 6.2.2 of ASTM E1996 shall be substituted as follows:

1. 6.2.2 Unless otherwise specified, select the wind zone based on the strength design wind speed, $V_{ult}$, as follows:
2. 6.2.2.1 *Wind Zone 1*—130 mph ≤ ultimate design wind speed, $V_{ult}$ < 140 mph.
3. 6.2.2.2 *Wind Zone 2*—140 mph ≤ ultimate design wind speed, $V_{ult}$ < 150 mph at greater than one mile (1.6 km) from the coastline. The coastline shall be measured from the mean high water mark.
4. 6.2.2.3 *Wind Zone 3*—150 mph (58 m/s) ≤ ultimate design wind speed, $V_{ult}$≤ 170 mph (63 m/s), or 140 mph (54 m/s) ≤ ultimate design wind speed, $V_{ult}$ ≤ 170 mph (63 m/s) and within one mile (1.6 km) of the coastline. The coastline shall be measured from the mean high water mark.
5. 6.2.2.4 *Wind Zone 4*— ultimate design wind speed, $V_{ult}$ >170 mph (63 m/s).

### 1609.1.2.3 Garage doors.

Garage door glazed opening protection for wind-borne debris shall meet the requirements of an *approved* impact-resisting standard or ANSI/DASMA 115.

### 1609.1.2.4 Impact-resistant coverings.

### 1609.1.2.4.1

Impact-resistant coverings shall be tested at 1.5 times the design pressure (positive or negative) expressed in pounds per square feet as determined by the Florida Building Code, Building Section 1609 or ASCE 7, for which the specimen is to be tested. The design pressures, as determined from ASCE 7, are permitted to be multiplied by 0.6.

### 1609.1.2.4.2 Impact-resistant coverings.

Impact resistant coverings shall be labeled in accordance with the provisions of Section 1709.9.

### 1609.1.3 Testing to allowable or nominal loads.

Where testing for wind load resistance is based on allowable or nominal wind loads, the design wind loads determined in accordance with ASCE 7 or Section 1609 are permitted to be multiplied by 0.6 for the purposes of the wind-load resistance testing.

### 1609.2 Definitions.

For the purposes of Section 1609 and as used elsewhere in this code, the following terms are defined in Chapter 2.

**HURRICANE-PRONE REGIONS.**

**WIND-BORNE DEBRIS REGION.**

**WIND SPEED, $V_{ult}$.**

**WIND SPEED, $V_{asd}$.**

### 1609.3 Ultimate design wind speed.

The ultimate design wind speed, $V_{ult}$, in mph, for the determination of the wind loads shall be determined by Figures 1609.3(1), 1609.3(2) and 1609.3(3) and 1609.3(4) The ultimate design wind speed, $V_{ult}$, for use in the design of Risk Category II buildings and structures shall be obtained from Figure 1609.3(1). The ultimate design wind speed, $V_{ult}$, for use in the design of Risk Category III and IV buildings and structures shall be obtained from Figure 1609.3(2). The ultimate design wind speed, $V_{ult}$, for use in the design of Risk Category IV buildings and structures shall be obtained from Figure 1609.3(3). The ultimate design wind speed, $V_{ult}$, for usein the design of Risk Category I buildings and structures shall be obtained from the Figure 1609.3(4). the ultimate design wind speed, $V_{ult}$, for the special wind regions indicated near mountainous terrain and near gorges shall be in accordance with local jurisdiction requirements. The ultimate design wind speeds, $V_{ult}$, determined by the local jurisdiction shall be in accordance

with Chapter 26 of ASCE 7. 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.

In non-hurricane-prone regions, when the ultimate design wind speed, $V_{ult}$, is estimated from regional climatic data, the ultimate design wind speed, $V_{ult}$, shall be determined in accordance with Section 26.5.3 of ASCE 7.

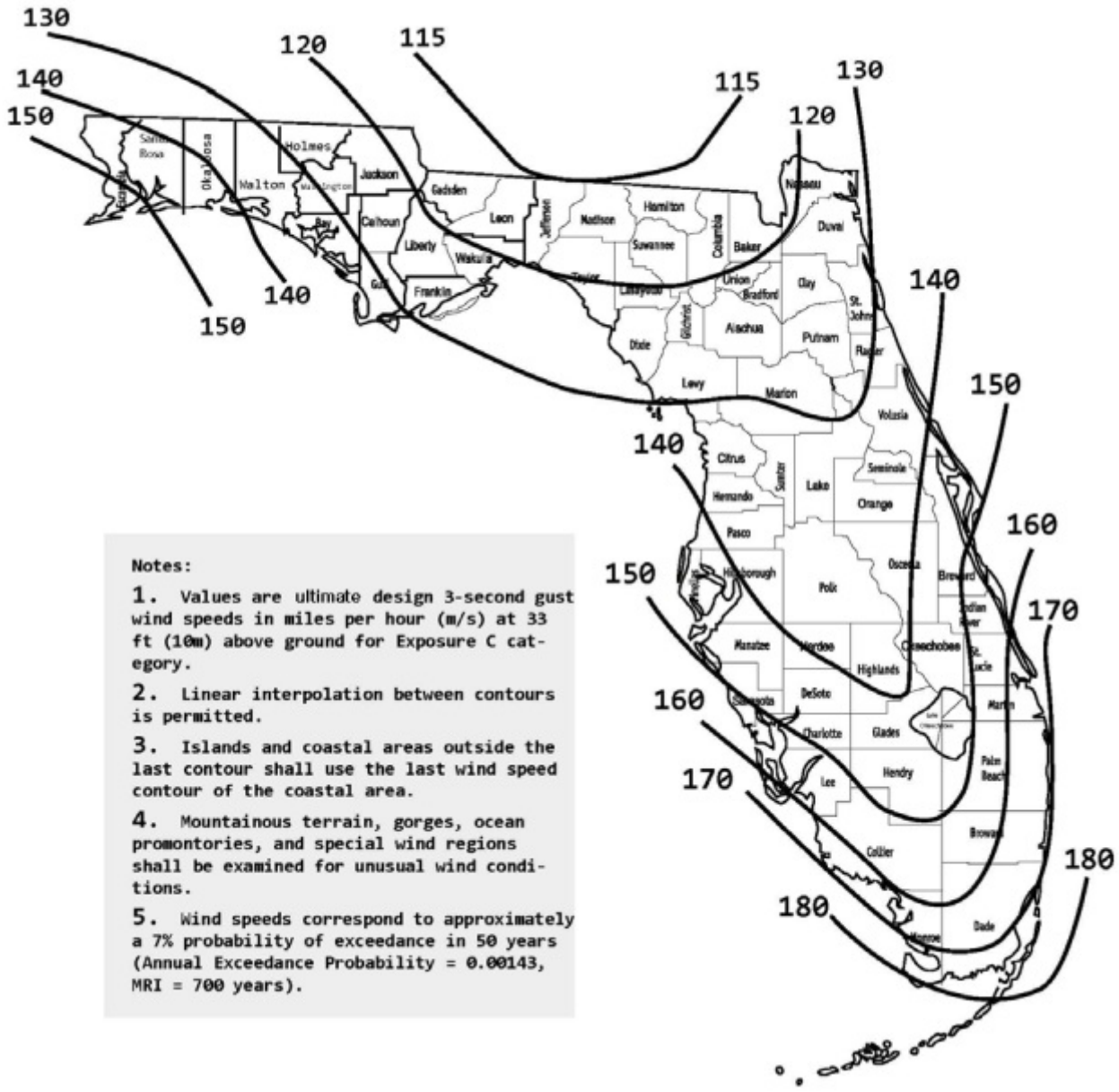


FIGURE 1609.3(1)

ULTIMATE DESIGN WIND SPEEDS, $V_{ULT}$, FOR RISK CATEGORY II BUILDINGS AND OTHER STRUCTURES

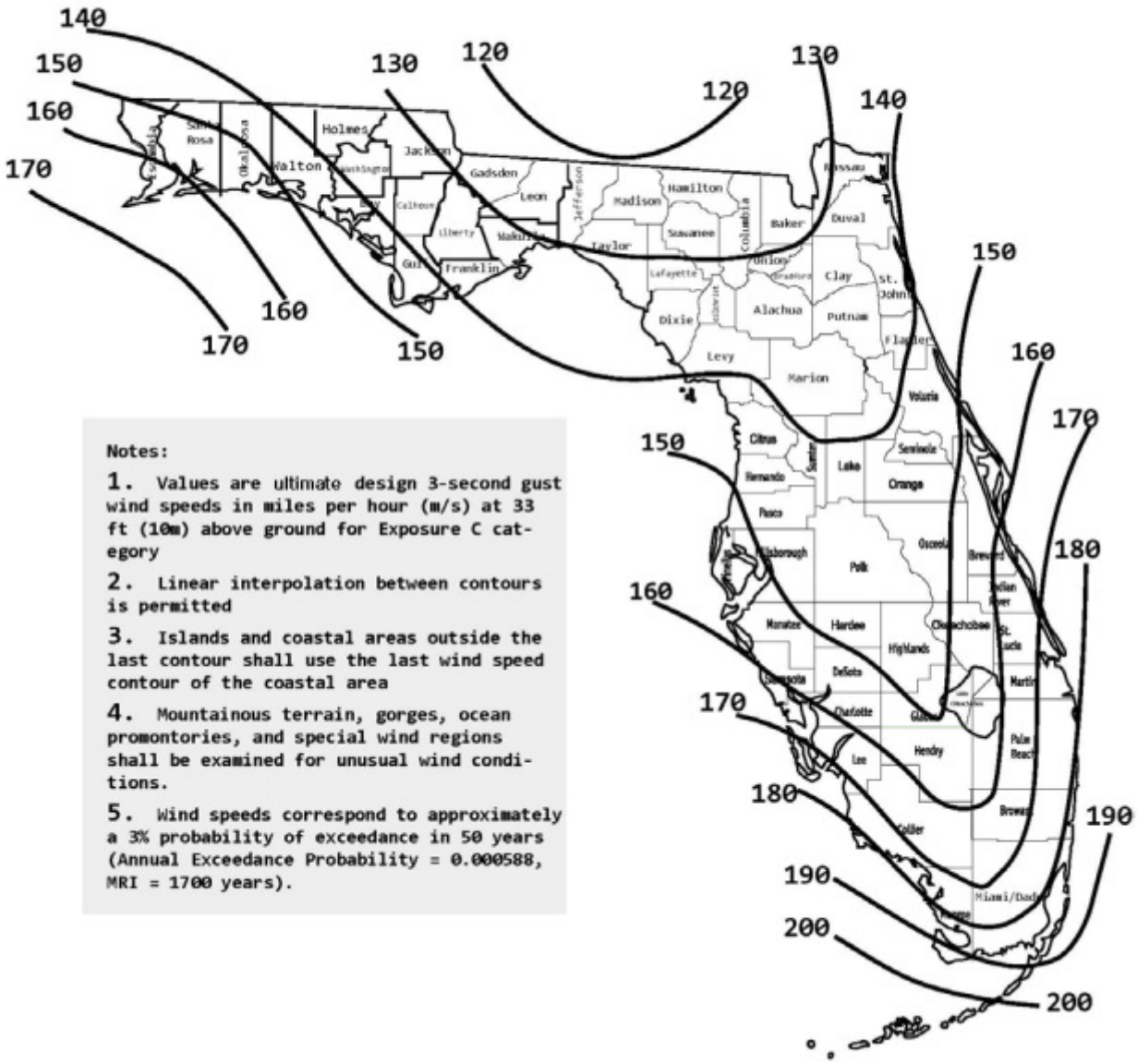


FIGURE 1609.3(2)
ULTIMATE DESIGN WIND SPEEDS, $V_{ULT}$, FOR RISK CATEGORY III AND IV BUILDINGS AND OTHER STRUCTURES

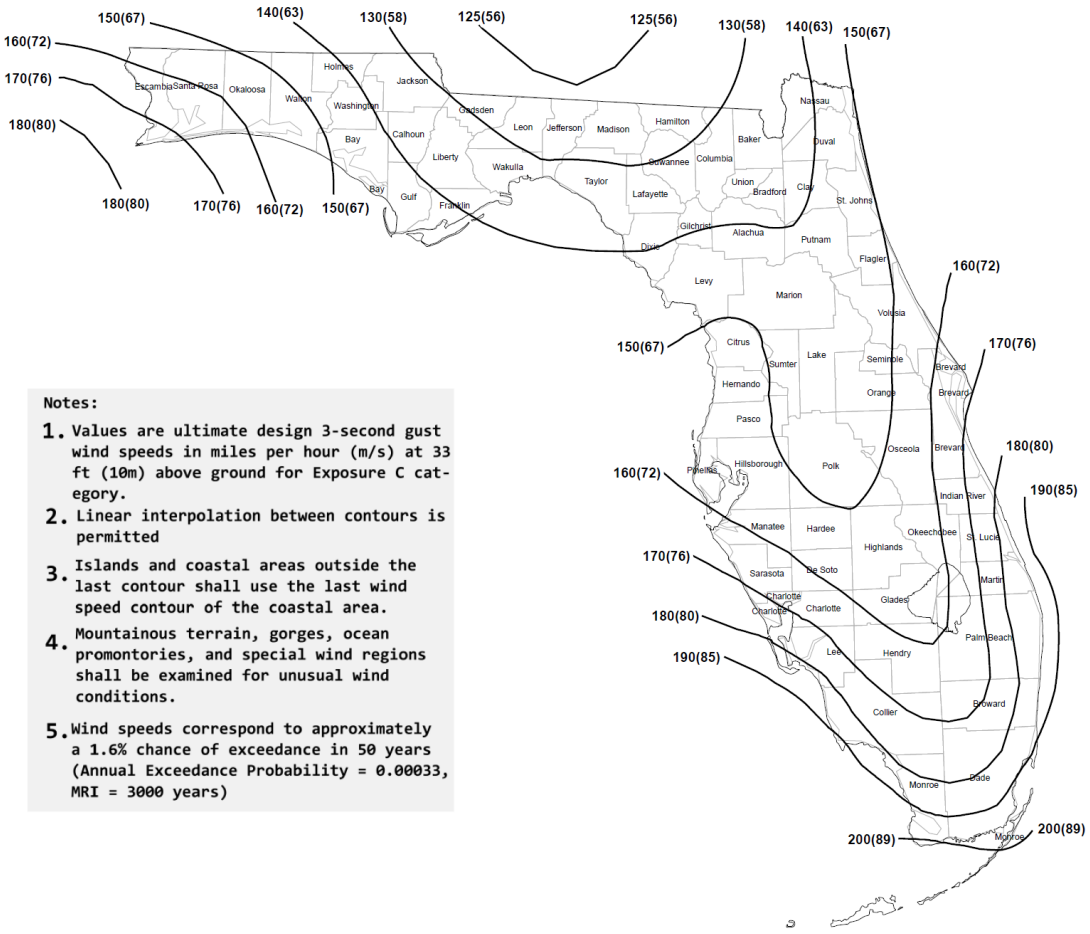


FIGURE 1609.3(3)
ULTIMATE DESIGN WIND SPEEDS, $V_{ULT}$, FOR RISK CATEGORY IV BUILDINGS AND OTHER STRUCTURES

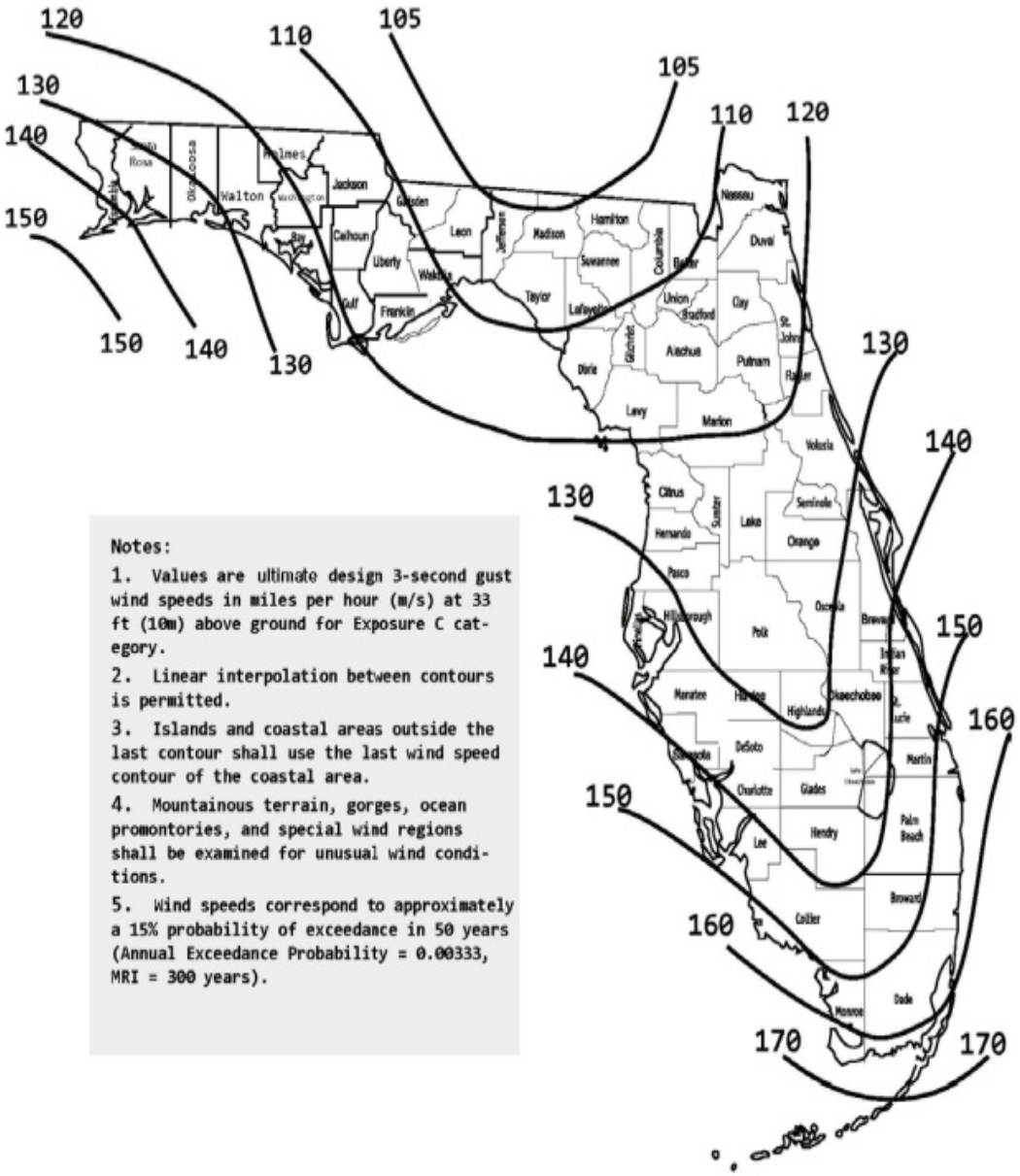


FIGURE 1609.3(4)
ULTIMATE DESIGN WIND SPEEDS, $V_{ULT}$, FOR RISK CATEGORY I BUILDINGS AND OTHER STRUCTURES

### 1609.3.1 Wind speed conversion.

When required, the ultimate design wind speeds of Figures 1609.3(1), 1609.3(2) and 1609.3(3) and 1609.3(4) shall be converted to nominal design wind speeds, $V_{asd}$, using Table 1609.3.1 or Equation 16-17.

$$V_{asd} = V_{ult}\sqrt{0.6}$$

**(Equation 16-17)**

**where:**

**$V_{asd}$ = Nominal design wind speed applicable to methods specified in Exceptions 4 and 5 of Section 1609.1.1.**

**$V_{ult}$ = Ultimate design wind speeds determined from Figures 1609.3(1), 1609.3(2) or 1609.3(3) or 1609.3(4).**

TABLE 1609.3.1
WIND SPEED CONVERSIONS[a, b, c]

| $V_{ult}$ | 100 | 110 | 120 | 130 | 140 | 150 | 160 | 170 | 180 | 190 | 200 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $V_{asd}$ | 78 | 85 | 93 | 101 | 108 | 116 | 124 | 132 | 139 | 147 | 155 |

For SI: 1 mile per hour = 0.44 m/s.

1. Linear interpolation is permitted.
2. $V_{asd}$ = nominal design wind speed applicable to methods specified in Exceptions 1 through 5 of Section 1609.1.1.
3. $V_{ult}$ = ultimate design wind speeds determined from Figure 1609.3(1), 1609.3(2) or 1609.3(3).or 1609.3(4). (S7226)

### 1609.4 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. Account shall be taken of variations in ground surface roughness that arise from natural topography and vegetation as well as from constructed features.

### 1609.4.1 Wind directions and sectors.

For each selected wind direction at which the wind loads are to be evaluated, the exposure of the building or structure shall be determined for the two upwind sectors extending 45 degrees (0.79 rad) either side of the selected wind direction. The exposures in these two sectors shall be determined in accordance with Sections 1609.4.2 and 1609.4.3 and the exposure resulting in the highest wind loads shall be used to represent winds from that direction.

### 1609.4.2 Surface roughness categories.

A ground surface roughness within each 45-degree (0.79 rad) sector shall be determined for a distance upwind of the site as defined in Section 1609.4.3 from the categories defined below, for the purpose of assigning an exposure category as defined in Section 1609.4.3.

1. **Surface Roughness B.** Urban and suburban areas, wooded areas or other terrain with numerous closely spaced obstructions having the size of single-family dwellings or larger.
2. **Surface Roughness C.** Open terrain with scattered obstructions having heights generally less than 30 feet (9144 mm). This category includes flat open country, and grasslands.
3. **Surface Roughness D.** Flat, unobstructed areas and water surfaces. This category includes smooth mud flats, salt flats and unbroken ice.

### 1609.4.3 Exposure categories.

An exposure category shall be determined in accordance with the following:

1. **Exposure B.** For buildings with a mean roof height of less than or equal to 30 feet (9144 mm), Exposure B shall apply where the ground surface roughness, as defined by Surface Roughness B, prevails in the upwind direction for a distance of at least 1,500 feet (457 m). For buildings with a mean roof height greater than 30 feet (9144 mm), Exposure B shall apply where Surface Roughness B prevails in the upwind direction for a distance of at least 2,600 feet (792 m) or 20 times the height of the building, whichever is greater.
2. **Exposure C.** Exposure C shall apply for all cases where Exposure B or D does not apply.
3. **Exposure D.** Exposure D shall apply where the ground surface roughness, as defined by Surface Roughness D, prevails in the upwind direction for a distance of at least 5,000 feet (1524 m) or 20 times the height of the building, whichever is greater. Exposure D shall also apply where the ground surface roughness immediately upwind of the site is B or C, and the site is within a distance of 600 feet (183 m) or 20 times the building height, whichever is greater, from an Exposure D condition as defined in the previous sentence.

## 1609.5 Tornado loads.

The design and construction of *Risk Category* III and IV buildings and other structures shall be in accordance with Chapter 32 of ASCE 7, except as modified by this code.

## 1609.6 Roof systems.

Roof systems shall be designed and constructed in accordance with Sections 1609.6.1through 1609.6.3, as applicable.

### 1609.6.1 Roof deck.

The roof deck shall be designed to withstand the wind pressures determined in accordance with ASCE 7. Where design for tornado loads is required, the roof deck shall be designed to withstand the greater of wind pressures or tornado pressures determined in accordance with ASCE 7.

### 1609.6.2 Roof coverings.

Roof coverings shall comply with Section 1609.6.1.

**Exception:** Rigid tile roof coverings that are air permeable and installed over a roof deck complying with Section 1609.6.1 are permitted to be designed in accordance with Section 1609.6.3.

### 1609.6.2 Asphalt shingles.

Asphalt shingles installed over a roof deck complying with Section 1609.6.1 shall comply with the wind-resistance requirements of Section 1504.1.1.

### 1609.6.3 Rigid tile.

Wind loads on rigid tile roof coverings shall be determined in accordance with the following equation:

$$M_a = q_h C_L b L L_a [1.0 - G C_p]$$

**(Equation 16-18)**

**For SI:**

$$M_a = \frac{q_h C_L b L L_a [1.0 - G C_p]}{1,000}$$

**where:**

***b* = Exposed width, feet (mm) of the roof tile.**

**$C_L$ = Lift coefficient. The lift coefficient for concrete and clay tile shall be 0.2 or shall be determined by test in accordance with Section 1504.2.1.**

**$GC_p$ = Roof pressure coefficient for each applicable roof zone determined from Chapter 30 of ASCE 7. Roof coefficients shall not be adjusted for internal pressure.**

**$K_d$ = Wind directionality factor determined from Chapter 26 of ASCE 7**

**$L$ = Length, feet (mm) of the roof tile.**

**$L_a$ = 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 application or 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 based on straight bond or broken bond and the tile profile.**

**$M_a$ = Aerodynamic uplift moment, feet-pounds (N-mm) acting to raise the tail of the tile.**

**$q_h$ = Wind velocity pressure, psf (kN/m$^2$) determined from Section 26.10.2 of ASCE 7.**

Concrete and clay roof tiles complying with the following limitations shall be designed to withstand the aerodynamic uplift moment as determined by this section.

1. The roof tiles shall be either loose laid on battens, mechanically fastened, mortar set or adhesive set.
2. The roof tiles shall be installed on solid sheathing that has been designed as components and cladding.
3. An underlayment shall be installed in accordance with Chapter 15.
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 feet (305 mm and 533 mm).
6. The exposed width of the tile shall be between 0.67 and 1.25 feet (204 mm and 381 mm).
7. The maximum thickness of the tail of the tile shall not exceed 1.3 inches (33 mm).
8. Roof tiles using mortar set or adhesive set systems shall have at least two-thirds of the tile's area free of mortar or adhesive contact.

**1609.6.3.1 Tornado loads.**

Where design for tornado loads is required, tornado loads on rigid tile roof coverings shall be determined in accordance with Section 1609.6.3, replacing $q_h$ with $q_{hT}$ and $GC_p$ with $KvT(GC_p)$ in Equation 16-18, where:

$q_{hT}$ = Tornado velocity pressure, psf (kN/m) determined in accordance with Section 32.10 of ASCE 7.

$K_{vT}$ = Tornado pressure coefficient adjustment factor for vertical winds, determined in accordance with Section 32.14 of ASCE 7.

## 1609.7 Garage doors and rolling doors.

Pressures from Table 1609.7(1) for wind loading actions on garage doors and rolling doors for buildings designed as enclosed shall be permitted.

TABLE 1609.7(1)
NOMINAL (ASD) GARAGE DOOR AND ROLLING DOOR WIND LOADS FOR A BUILDING WITH A MEAN ROOF HEIGHT OF 30 FEET LOCATED IN EXPOSURE B (PSF) [1, 2, 3, 4, 5]

| ULTIMATE DESIGN WIND SPEED ($V_{ult}$) DETERMINED IN ACCORDANCE WITH SECTION 1609.3 (MPH - 3 SECOND GUST) | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Width (ft) | Height (ft) | 100 MPH | | 110 MPH | | 120 MPH | | 130 MPH | | 140 MPH | | 150 MPH | | 160 MPH | | 170 MPH | | 180 MPH | | 190 MPH | | 200 MPH | |
| Roof Angle 0 – 10 degrees | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | 8 | + 10.0 | – 10.0 | + 10.5 | – 11.9 | + 12.5 | – 14.2 | + 14.7 | – 16.6 | + 17.1 | – 19.3 | + 19.6 | – 22.2 | + 22.3 | – 25.2 | + 25.1 | – 28.5 | + 28.2 | – 31.9 | + 31.4 | – 35.5 | + 34.8 | – 39.4 |
| 10 | 10 | + 10.0 | – 10.0 | + 10.2 | – 11.4 | + 12.1 | – 13.6 | + 14.2 | – 16.0 | + 16.5 | – 18.5 | + 18.9 | – 21.2 | + 21.5 | – 24.2 | + 24.3 | – 27.3 | + 27.3 | – 30.6 | + 30.4 | – 34.1 | + 33.7 | – 37.8 |
| 14 | 14 | + 10.0 | – 10.0 | + 10.0 | – 10.8 | + 11.5 | – 12.8 | + 13.5 | – 15.0 | + 15.7 | – 17.4 | + 18.0 | – 20.0 | + 20.5 | – 22.8 | + 23.1 | – 25.7 | + 25.9 | – 28.8 | + 28.9 | – 32.1 | + 32.0 | – 35.6 |
| Roof Angle > 10 degrees | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | 7 | +10.0 | –10.9 | + 11.4 | – 12.9 | + 13.7 | – 15.5 | + 16.1 | – 18.2 | + 18.5 | – 20.9 | + 21.3 | – 24.1 | + 24.3 | – 27.5 | + 27.6 | – 31.2 | + 30.6 | – 34.6 | + 34.2 | – 38.6 | + 38.0 | – 43.0 |
| 16 | 7 | +10.0 | –10.3 | + 10.9 | – 12.2 | + 13.1 | – 14.6 | + 15.5 | – 17.2 | + 17.7 | – 19.7 | + 20.4 | – 22.7 | + 23.3 | – 26.0 | + 26.4 | – 29.4 | + 29.3 | – 32.6 | + 32.7 | – 36.5 | + 36.4 | – 40.6 |
| | | 78 MPH | | 85 MPH | | 93 MPH | | 101 MPH | | 108 MPH | | 116 MPH | | 124 MPH | | 132 MPH | | 139 MPH | | 147 MPH | | 155 MPH | |

For SI: 1 foot = 304.8 mm, 1 mile per hour = 1.609 km/h, 1 psf = 47.88 N/m$^2$.

Nominal Design Wind Speed ($V_{asd}$) converted from Ultimate Design Wind Speed per Section 1609.3.1.

1. For door sizes or wind speeds between those given above the load may be interpolated, otherwise use the load associated with the lower door size.
2. Table values shall be adjusted for height and exposure by multiplying by the adjustment coefficient in Table 1609.7(2). Minimum positive wind load shall be 10 psf and minimum negative wind load shall be 10 psf.
3. Plus and minus signs signify pressures acting toward and away from the building surfaces.
4. Negative pressures assume door has 2 feet of width in building's end zone.
5. Table values include the 0.6 load reduction factor.

TABLE 1609.7 (2)
ADJUSTMENT FACTOR FOR BUILDING HEIGHT AND EXPOSURE, (λ)

| MEAN ROOF HEIGHT (feet) | EXPOSURE | | |
|---|---|---|---|
| | B | C | D |
| 15 | 0.82 | 1.21 | 1.47 |
| 20 | 0.82 | 1.29 | 1.55 |
| 25 | 0.94 | 1.35 | 1.61 |
| 30 | 1.00 | 1.40 | 1.66 |
| 35 | 1.05 | 1.45 | 1.70 |
| 40 | 1.06 | 1.49 | 1.74 |
| 45 | 1.10 | 1.53 | 1.78 |
| 50 | 1.13 | 1.56 | 1.81 |
| 55 | 1.16 | 1.59 | 1.84 |
| 60 | 1.19 | 1.62 | 1.87 |

# SECTION 1610
# SOIL LATERAL LOADS AND HYDROSTATIC PRESSURE

## 1610.1 Lateral pressures.

Foundation walls and retaining walls shall be designed to resist lateral soil loads from adjacent soil. Soil loads specified in Table 1610.1 shall be used as the minimum design lateral soil loads unless determined otherwise by a geotechnical investigation in accordance with Section 1803. Foundation walls and other walls in which horizontal movement is restricted at the top shall be designed for at-rest pressure. Retaining walls free to move and rotate at the top shall be permitted to be designed for active pressure. Lateral pressure from surcharge loads shall be added to the lateral soil load. Lateral pressure shall be increased if expansive soils are present at the stie. Foundation walls shall be designed to support the weight of the full hydrostatic pressure of undrained backfill unless a drainage system is installed in accordance with Sections 1805.4.2 and 1805.4.3.

**Exception:** Foundation walls extending not more than 8 feet (2438 mm) below grade and laterally supported at the top by flexible diaphragms shall be permitted to be designed for active pressure.

TABLE 1610.1
LATERAL SOIL LOAD

| DESCRIPTION OF BACKFILL MATERIAL[c] | UNIFIED SOILCLASSIFICATION | DESIGN LATERAL SOIL LOAD[a](pound per square foot per foot of depth) | |
|---|---|---|---|
| | | Active pressure | At-rest pressure |
| Well-graded, clean gravels; gravel-sand mixes | GW | 30 | 60 |
| Poorly graded clean gravels; gravel-sand mixes | GP | 30 | 60 |
| Silty gravels, poorly graded gravel-sand mixes | GM | 40 | 60 |
| Clayey gravels, poorly graded gravel-and-clay mixes | GC | 45 | 60 |
| Well-graded, clean sands; gravelly sand mixes | SW | 30 | 60 |
| Poorly graded clean sands; sand-gravel | SP | 30 | 60 |

| | | | |
|---|---|---|---|
| mixes | | | |
| Silty sands, poorly graded sand-silt mixes | SM | 45 | 60 |
| Sand-silt clay mix with plastic fines | SM-SC | 45 | 100 |
| Clayey sands, poorly graded sand-clay mixes | SC | 60 | 100 |
| Inorganic silts and clayey silts | ML | 45 | 100 |
| Mixture of inorganic silt and clay | ML-CL | 60 | 100 |
| Inorganic clays of low to medium plasticity | CL | 60 | 100 |
| Organic silts and silt clays, low plasticity | OL | Note b | Note b |
| Inorganic clayey silts, elastic silts | MH | Note b | Note b |
| Inorganic clays of high plasticity | CH | Note b | Note b |
| Organic clays and silty clays | OH | Note b | Note b |

For SI: 1 pound per square foot per foot of depth = 0.157 kPa/m, 1 foot = 304.8 mm.

1. Design lateral soil loads are given for moist conditions for the specified soils at their optimum densities. Actual field conditions shall govern. Submerged or saturated soil pressures shall include the weight of the buoyant soil plus the hydrostatic loads.
2. Unsuitable as backfill material.
3. The definition and classification of soil materials shall be in accordance with ASTM D2487.

### 1610.2 Uplift loads on floor and foundations.

Basement floors, slabs on ground, foundations, and similar approximately horizontal elements below grade shall be designed to resist uplift loads where applicable. The upward pressure of water shall be taken as the full hydrostatic pressure applied over the entire area. The hydrostatic load shall be measured from the underside of the element being evaluated. The design for upward loads caused by expansive soils shall comply with Section 1808.6.

## SECTION 1611
## RAIN LOADS

### 1611.1 Design rain loads.

Each portion of a roof shall be designed to sustain the load of rainwater as per the requirements of Chapter 8 of ASCE 7. Rain loads shall be based on the summation of the static head, ds, hydraulic head, dh, and ponding head, dp using Equation 16-19. The hydraulic head shall be based on hydraulic test data or hydraulic calculations assuming a flow rate corresponding to a rainfall intensity equal to or greater than the 15-minute duration storm with return period given in Table 1611.1. The ponding head shall be based on structural analysis as the depth of water due to deflections of the roof subjected to unfactored rain load and unfactored dead load.

$$R = 5.2(d_s + d_h + d_p)$$ (Equation 16-19)

For SI: R = 0.0098(ds + dh + dp)

where:

dh = Hydraulic head equal to the depth of water on the undeflected roof above the inlet of the secondary drainage system for structural loading (SDSL) required to achieve the design flow in inches (mm).

dp = Ponding head equal to the depth of water due to deflections of the roof subjected to unfactored rain load and unfactored dead load in inches (mm).

ds = Static head equal to the depth of water on the undeflected roof up to the inlet of the secondary drainage system for structural loading (SDSL) in inches (mm).

R = Rain load in psf (kN/m2).

SDSL is the roof draining system through which water is drained from the roof when the drainage systems listed in ASCE 7, Section 8.2(a) through (d) are blocked or not working.

TABLE 1611.1DESIGN STORM RETURN PERIOD BY RISK CATEGORY

| RISK CATEGORY | DESIGN STORM RETURN PERIOD |
|---|---|
| I & II | 100 years |
| III | 200 years |
| IV | 500 years |

### 1611.2 Ponding instability.

Susceptible bays of roofs shall be evaluated for ponding instability in accordance with Section 8.4 of ASCE 7.

### 1611.3 Controlled drainage.

Roofs equipped with hardware to control the rate of drainage shall be equipped with a secondary drainage system at a higher elevation that limits accumulation of water on the roof above that elevation. Such roofs shall be designed to sustain the load of rainwater that will accumulate on them to the elevation of the secondary drainage system plus the uniform load caused by water that rises above the inlet of the secondary drainage system at its design flow determined from Section 1611.1. Such roofs shall also be checked for ponding instability in accordance with Section 1611.2.

## SECTION 1612
## FLOOD LOADS

### 1612.1 General.

Within *flood hazard areas* as established in Section 1612.3, all new construction of buildings, structures and portions of buildings and structures, including substantial improvement and restoration of substantial damage to buildings and structures, shall be designed and constructed to resist the effects of flood hazards and flood loads. For buildings that are located in more than one *flood hazard area*, the provisions associated with the most restrictive *flood hazard area* shall apply.

TABLE 1612.1
CROSS REFERENCES DEFINING FLOOD-RESISTANT PROVISIONS OF THE FLORIDA BUILDING CODE

| **Florida Building Code – Building** | | | |
|---|---|---|---|
| **Section** | | **Section** | |
| Chapter 1 | Scope and Administration | Chapter 14 | Exterior Walls |
| 102 | Applicability | 1403 | Performance Requirements |
| 105 | Permits | | |
| 107 | Submittal Documents | Chapter 16 | Structural Design |
| 110 | Inspections | 1601 | General |
| 111 | Certificates of Occupancy and Completion | 1603 | Construction Documents |
| 117 | Variances in Flood Hazard Areas | 1605 | Load Combinations |
| | | 1612 | Flood Loads |
| Chapter 2 | Definitions | | |
| 202 | Definitions | Chapter 18 | Soils and Foundations |

| | | | |
|---|---|---|---|
| | | 1804 | Excavation, Grading and Fill |
| Chapter 4 | Special Detailed Requirements Based on Use and Occupancy | 1805 | Dampproofing and Waterproofing |
| 449 | Hospitals | | |
| 450 | Nursing Homes | Chapter 27 | Electrical |
| 453 | State Requirements for Educational Facilities | 2702 | Emergency and Standby Power Systems |
| 454 | Swimming Pools and Bathing Places(Public And Private) | | |
| | | Chapter 30 | Elevators and Conveying Systems |
| Chapter 8 | Interior Finishes and Decorative Materials | 3001 | General |
| 801 | General | | |
| | | Chapter 31 | Special Construction |
| Chapter 12 | Interior Environment | 3102 | Membrane Structures |
| 1203 | Ventilation | 3109 | Structures Seaward of a Coastal Construction Control Line |
| | | | |
| **Florida Building Code – Residential** | | | |
| **Section** | | **Section** | |
| Chapter 2 | Definitions | Chapter 21 | Hydronic Piping |
| R202 | Definitions | M2101 | Hydronic Piping Systems Installaion |
| | | | |
| Chapter 3 | Building Planning | | |
| R301 | Design Criteria | M2201 | Oil Tanks |
| R309 | Garages and Carports | | |
| R322 | Flood-Resistant Construction | Chapter 24 | Fuel Gas |
| | | G2404 (301) | General |
| Chapter 4 | Foundations | | |
| R401 | General | Chapter 26 | General Plumbing Requirements |
| R404 | Foundation and Retaining Walls | P2601 | General |

| | | | |
|---|---|---|---|
| R408 | Under-Floor Space | | |
| | | P2602 | Individual Water Supply and Sewage Disposal |
| Chapter 13 | General Mechanical System Requirements | P2705 | Installation |
| M1301 | General | | |
| | | Chapter 30 | Sanitary Drainage |
| Chapter 14 | Heating and Cooling Equipment and Applicances | | |
| M1401 | General | Chapter 30 | Sanitary Drainage |
| | | P3001 | General |
| Chapter 19 | Special Appliances, Equipment, and Systems | | |
| M1905 | Residential Permanently Installed Stand-By Generators | | |
| Chapter 16 | Duct Systems | Chapter 20 | Boilers and Water Heaters |
| M1601 | Duct Construction | M2001 | Boilers |
| | | Chapter 31 | Vents |
| Chapter 17 | Combustion Air | Chapter 45 | Private Swimming Pools |
| M1701 | General | R4501 | General |
| Chapter 19 | Special Appliances, Equipment and Systems | Chapter 45 | Private Swimming Pools |
| M1905 | Residential Permanently Installed Stand-By Generators | R4501 | General |
| | | | |
| **Florida Building Code – Existing Building** | | | |
| **Section** | | **Section** | |
| Chapter 2 | Definitions | Chapter 7 | Alterations – Level I |
| 202 | Definitions | 701 | General |
| | | | |
| Chapter 3 | Provisions for All Compliance | Chapter 12 | Historic Buildings |
| 301 | Administration | 1201 | General |
| Chapter 4 | Repairs | Chapter 13 | Relocated or Moved Buildings |
| 401 | General | 1302 | Requirements |

| | | | |
|---|---|---|---|
| 406 | Structural | | |
| | | | |
| Chapter 5 | Prescriptive Compliance Method | | |
| 502 | Additions | | |
| 503 | Alterations | | |
| | | | |
| **Florida Building Code – Mechanical** | | | |
| **Section** | | **Section** | |
| Chapter 3 | General Regulations | Chapter 6 | Duct Systems |
| 301 | General | 602 | Plenums |
| | | 603 | Duct Construction and Installation |
| Chapter 4 | Ventilation | | |
| 401 | General | Chapter 12 | Hydronic Piping |
| | | 1206 | Piping Installation |
| Chapter 5 | Exhaust Systems | | |
| 501 | General | Chapter 13 | Fuel Oil Piping and Storage |
| | | 1305 | Fuel Oil System Installation |
| | | | |
| **Florida Building Code – Plumbing** | | | |
| **Section** | | | |
| Chapter 3 | General Regulations | | |
| 309 | Flood Hazard Resistance | | |
| | | | |
| **Florida Building Code – Fuel Gas** | | | |
| **Section** | | | |
| Chapter 3 | General Regulations | | |
| 301 | General (IFGC) | | |

1612.1.1 Cross references.

See Table 1612.1.

1612.2 Definitions.

The following terms are defined in Chapter 2:

**BASE FLOOD.**

**BASE FLOOD ELEVATION.**

**BASEMENT.**

**COASTAL A ZONE.**

**COASTAL HIGH HAZARD AREA.**

**DESIGN FLOOD.**

**DESIGN FLOOD ELEVATION.**

**DRY FLOODPROOFING.**

**EXISTING STRUCTURE.**

**FLOOD or FLOODING.**

**FLOOD DAMAGE-RESISTANT MATERIALS.**

**FLOOD HAZARD AREA.**

**FLOOD INSURANCE RATE MAP (FIRM).**

**FLOOD INSURANCE STUDY.**

**FLOODWAY.**

**LOWEST FLOOR.**

**SPECIAL FLOOD HAZARD AREA.**

**START OF CONSTRUCTION.**

**SUBSTANTIAL DAMAGE.**

**SUBSTANTIAL IMPROVEMENT.**

**1612.3 Establishment of flood hazard areas.**

To establish *flood hazard areas*, the applicable governing authority shall, by local floodplain management ordinance, adopt a flood hazard map and supporting data. The flood hazard map shall include, at a minimum, areas of special flood hazard as identified by the Federal Emergency Management Agency.

### 1612.3.1 Design flood elevations.

Where design flood elevations are not included in the *flood hazard areas* established in Section 1612.3, or where floodways are not designated, the *building official* is authorized to require the applicant to:

1. Obtain and reasonably utilize any design flood elevation and floodway data available from a federal, state or other source; or
2. Determine the design flood elevation and/or floodway in accordance with accepted hydrologic and hydraulic engineering practices used to define special flood hazard areas. Determinations shall be undertaken by a *registered design professional* who shall document that the technical methods used reflect currently accepted engineering practice.

### 1612.3.2 Determination of impacts.

In riverine *flood hazard areas* where design flood elevations are specified but floodways have not been designated, the applicant shall provide a floodway analysis that demonstrates that the proposed work will not increase the design flood elevation more than 1 foot (305 mm) at any point within the jurisdiction of the applicable governing authority.

### 1612.4 Design and construction.

The design and construction of buildings and structures located in flood hazard areas, including coastal high hazard areas and Coastal A Zones, shall be in accordance with Chapter 5 of ASCE 7 and with ASCE 24.

### 1612.4.1 Modification of ASCE 24.

Table 6-1 and Section 6.2.1 in ASCE 24 shall be modified as follows:

1. The title of Table 6.1 shall be “Minimum Elevation of Floodproofing, Relative to Base Flood Elevation (BFE) or Design Flood Elevation (DFE), in Coastal A Zones and in Other Flood Hazard Areas that are not High Risk Flood Hazard Areas.”
2. Section 6.2.1 shall be modified to permit dry floodproofing in Coastal A Zones, as follows: “Dry floodproofing of nonresidential structures and nonresidential areas of mixed-use structures shall not be allowed unless such structures are located outside of High Risk Flood Hazard areas and Coastal High Hazard Areas. Dry floodproofing shall be permitted in Coastal A Zones provided wave loads and the potential for erosion and local scour are accounted for in the design. Dry floodproofing of residential structures or residential areas of mixed-use structures shall not be permitted.”

**1612.4.2 Modification of ASCE 24 9.6 Pools.** Modify Section 9.6 in ASCE 24 by adding an exception as follows:

9.6 Pools. In-ground and above-ground pools shall be designed to withstand all flood-related loads and load combinations. Mechanical equipment for pools such as pumps, heating systems and filtering systems, and their associated electrical systems, shall comply with Chapter 7.

**Exception:** Equipment for pools, spas and water features shall be permitted below the elevation required in Table 7-1, provided it is elevated to the extent practical, and is supplied by branch circuits that have ground-fault circuit-interrupter protections.

## 1612.5 Flood hazard documentation.

The following documentation shall be prepared and sealed by a licensed professional surveyor and mapper or a *registered design professional, as applicable,* and submitted to the *building official*:

1. For construction in *flood hazard areas* other than *coastal high hazard areas* or *coastal A zones*:

   1.1.The elevation of the lowest floor, including the basement, as required by the lowest floor elevation inspection in Section 110.3, Building, 1.1 and for the final inspection in Section 110.3, Building, 5.1.

   1.2.For fully enclosed areas below the design flood elevation where provisions to allow for the automatic entry and exit of floodwaters do not meet the minimum requirements in Section 2.7.2.1 of ASCE 24, *construction documents* shall include a statement that the design will provide for equalization of hydrostatic flood forces in accordance with Section 2.7.2.2 of ASCE 24.

   1.3.For dry floodproofed nonresidential buildings, *construction documents* shall include a statement that the dry floodproofing is designed in accordance with ASCE 24 and shall include the flood emergency plan specified in Chapter 6 or ASCE 24.

   1.4 For dry floodproofed nonresidential buildings, the elevation to which the building is dry floodproofed as required for the final inspection in Section 110.3, Building 6.1.

2. For construction in *coastal high hazard areas* and *coastal A zones*:

   2.1.The elevation of the bottom of the lowest horizontal structural member as required by the lowest floor elevation inspection in Section 110.3, Building, 1.1 and for the final inspection in Section 110.3, Building, 5.1.

   2.2.*Construction documents* shall include a statement that the building is designed in accordance with ASCE 24, including that the pile or column foundation and building or structure to be attached thereto is designed to be anchored to resist flotation, collapse and lateral movement due to the effects of wind and flood loads acting simultaneously on all building components, and other load requirements of Chapter 16.

2.3.For breakaway walls designed to have a resistance of more than 20 psf (0.96 kN/m$^2$) determined using allowable stress design, *construction documents* shall include a statement that the breakaway wall is designed in accordance with ASCE 24.

2.4. For breakaway walls where provistions to allow for the automatic entry and exit of floodwaters do not meet the minimum requirements in Section 2.7.2.1 of ASCE 24, construction documents shall include a statement that the design will provide for equalization of hydrostatic flood forces in accordance with Section 2.7.2.2 of ASCE 24.

## SECTION 1613
## RESERVED

## SECTION 1614
## ATMOSPHERIC ICE LOADS

### 1614.1 General.

Ice-sensitive structures shall be designed for atmospheric ice loads in accordance with Chapter 10 of ASCE 7.

## SECTION 1615
## STRUCTURAL INTEGRITY

### 1615.1 General.

*High-rise buildings* that are assigned to *Risk Category* III or IV shall comply with the requirements of this section. Frame structures shall comply with the requirements of Section 1615.3 if they are frame structures, or Section 1615.4 if they are bearing wall structures.

### 1615.2 Definitions.

The following words and terms are defined in Chapter 2:

**BEARING WALL STRUCTURE.**

**FRAME STRUCTURE.**

### 1615.3 Frame structures.

Frame structures shall comply with the requirements of this section.

### 1615.3.1 Concrete frame structures.

Frame structures constructed primarily of reinforced or prestressed concrete, either cast-in-place or precast, or a combination of these, shall conform to the requirements of Section 4.10 of ACI 318. Where ACI 318 requires that nonprestressed reinforcing or prestressing steel pass through the region bounded by the longitudinal column reinforcement, that reinforcing or prestressing steel shall have a minimum nominal tensile strength equal to two-thirds of the required one-way vertical strength of the connection of the floor or roof system to the column in each direction of beam or slab reinforcement passing through the column.

**Exception:** Where concrete slabs with continuous reinforcement having an area not less than 0.0015 times the concrete area in each of two orthogonal directions are present and are either monolithic with or equivalently bonded to beams, girders or columns, the longitudinal reinforcing or prestressing steel passing through the column reinforcement shall have a nominal tensile strength of one-third of the required one-way vertical strength of the connection of the floor or roof system to the column in each direction of beam or slab reinforcement passing through the column.

### 1615.3.2 Structural steel, open web steel joist or joist girder, or composite steel and concrete frame structures.

Frame structures constructed with a structural steel frame or a frame composed of open web steel joists, joist girders with or without other structural steel elements or a frame composed of composite steel or composite steel joists and reinforced concrete elements shall conform to the requirements of this section.

#### 1615.3.2.1 Columns.

Each column splice shall have the minimum design strength in tension to transfer the design dead and live load tributary to the column between the splice and the splice or base immediately below.

#### 1615.3.2.2 Beams.

End connections of all beams and girders shall have a minimum nominal axial tensile strength equal to the required vertical shear strength for *allowable stress design* (ASD) or two-thirds of the required shear strength for *load and resistance factor design* (LRFD) but not less than 10 kips (45 kN). For the purpose of this section, the shear force and the axial tensile force need not be considered to act simultaneously.

**Exception:** Where beams, girders, open web joist and joist girders support a concrete slab or concrete slab on metal deck that is attached to the beam or girder with not less than $^{3}/_{8}$-inch-diameter (9.5 mm) headed shear studs, at a spacing of not more than 12 inches (305 mm) on center, averaged over the length of the member, or other attachment having equivalent shear strength, and the slab contains continuous distributed reinforcement in each of two orthogonal

directions with an area not less than 0.0015 times the concrete area, the nominal axial tension strength of the end connection shall be permitted to be taken as half the required vertical shear strength for ASD or one-third of the required shear strength for LRFD, but not less than 10 kips (45 kN).

### 1615.4 Bearing wall structures.

Bearing wall structures shall have vertical ties in all load-bearing walls and longitudinal ties, transverse ties and perimeter ties at each floor level in accordance with this section and as shown in Figure 1615.4.

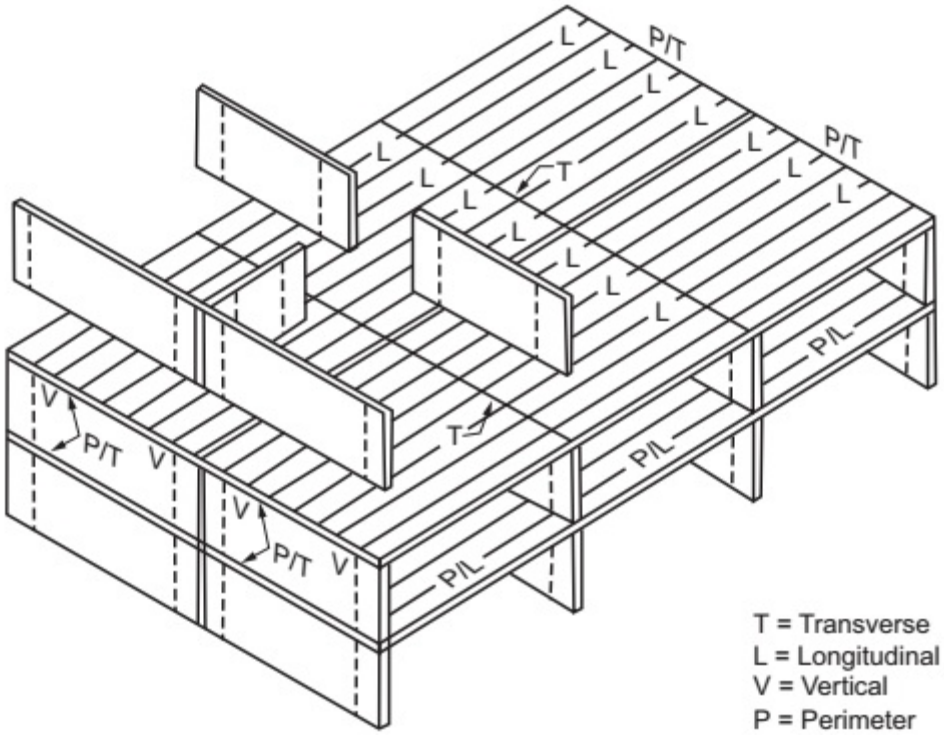


FIGURE 1615.4

LONGITUDINAL, PERIMETER, TRANSVERSE AND VERTICAL TIES

### 1615.4.1 Concrete wall structures.

Precast bearing wall structures constructed solely of reinforced or prestressed concrete, or combinations of these shall conform to the requirements of Sections 16.2.4 and 16.2.5 of ACI 318.

### 1615.4.2 Other bearing wall structures.

Ties in bearing wall structures other than those covered in Section 1615.4.1 shall conform to this section.

### 1615.4.2.1 Longitudinal ties.

Longitudinal ties shall consist of continuous reinforcement in slabs; continuous or spliced decks or sheathing; continuous or spliced members framing to, within or across walls; or connections of continuous framing members to walls. Longitudinal ties shall extend across interior load-bearing walls and shall connect to exterior load-bearing walls and shall be spaced at not greater than 10 feet (3038 mm) on center. Ties shall have a minimum nominal tensile strength, $T_T$, given by Equation 16-20. For ASD the minimum nominal tensile strength shall be permitted to be taken as 1.5 times the allowable tensile stress times the area of the tie.

$$T_T = w\,LS \le \alpha_T S$$

**(Equation 16-20)**

**where:**

***L* = The span of the horizontal element in the direction of the tie, between bearing walls, feet (m).**

***w* = The weight per unit area of the floor or roof in the span being tied to or across the wall, psf (N/m²).**

***S* = The spacing between ties, feet (m).**

**$\alpha_T$ = A coefficient with a value of 1,500 pounds per foot (2.25 kN/m) for masonry bearing wall structures and a value of 375 pounds per foot (0.6 kN/m) for structures with bearing walls of cold-formed steel light-frame construction.**

### 1615.4.2.2 Transverse ties.

Transverse ties shall consist of continuous reinforcement in slabs; continuous or spliced decks or sheathing; continuous or spliced members framing to, within or across walls; or connections of continuous framing members to walls. Transverse ties shall be placed no farther apart than the spacing of load-bearing walls. Transverse ties shall have minimum nominal tensile strength $T_T$, given by Equation 16-20. For ASD the minimum nominal tensile strength shall be permitted to be taken as 1.5 times the allowable tensile stress times the area of the tie.

### 1615.4.2.3 Perimeter ties.

Perimeter ties shall consist of continuous reinforcement in slabs; continuous or spliced decks or sheathing; continuous or spliced members framing to, within or across walls; or connections of continuous framing members to walls. Ties around the perimeter of each floor and roof shall be

located within 4 feet (1219 mm) of the edge and shall provide a nominal strength in tension not less than $T_p$, given by Equation 16-21. For ASD the minimum nominal tensile strength shall be permitted to be taken as 1.5 times the allowable tensile stress times the area of the tie.

$$T_p = 200w \leq \beta_T$$

**(Equation 16-21)**

**For SI:** $T_p = 90.7w \leq \beta_T$

**where:**

***w* = As defined in Section 1615.4.2.1.**

**$\beta_T$ = A coefficient with a value of 16,000 pounds (7200 kN) for structures with masonry bearing walls and a value of 4,000 pounds (1300 kN) for structures with bearing walls of cold-formed steel light-frame construction.**

1615.4.2.4 Vertical ties.

Vertical ties shall consist of continuous or spliced reinforcing, continuous or spliced members, wall sheathing or other engineered systems. Vertical tension ties shall be provided in bearing walls and shall be continuous over the height of the building. The minimum nominal tensile strength for vertical ties within a bearing wall shall be equal to the weight of the wall within that *story* plus the weight of the diaphragm tributary to the wall in the *story* below. No fewer than two ties shall be provided for each wall. The strength of each tie need not exceed 3,000 pounds per foot (450 kN/m) of wall tributary to the tie for walls of masonry construction or 750 pounds per foot (140 kN/m) of wall tributary to the tie for walls of cold-formed steel light-frame construction.

# SECTION 1616
# HIGH-VELOCITY HURRICANE ZONES— GENERAL, DEFLECTION, VOLUME CHANGES AND MINIMUMLOADS

## 1616.1 General design requirements.

### 1616.1.1

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.

**1616.1.2**

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.

**1616.1.3**

Reserved.

**1616.1.4**

Reserved.

**1616.1.5**

Reserved.

**1616.1.6**

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.

**1616.2 General design for specific occupancies and structures.**

**1616.2.1 Fences.**

Fences not exceeding 6 feet (1829 mm) in height from grade may be designed for allowable wind speeds of 75 mph (33 m/s) fastest mile wind speed or 115 mph (40 m/s) 3-second gust.

**1616.2.1.1 Wood fences.**

Wood fence design shall be as specified by Section 2328.

**1616.2.2 Sway forces in stadiums.**

1. 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. 2.Sway forces shall be applied simultaneously with gravity loads.
3. 3.Sway forces need not be applied simultaneously with other lateral forces.

### 1616.3 Deflection.

### 1616.3.1 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. Structural metal roof panels of cold-formed steel construction | L/180 |
| 4. Floor members or components | L/360 |
| 5. 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 |
| 6. Vertical members and wall members or components not required to meet the conditions of Section 1616.3, Item 4 | L/180 |
| 7. Roof and vertical members, wall members and panels of carports, canopies, marquees, the roof projection is greater than 12 feet (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 |
| 8. 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 feet (3.7 m) or less in the direction of the span and for free-standing roofs and roofs supported by existing structures | L/80 |
| 9. Members supporting screens only | L/80 |
| 10. 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 |
| 11. Roofs and exterior walls of utility sheds having maximum dimensions of 10 feet (3 m) length, 10 feet (3 m) width, and 7 feet (2.1 m) height | L/80 |
| 12. Roofs and exterior walls of storage buildings larger than utility sheds | L/180 |

### 1616.4 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.

1616.5 Live loads.

Live loads for balconies and decks shall be designed in accordance with ASCE 7.

**1616.6 Concentrated loads**.

Reserved.

## SECTION 1617
## HIGH-VELOCITY HURRICANE ZONES—
## ROOF DRAINAGE
## RESERVED

## SECTION 1618
## HIGH-VELOCITY HURRICANE ZONES—
## SPECIAL LOAD CONSIDERATIONS

1618.1 Floors.

Reserved.

**1618.2 Below grade structures.**

Reserved.

**1618.3 Helistops/heliports.**

Reserved.

**1618.4 Safeguards**.

Reserved.

**1618.4.6 Railing.**

**1618.4.6.1 Reserved.**

**1618.4.6.2 Reserved.**

**1618.4.6.3**

Laminated 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 using a 400 foot-pound (542 N) 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-inch (76 mm) diameter sphere may freely pass. The glass panel shall remain within the supporting frame.

### 1618.4.6.4

If the posts that support the top rail of exterior railings are substituted with glass, the assembly shall be tested to TAS 201, where the impacted glass continues to support the top rail and all applicable loads after impact.

## 1618.5 Vehicle safeguard barriers.

Reserved.

## 1618.6 Special requirements for cable safeguard barriers.

Reserved.

## 1618.7 Ornamental projections.

Reserved.

## 1618.8 Interior wall and partitions.

Reserved.

## 1618.9 Load combination.

Reserved.

# SECTION 1619
# HIGH VELOCITY HURRICANE ZONES—
# LIVE LOAD REDUCTIONS
# RESERVED

# SECTION 1620
# HIGH-VELOCITY HURRICANE ZONES—
# WIND LOADS

1620.1

Buildings and structures, and every portion thereof, shall be designed and constructed to meet the requirements of Chapters 26 through 31 of ASCE 7.

**Exception:** Exposed mechanical equipment or appliances fastened to a roof or installed on the ground in compliance with the code using rated stands, platforms, curbs, slabs, walls, or other means are deemed to comply with the wind resistance requirements of the 2007 Florida Building Code, as amended. Further support or enclosure of such mechanical equipment or appliances is not required by a state or local official having authority to enforce the Florida Building Code.

**1620.2**

Wind velocity (3-second gust) used in structural calculations shall be as follows:

**Miami-Dade County**

- Risk Category I Buildings and Structures: 165 mph
- Risk Category II Buildings and Structures: 175 mph
- Risk Category III Buildings and Structures: 186 mph
- Risk Category IV Buildings and Structures: 195 mph

**Broward County**

- Risk Category I Buildings and Structures: 156 mph
- Risk Category II Buildings and Structures: 170 mph
- Risk Category III and ~~IV~~ Buildings and Structures: 180 mph
- Risk Category IV Buildings and Structures 185 mph

**1620.3**

All buildings and structures shall be considered to be in Exposure Category C, unless Exposure Category D applies, as defined in Section 26.7 of ASCE 7.

1620.4

For wind force calculations, roof live loads shall not be considered to act simultaneously with the wind load.

1620.5

Utility sheds shall be designed for a wind load of not less than 15 psf (718 Pa).

### 1620.6 Rooftop equipment and structures.

Wind loads on rooftop equipment and other structures shall be in accordance with Chapter 29 of ASCE 7.

> **Exception:** Exposed mechanical equipment or appliances fastened to a roof or installed on the ground in compliance with the code using rated stands, platforms, curbs, slabs, walls, or other means are deemed to comply with the wind-resistance requirements of the 2007 Florida Building Code, as amended. Further support or enclosure of such mechanical equipment or appliances is not required by a state or local official having authority to enforce the Florida Building Code.

### 1620.7 Tornado Loads

The design and construction of Risk Category III and IV buildings and other structures shall be in accordance with Chapter 32 of ASCE 7.

## SECTION 1621
## HIGH-VELOCITY HURRICANE ZONES—
## OVERTURNING MOMENT AND UPLIFT

**1621.1**

Computations for overturning moment and uplift shall be based on ASCE 7.

**1621.2**

Overturning and uplift stability of any building, structure or part thereof taken as a whole shall be provided and shall be satisfied by conforming to the load combination requirements of ASCE 7.

# SECTION 1622
# HIGH-VELOCITY HURRICANE ZONES—
# SCREEN ENCLOSURES

## 1622.1 Screen enclosures.

### 1622.1.1

The wind loads on screen surfaces shall be in accordance with ASCE 7 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.

**Exception:** Screen enclosures shall be permitted to be designed in accordance with the AAF Guide to Aluminum Construction in High Wind Areas. Construction documents based on the AAF Guide to Aluminum Construction in High Wind Areas shall be prepared and signed and sealed by a Florida registered architect or engineer.

## 1622.2 Windbreakers.

### 1622.2.1

Vinyl and acrylic glazed panels shall be removable. Removable panels shall be identified as removable by a decal. The identification decal shall essentially state “Removable panel SHALL be removed when wind speeds exceed 75 mph (34 m/s).” Decals shall be placed such that the decal is visible when the panel is installed.

### 1622.2.2

Permanent frame shall be designed in accordance with Sections 1620 and 1622.1.2.

# SECTION 1623
# HIGH-VELOCITY HURRICANE ZONES—
# LIVE LOADS POSTED AND OCCUPANCY PERMITS
# RESERVED

# SECTION 1624
# HIGH-VELOCITY HURRICANE ZONES—
# FOUNDATION DESIGN
# RESERVED

# 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 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 the material or assembly under dead plus live load shall deflect not more than as set forth in Section 1616.3, 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 one-half 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.

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 Section 1626, shall be subject to fatigue loading testing and shall obtain product approval by the building official.

TABLE 1625.4
FATIGUE LOADING SEQUENCE

| RANGE OF TEST | NUMBER OF CYCLES[1] |
|---|---|
| 0 to $0.5p_{max}$[2] | 600 |
| 0 to $0.6p_{max}$ | 70 |
| 0 to $1.3p_{max}$ | 1 |

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. $p_{max}$ = 0.6 × ultimate design load in accordance with ASCE7

# SECTION 1626
# HIGH-VELOCITY HURRICANE ZONES— IMPACT TESTS FOR WIND-BORNE DEBRIS

TABLE 1626
CYCLIC WIND PRESSURE LOADING

| INWARD ACTING PRESSURE | | OUTWARD ACTING PRESSURE | |
|---|---|---|---|
| RANGE | NUMBER OF CYCLES[1] | RANGE | NUMBER OF CYCLES[1] |
| 0.2 $P_{MAX}$ to 0.5 $P_{MAX}$[2] | 3,500 | 0.3 $P_{MAX}$ to 1.0 $P_{MAX}$ | 50 |
| 0.0 $P_{MAX}$ to 0.6 $P_{MAX}$ | 300 | 0.5 $P_{MAX}$ to 0.8 $P_{MAX}$ | 1,050 |
| 0.5 $P_{MAX}$ to 0.8 $P_{MAX}$ | 600 | 0.0 $P_{MAX}$ to 0.6 $P_{MAX}$ | 50 |
| 0.3 $P_{MAX}$ to 1.0 $P_{MAX}$ | 100 | 0.2 $P_{MAX}$ to 0.5 $P_{MAX}$ | 3,350 |

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 1.
2. $p_{max}$ = 0.6 × ultimate 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.

**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 wind-borne 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 (67 $m^2$) 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 and meet the requirements of Section 1626.5.3
h. Buildings and structures for marinas, cabanas, swimming pools, and greenhouses.
i. Exterior balconies or porches under existing roofs or decks enclosed with screen or removable vinyl and acrylic panels complying with Section 1622.1 or 1622.2 shall not be required to be protected and openings in the wall separating the unit from the balcony or porch shall not be required to be protected unless required by other provisions of this code.

### 1626.2 Large missile impact tests.

### 1626.2.1

This test shall be conducted on three test specimens in accordance with test protocols TAS 201 and TAS 203. 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 inches by 4 inches (51 mm by 102 m) weighing 9 pounds (4.1 kg).

1626.2.4

The large missile shall impact the surface of each test specimen at a speed of 50 feet per second (15.2 m/s); 80 feet per second (24.38 m/s) for Risk Category IV–Essential Facility buildings or structures.

**1626.2.5**

Each test specimen shall receive two impacts except as noted in Sections 1626.2.5.1and 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 Section 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 Section 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 Section 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 Section 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 Sections 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 airtight, 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 in accordance with test protocols TAS 201 and TAS 203. 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; Risk Category IV–Essential Facility buildings or structures shall follow the large missile impact testing in Section 1626.2.4 at 50 feet per second (15.2 m/s).

**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 $^{5}/_{16}$-inch (7.9 mm) nominal diameter.

**1626.3.4**

Each missile shall impact the surface of each test specimen at a speed of 130 feet per second (40 m/s).

**1626.3.5**

Each test specimen shall receive 30 small missile impacts except as noted in Sections 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 $m^2$) area located at the center of the test specimen, the second 10 distributed uniformly over a 2 square foot area (0.19 $m^2$) 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 $m^2$) 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 Section 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 Section 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 Section 1626.3.5.

**1626.3.5.2.1**

For doors with glass, the glass shall be impacted in accordance with Section 1626.3.5 and the thinnest section through the assembly that is not glass shall be impacted in accordance with Section 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 Sections 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 airtight, 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 22and 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 inches (51 mm) thickness.
5. Roof systems constructed in accordance with Chapter 22 or Chapter 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.

### 1626.5 Louvers.

1626.5.1

Louvers protecting the exterior wall envelope and are within 30 feet (9144 mm) of grade shall meet the requirements of AMCA 540 or TAS 201 (large missile test) or shall be protected by an impact-resistant cover complying with TAS 201 (large missile test), TAS 202 and TAS 203.

1626.5.2

Louvers required to be open for life safety purposes, such as providing a breathable atmosphere, that are protecting the exterior wall envelope and are within 30 feet (9144 mm) of grade shall meet the impact requirements of AMCA 540 or TAS 201 (large missile test).

1626.5.3

Open and closed louvers protecting the exterior wall envelope, regardless of their function or location from grade, shall also comply with uniform air pressure testing per TAS 202 protocol and either the cyclical wind pressure loading per TAS 203 protocol or by complying with both the impact and cyclical pressure testing of AMCA 540.

# Part II

## Excerpts from the Rules of the Florida Board of Professional Engineers

The following are responsibilities for Professional Engineers who design Structures under the Florida Building Code as well as Rules of Responsibility Common to all Engineers and the Grounds for Disciplinary Proceeding against engineers in violation of these rules. These requirements specific to Professional Engineers are:

1. Requirement to take continuing education courses on the Florida Building Code. See Chapter 471.0195 F.S.

2. Grounds for Disciplinary Proceedings. See Chapter 61G15-19.001, F.A.C.

3. Rules of Responsibility Common to All Engineers. See Chapter 61G15-30, F.A.C.

4. Responsibility Rules of Professional Engineers Concerning the Design of Structures. See Chapter 61G15-31, F.A.C.

**471.0195 Florida Building Code training for engineers.**
All licensees actively participating in the design of engineering works or systems in connection with buildings, structures, or facilities and systems covered by the Florida Building Code shall take continuing education courses and submit proof to the board, at such times and in such manner as established by the board by rule, that the licensee has completed any specialized or advanced courses on any portion of the Florida Building Code applicable to the licensee's area of practice. The board shall record reported continuing education courses on a system easily accessed by code enforcement jurisdictions for evaluation when determining license status for purposes of processing design documents. Local jurisdictions shall be responsible for notifying the board when design documents are submitted for building construction permits by persons who are not in compliance with this section. The board shall take appropriate action as provided by its rules when such noncompliance is determined to exist.
History.—s. 38, ch. 2000-356; s. 23, ch. 2002-299; s. 12, ch. 2009-195.

## CHAPTER 61G15-19
## GROUNDS FOR DISCIPLINARY PROCEEDINGS



**61G15-19.001 Grounds for Disciplinary Proceedings.**

(1) Pursuant to Section 471.033(2), F.S., the Board, to the extent not otherwise set forth in Florida Statutes, hereby specifies that the following acts or omissions are grounds for disciplinary proceedings pursuant to Section 471.033(1), F.S.

(2) A professional engineer shall not advertise in a false, fraudulent, deceptive or misleading manner. As used in Section 471.033(1)(f), F.S., the term "advertising goods or services in a manner which is fraudulent, false, deceptive, or misleading in form or content" shall include without limitation a false, fraudulent, misleading, or deceptive statement or claim which:

(a) Contains a material misrepresentation of facts;

(b) Omits to state any material fact necessary to make the statement in the light of all circumstances not misleading;

(c) Is intended or is likely to create an unjustified expectation;

(d) States or implies that an engineer is a certified specialist in any area outside of his field of expertise;

(e) Contains a representation or implication that is likely to cause an ordinary prudent person to misunderstand or be deceived or fails to contain reasonable warnings or disclaimers necessary to make a representation or implication not deceptive;

(f) Falsifies or misrepresents the extent of his education, training or experience to any person or to the public at large, tending to establish or imply qualification for selection for engineering employment, advancement, or professional engagement. A professional engineer shall not misrepresent or exaggerate his degree of responsibility in or for the subject matter of prior assignments;

(g) In any brochure or other presentation made to any person or to the public at large, incident to the solicitation of an engineering employment, misrepresents pertinent facts concerning a professional engineer's employer, employees, associates, joint ventures, or his or their past accomplishments with the intent and purpose of enhancing his qualifications and his works.

(3) A professional engineer, corporation or partnership, or other qualified business organization ("firm") shall not practice engineering under an assumed, fictitious or corporate name that is misleading as to the identity, responsibility or status of those practicing thereunder or is otherwise false, fraudulent, misleading or deceptive within the meaning of subsection 61G15-19.001(2), F.A.C. When a qualified business organization or individual is practicing engineering as a sole proprietor under a combination of his own given name, and terms such as "engineering," "and associates" or "and company," then said person or qualified business organization is practicing engineering under a fictitious name, and must be qualified by a Florida professional engineer pursuant to Section 471.023(2), F.S.

(4) A professional engineer shall not be negligent in the practice of engineering. The term negligence set forth in Section 471.033(1)(g), F.S., is herein defined as the failure by a professional engineer to

utilize due care in performing in an engineering capacity or failing to have due regard for acceptable standards of engineering principles. Professional engineers shall approve and seal only those documents that conform to acceptable engineering standards and safeguard the life, health, property and welfare of the public.

Failure to comply with the procedures set forth in the Responsibility Rules as adopted by the Board of Professional Engineers shall be considered as non-compliance with this section unless the deviation or departures therefrom are justified by the specific circumstances of the project in question and the sound professional judgment of the professional engineer.

(5) A professional engineer shall not be incompetent to practice engineering. Incompetence in the practice of engineering as set forth in Section 471.033(1)(g), F.S., shall mean the physical or mental incapacity or inability of a professional engineer to perform the duties normally required of the professional engineer.

(6) A professional engineer shall not commit misconduct in the practice of engineering. Misconduct in the practice of engineering as set forth in Section 471.033(1)(g), F.S., shall include, but not be limited to:

(a) Expressing an opinion publicly on an engineering subject without being informed as to the facts relating thereto and being competent to form a sound opinion thereupon;

(b) Being untruthful, deceptive, or misleading in any professional report, statement, or testimony whether or not under oath or omitting relevant and pertinent information from such report, statement or testimony when the result of such omission would or reasonably could lead to a fallacious conclusion on the part of the client, employer or the general public;

(c) Performing an engineering assignment when not qualified by training or experience in the practice area involved;

1. All professional engineer asbestos consultants are subject to the provisions of Sections 469.001 – 459.014 and Chapter 471, F.S., and chapter 61G15-19, F.A.C., and shall be disciplined as provided therein.

2. The approval of any professional engineer as a "special inspector" under the provisions of Chapter 553, F.S., does not constitute acceptance by the Board that any such professional engineer is in fact qualified by training or experience to perform the duties of a "special inspector" by virtue of training or experience. Any such professional engineer must still be qualified by training or experience to perform such duties and failure to be so qualified could result in discipline under this chapter or Chapter 471, F.S.;

(d) Affixing a signature or seal to any engineering plan of document in a subject matter over which a professional engineer lacks competence because of inadequate training or experience;

(e) Offering directly or indirectly any bribe or commission or tendering any gift to obtain selection or preferment for engineering employment with the exception of the payment of the usual commission for securing salaried positions through licensed employment agencies;

(f) Becoming involved in a conflict of interest with an employer or client, without the knowledge and approval of the client or employer, but if unavoidable a professional engineer shall immediately take the following actions:

1. Disclose in writing to his employer or client the full circumstances as to a possible conflict of interest; and,

2. Assure in writing that the conflict will in no manner influence the professional engineer's judgment or the quality of his services to his employer or client; and,

3. Promptly inform his client or employer in writing of any business association, interest or circumstances which may be influencing his judgment or the quality of his services to his client or employer;

(g) Soliciting or accepting financial or other valuable considerations from material or equipment suppliers for specifying their products without the written consent to the engineer's employer or client;

(h) Soliciting or accepting gratuities directly or indirectly from contractors, their agents or other parties dealing with the professional engineer's client or employer in connection with work for which the

professional engineer is responsible without the written consent of the engineer's employer or client;

(i) Use by a professional engineer of his engineering expertise and/or his professional engineering status to commit a felony;

(j) Affixing his seal and/or signature to plans, specifications, drawings, or other documents required to be sealed pursuant to Section 471.025(1), F.S., when such document has not been personally prepared by the engineer or prepared under his responsible supervision, direction and control;

(k) A professional engineer shall not knowingly associate with or permit the use of his name or firm name in a business venture by any person or firm which he knows or has reason to believe is engaging in business or professional practices of a fraudulent or dishonest nature;

(l) If his engineering judgment is overruled by an unqualified lay authority with the results that the public health and safety is threatened, failure by a professional engineer to inform his employer, responsible supervision and the responsible public authority of the possible circumstances;

(m) If a professional engineer has knowledge or reason to believe that any person or firm is guilty of violating any of the provisions of Chapter 471, F.S., or any of these rules of professional conduct, failure to immediately present this information to FEMC;

(n) Violation of any law of the State of Florida directly regulating the practice of engineering;

(o) Failure on the part of any professional engineer or qualified business organization to obey the terms of a final order imposing discipline upon said professional engineer or qualified business organization;

(p) Making any statement, criticism or argument on engineering matters which is inspired or paid for by interested parties, unless the professional engineer specifically identifies the interested parties on whose behalf he is speaking, and reveals any interest he or the interested parties have in such matters;

(q) Sealing and signing all documents for an entire engineering project, unless each design segment is signed and sealed by the professional engineer in responsible charge of the preparation of that design segment;

(r) Revealing facts, data or information obtained in a professional capacity without the prior consent of the professional engineer's client or employer except as authorized or required by law.

(s) Renewing or reactivating a license without completion of Continuing Education (CE) hours and subject areas as required by Section 471.017, F.S., and Rule 61G15-22.001, F.A.C.

(7) A professional engineer who performs building code inspector or plans examiner duties in accordance with Section 471.045, or 468.603(6), (7), F.S., shall be subject to disciplinary action for commission of the following:

(a) Violating or failing to comply with any provision of Chapter 471, F.S., or the rules of the Board of Professional Engineers;

(b) Having been convicted of a crime in any jurisdiction which directly relates to the practice of building code inspection or plans examination;

(c) Making or filing a false report or record, inducing another to file a false report or record, failing to file a report or record required by state or local law, impeding or obstructing such filing, or inducing another person to impede or obstruct such filing.

(8) A professional engineer shall not be negligent in the practice of engineering while performing duties as a special inspector. Negligence is herein defined as the failure by a professional engineer to utilize due care in performing in an engineering capacity or failing to have due regard for acceptable standards of engineering and special inspection principles. Failure to comply with the procedures set forth in the Responsibility Rules for Professional Engineers Providing Threshold Building Inspection, as adopted by the Board of Professional Engineers, shall be considered non-compliance with this section unless the deviation or departures therefrom are justified by the specific circumstances of the project in question and the sound professional judgment of the engineer.

*Rulemaking Authority 471.033(2) FS. Law Implemented 471.025(1), 471.033(1)(f), (g), (2) FS. History–New 1-8-80, Amended 6-23-80, 3-23-81, 6-4-85, Formerly 21H-19.01, Amended 5-14-86, 4-23-87, 11-8-88, 1-11-89, 7-3-90, 11-9-92, Formerly 21H-19.001, Amended 11-27-94, 5-20-02, 9-5-16, 12-29-19.*

**61G15-19.002 Payments of Fine.**
All fines imposed by the Board for violations of Section 471.033, F.S., shall be paid within a period of thirty (30) days from the date of the final order entered by the Board. This time limit may be modified by the Board at its discretion in order to prevent undue hardship to the public.
*Rulemaking Authority 455.227(2) FS. Law Implemented 455.227(2), 471.033(3)(c) FS. History–New 8-19-80, Formerly 21H-19.02, 21H-19.002.*

**61G15-19.003 Purpose.**
*Rulemaking Authority 471.033(2) FS. Law Implemented 471.001, 471.033 FS. History–New 5-14-86, Formerly 21H-19.003, Repealed 2-2-12.*

**61G15-19.004 Disciplinary Guidelines; Range of Penalties; Aggravating and Mitigating Circumstances.**

(1) The Board sets forth below a range of disciplinary guidelines from which disciplinary penalties will be imposed upon practitioners (including qualified business organizations) guilty of violating Chapter 471, F.S. The purpose of the disciplinary guidelines is to give notice to licensees of the range of penalties which will normally be imposed upon violations of particular provisions of Chapter 471, F.S. The disciplinary guidelines are based upon a single count violation of each provision listed. Multiple counts of violations of the same provision of Chapter 471, F.S., or the rules promulgated thereto, or other unrelated violations contained in the same administrative complaint will be grounds for enhancement of penalties. All penalties at the upper range of the sanctions set forth in the guidelines, i.e., suspension, revocation, etc., include lesser penalties, i.e., fine, probation or reprimand which may be included in the final penalty at the Board's discretion. All impositions of probation as a penalty shall include successful completion of the Engineering Law and Rules Study Guide, completion of a Board-approved course in Engineering Professionalism and Ethics, and an appearance before the Board at the option of the Board at the end of the probationary period. Other terms may be imposed by the Board at its discretion.

(2) The following disciplinary guidelines shall be followed by the Board in imposing disciplinary penalties upon licensees for violation of the below mentioned statutes and rules. For the purposes of this rule, the descriptions of the violations are abbreviated and the full statute or rule cited should be consulted to determine the prohibited conduct.

| VIOLATION | PENALTY RANGE | |
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| | FIRST VIOLATION | SECOND AND SUBSEQUENT VIOLATIONS |
| (a) Violating any provision of Section 455.227(1), 471.025 or 471.031, F.S., or any other provision of chapter 471, F.S., or rule of the Board or Department.<br><br>(Sections 471.033(1)(a) and 455.227(1)(b), (q), F.S.) | Reprimand and $1,000.00 fine, to One (1) year suspension, two (2) years probation and $5,000 fine. | One (1) year suspension, two (2) years probation and $5,000.00 fine to Revocation. |
| 1. Failure to sign, seal or date documents.<br><br>(Section 471.025(1), F.S.) | Reprimand to one (1) year probation. | Reprimand and one (1) year probation to Revocation. |
| 2. Sealing any document after license has expired or been revoked or suspended, or failure to surrender seal if the license has been revoked or | Suspended license: Revocation and | Suspended license: Revocation and $5,000.00 |

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| suspended.<br><br>(Section 471.025(2), F.S.) | $1,000.00 fine.<br><br>Revoked license: Referral to State's Attorney's office. | fine.<br><br>Revoked license: Referral to State's Attorney's office. |
| 3. Signing or sealing any document that depicts work the licensee is not licensed to perform or which is beyond his or her profession or specialty therein or practicing or offering to practice beyond the scope permitted by law or accepting and performing responsibilities the licensee is not competent to perform.<br><br>(Sections 471.025(3), 455.227(1)(o), F.S., paragraphs 61G15-19.001(6)(c), (d), F.A.C.) | Reprimand, one (1) year probation and $1,000.00 fine; to $5,000.00 fine, one (1) year suspension and two (2) years probation. | Reprimand, $5,000.00 fine, one (1) year suspension and two (2) years probation to Revocation. |
| 4. Firm practicing without proper qualification.<br><br>(Section 471.023, F.S., and subsection 61G15-19.001(3), F.A.C.) | $1,000.00 fine to $5,000.00 fine. | $5,000.00 fine. |
| 5. Practicing engineering without a license or using a name or title tending to indicate that such person holds an active license as an engineer.<br><br>(Sections 471.031(1)(a), (b), F.S.) | $1,000.00 fine to $5,000.00 fine. | $5,000.00 fine and referral to State Attorney's office. |
| 6. Presenting as his or her own the license of another.<br><br>(Section 471.031(1)(c), F.S.) | $1,000.00 fine to $5,000.00 fine. | $5,000.00 fine and referral to State Attorney's office. |
| 7. Giving false or forged evidence to the Board or concealing information relative to violations of this chapter.<br><br>(Sections 471.031(1)(d), (g), F.S.) | $1,000.00 fine to $5,000.00 fine and suspension. | Reprimand and $5,000.00 fine to Revocation. |
| 8. Employing unlicensed persons to practice engineering or aiding, assisting, procuring, employing unlicensed practice or practice contrary to Chapter 455 or 471, F.S.<br><br>(Sections 471.031(1)(f), and 455.227(1)(j), F.S.) | $1,000.00 fine and reprimand; to $5,000.00 and suspension. | Reprimand and $5,000.00 fine to Revocation. |
| 9. Having been found liable for knowingly filing a false complaint against another licensee.<br><br>(Section 455.227(1)(g), F.S.) | $1,000.00 fine and reprimand; to $5,000.00 per count and suspension. | Reprimand and $5,000.00 fine to Revocation. |
| 10. Failing to report a person in violation of Chapters 455, and 471, F.S., or the rules of the | Reprimand to $5,000.00 and suspension for one (1) year. | Reprimand and $5,000.00 fine to Revocation. |

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| Board or the Department.<br><br>(Section 455.227(1)(i), F.S.) | | |
| 11. Failing to perform any statutory or legal obligation.<br><br>(Section 455.227(1)(k), F.S.) | Reprimand to one (1) year suspension and a $1,000.00 fine. | Reprimand and a $5,000.00 fine to Revocation, |
| 12. Exercising influence on a client for financial gain.<br><br>(Section 455.227(1)(n), F.S.) | Reprimand to one (1) year suspension and $5,000.00 fine. | Reprimand and $5,000.00 fine to Revocation. |
| 13. Improper delegation of professional responsibilities.<br><br>(Section 455.227(1)(p), F.S.) | $1,000.00 fine and probation for one (1) year, to suspension. | Reprimand and $5,000.00 fine to Revocation. |
| 14. Improperly interfering with an investigation or inspection or disciplinary proceeding.<br><br>(Section 455.227(1)(r), F.S.) | $1,000.00 fine and probation for one (1) year; to suspension. | Reprimand and $5,000.00 fine to Revocation. |
| (b) Attempting to procure a license by bribery, fraudulent misrepresentation, or error of the Board or Department.<br><br>(Sections 471.033(1)(b) and 455.227(1)(h), F.S.) | One (1) year suspension and $1,000.00 fine, to Revocation if licensed; if not licensed, denial of license and referral to State Attorney. | Revocation and $5,000.00 fine if licensed; if not licensed, denial of license and referral to State Attorney. |
| (c) Having a license to practice engineering acted against or denied by another jurisdiction.<br><br>(Sections 471.033(1)(c) and 455.227(1)(f), F.S.) | Same penalty as imposed in other jurisdiction or as close as possible to penalties set forth in Florida Statutes. | Same penalty as imposed in other jurisdiction or as close as possible to penalties set forth in Florida Statutes. |
| (d)1. Being convicted or found guilty of, or entering a plea of nolo contendere to a, crime which relates to the practice or ability to practice.<br><br>(Sections 471.033(1)(d) and 455.227(1)(c), F.S.) | Depending on the severity of the crime, from Reprimand $1,000.00 fine, and one (1) year probation, to Revocation. | Depending on the severity of the crime, from one (1) year suspension with 2 years' probation to Revocation. |
| 2. Conviction of crime related to building code inspection or plans examination.<br><br>(Paragraph 61G15-19.001(7)(a), F.A.C.) | Reprimand $1,000.00 fine, and one (1) year probation. | One (1) year suspension with 2 years' probation to Revocation. |
| (e) Knowingly making or filing a false report or record, failing to file a report or record required by law, impeding or obstructing such filing.<br><br>(Sections 471.033(1)(e), 455.227(1)(l), F.S., and paragraph 61G15-19.001(7)(c), F.A.C.) | Reprimand and $1,000.00 fine to one (1) year suspension, two (2) years probation. | One (1) year suspension, 2 years' probation, and $1,000.00 fine, to Revocation and $5,000.00 fine. |
| (f) Fraudulent, false, deceptive or misleading | Reprimand to one (1) year probation and | One (1) year probation and $5,000.00 fine to |

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| advertising.<br><br>(Sections 471.033(1)(f), F.S., and subsection 61G15-19.001(2), F.A.C.) | $5,000.00 fine. | Revocation. |
| (g) Fraud, deceit, negligence, incompetence or misconduct.<br><br>(Sections 471.033(1)(g) and 455.227(1)(a), (m), F.S.) | | |
| 1. Fraud or deceit | Reprimand, two (2) years probation and $1,000 fine, to one (1) year supension and $5,000.00 fine. | One (1) year suspension and $5,000.00 fine to Revocation. |
| 2.a. Negligence.<br><br>(Subsection 61G15-19.001(4), F.A.C.) | Reprimand, two (2) years probation and $1,000 fine, to $5,000.00 fine, five (5) year suspension and ten (10) years probation. | Two (2) years probation and $1,000.00 fine, to $5,000.00 fine and Revocation. |
| b. Negligence in procedural requirements.<br><br>(Subsections 61G15-30.003(2), (3) and (5), F.A.C.;<br><br>Rules 61G15-30.005 and 61G15-30.006, F.A.C.) | Reprimand to two (2) years probation and $1,000.00 fine. | Two (2) years probation and $1,000.00 fine, to $5,000.00 fine and Revocation. |
| c. As a special inspector. | Reprimand, two (2) years probation and $1,000 fine, to $5,000.00 fine. | Two (2) years probation and $1,000.00 fine, to $5,000.00 fine and Revocation. |
| 3. Incompetence.<br><br>(Subsection 61G15-19.001(5), F.A.C.) | Two (2) year probation to Suspension until ability to practice proved followed by two (2) year probation. | Suspension until ability to practice proved followed by two (2) year probation, to Revocation. |
| 4. Misconduct.<br><br>(Subsection 61G15-19.001(6), F.A.C.) | Reprimand and $1,000.00 fine to one (1) year suspension. | One (1) year suspension to Revocation and $5,000.00 fine. |
| a. Expressing an opinion publicly on an engineering subject without being informed as to the facts and being competent to form a sound opinion.<br><br>(Paragraph 61G15-19.001(6)(a), F.A.C.) | Reprimand and $1,000.00 fine to one (1) year suspension. | One (1) year suspension to Revocation and $5,000.00 fine. |
| b. Being untruthful, deceptive or misleading in any professional report, statement or testimony or omitting relevant and pertinent information from such report, statement or testimony when the result or such omission would or reasonably could lead to | Reprimand and $1,000.00 fine to one (1) year suspension. | One (1) year suspension to Revocation and $5,000.00 fine. |

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| a fallacious conclusion.<br><br>(Paragraph 61G15-19.001(6)(b), F.A.C.) | | |
| c. Offering directly or indirectly any bribe or commission or tendering any gift to obtain selection or preferment for engineering employment other than the payment of the usual commission for securing salaried positions through licensed employment agencies.<br><br>(Paragraph 61G15-19.001(6)(e), F.A.C.) | Reprimand, $5,000.00 fine per count and suspension for five (5) years, to Revocation. | Five (5) years suspension to Revocation. |
| d. Soliciting or accepting gratuities without client knowledge.<br><br>(Paragraphs 61G15-19.001(6)(g), (h), F.A.C.) | Reprimand, one (1) year probation and $1,000 fine, to one (1) year suspension, two (2) years probation and $5,000.00 fine. | One (1) year suspension, two (2) years probation and $5,000.00 fine to Revocation. |
| e. Failure to preserve client's confidence.<br><br>(Paragraph 61G15-19.001(6)(r), F.A.C.) | Reprimand, one (1) year probation and $1,000.00 fine, to one (1) year suspension, two (2) years probation (if pecuniary benefit accrues to engineer). | One (1) year suspension, two (2) years probation and $5,000.00 fine to Revocation. |
| f. Professional judgment overruled by unqualified person.<br><br>(Paragraph 61G15-19.001(6)(l), F.A.C.) | Reprimand, one (1) year probation and $1,000.00 fine, to one (1) year suspension, two (2) years probation and $5,000.00 fine. | One (1) year suspension, two (2) years probation and $5,000.00 fine to Revocation. |
| g. Use of name/firm in fraudulent venture.<br><br>(Paragraph 61G15-19.001(6)(k), F.A.C.) | Reprimand, one (1) year probation and $1,000.00 fine, to $5,000.00 fine, one (1) year suspension and two (2) years probation. | One (1) year suspension, two (2) years probation and $5,000.00 fine to Revocation. |
| h. Undisclosed conflict of interest.<br><br>(Paragraphs 61G15-19.001(6)(f), (p), F.A.C.) | Reprimand, $1,000.00 fine and two (2) years probation, to Revocation and $5,000.00 fine. | One (1) year suspension, two (2) years probation and $5,000.00 fine to Revocation. |
| i. Renewing or reactivating a license without completion of continuing education hours.<br><br>(Paragraph 61G15-19.001(6)(s), F.A.C.) | Reprimand, $1,000.00 fine, to suspension until licensee demonstrates compliance. | One (1) year suspension and $1,000.00 fine to Revocation. |
| (h) Violating any provision of chapter 455, F.S.<br><br>(Sections 471.033(1)(h) and 455.227(1)(q), F.S.) | Depending on the severity of the violation, Reprimand and $1,000.00 fine per count, to $5,000.00 fine and | Depending on the severity of the violation, One (1) year suspension, two (2) years probation and $5,000.00 fine to |

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| | revocation. | Revocation. |
| (i) Practicing on a revoked, suspended, inactive or delinquent license, or through a business organization not properly qualified.<br><br>(Sections 471.033(1)(i) and 471.031(1)(e), F.S.) | | |
| 1. Delinquent license. | Fine based on length of time in practice while inactive; $100.00/month or $1,000.00 maximum, renewal of license or cease practice. | |
| 2. Inactive license. | Fine based on length of time in practice while inactive; $100.00/month or $1,000.00 maximum, renewal of license or cease practice. | |
| 3. Suspended license. | Revocation and $1,000.00 fine. | |
| 4. Revoked license. | Referral to State Attorney. | Referral to State Attorney. |
| 5. Business Organization not properly qualified. | Repremand; $500.00 fine to $5,000.00 fine, and one (1) year suspension. | One (1) year suspension and $5,000.00 fine to Revocation. |
| (j) Affixing or permitting to be affixed his or her seal, name, or digital signature to any documents that were not prepared by him or her or under his or her responsible supervision, direction or control.<br><br>(Section 471.033(1)(j), F.S., and paragraphs 61G15-19.001(6)(j), (q), F.A.C.) | Reprimand, one (1) year probation and $1,000.00 fine, to $5,000.00 fine, one (1) year suspension and two (2) years probation. | One (1) year suspension, two (2) years probation and $5,000.00 fine to Revocation. |
| (k) Violating any order of the board or department. (Sections 471.033(1)(k), 455.227(1)(q), F.S., and paragraph 61G15-19.001(6)(o), F.A.C.) | Depending on the severity of the violation, from Suspension until compliant with the order of the Board and $1,000.00 fine, to Revocation and $5,000.00 fine. | Depending on the severity of the violation, Suspension until compliant with the order of the Board and $1,000.00 fine, to Revocation and $5,000.00 fine. |
| (l) Aiding, assisting, procuring, employing unlicensed practice or practice contrary to chapter 455 or 471, F.S.<br><br>(Section 455.227(1)(j), F.S.) | $1,000.00 fine and probation for one (1) year, to $5,000.00 fine and suspension. | Reprimand and $5,000.00 fine to Revocation. |
| (m) Failing to report in writing a conviction or plea of nolo contendere, a crime in any jurisdiction.<br><br>(Section 455.227(1)(t), F.S.) | Reprimand to $5,000.00 fine. | Six (6) month suspension to $5,000.00 fine and Revocation. |

(3) The board shall be entitled to deviate from the above-mentioned guidelines upon a showing of aggravating or mitigating circumstances by clear and convincing evidence presented to the board prior to the imposition of a final penalty. The fact that an Administrative Law Judge of the Division of Administrative Hearings may or may not have been aware of the below mentioned aggravating or mitigating circumstances prior to a recommendation of penalty in a Recommended Order shall not obviate the duty of the board to consider aggravating and mitigating circumstances brought to its attention prior to the issuance of a Final Order.

(a) Aggravating circumstances; circumstances which may justify deviating from the above set forth disciplinary guidelines and cause the enhancement of a penalty beyond the maximum level of discipline in the guidelines shall include but not be limited to the following:

1. History of previous violations of the practice act and the rules promulgated thereto.

2. In the case of negligence; of the magnitude and scope of the project and the damage inflicted upon the general public by the licensee's misfeasance.

3. Evidence of violation of professional practice acts in other jurisdictions wherein the licensee has been disciplined by the appropriate regulatory authority.

4. Violation of the provision of the practice act wherein a letter of guidance as provided in Section 455.225(3), F.S., has previously been issued to the licensee.

(b) Mitigating circumstances; circumstances which may justify deviating from the above set forth disciplinary guidelines and cause the lessening of a penalty beyond the minimum level of discipline in the guidelines shall include but not be limited to the following:

1. In cases of negligence, the minor nature of the project in question and lack of danger to the public health, safety and welfare resulting from the licensee's misfeasance.

2. Lack of previous disciplinary history in this or any other jurisdiction wherein the licensee practices his profession.

3. Restitution of any damages suffered by the licensee's client.

4. The licensee's professional standing among his peers including continuing education.

5. Steps taken by the licensee or his firm to insure the non-occurrence of similar violations in the future.

*Rulemaking Authority 455.227, 455.2273, 471.008, 471.031, 471.033 FS. Law Implemented 455.227, 455.2273, 455.2277, 471.031, 471.033 FS. History–New 1-7-87, Formerly 21H-19.004, Amended 11-27-94, 5-22-01, 11-15-01, 5-20-02, 11-21-06, 2-21-10, 9-5-16, 12-29-19.*

**61G15-19.0051 Notice of Noncompliance.**

(1) As an alternative to investigation and prosecution, when a complaint is received, FEMC shall provide a licensee with a notice of noncompliance for an initial offense for the following violations:

(a) Failure to date documents when affixing signature and seal.

(b) Practice with an inactive or delinquent license less than one month.

(c) Licensee practicing through a business organization that is not properly qualified with the Board for less than one month.

(d) Failing to report a criminal conviction or plea of nolo contendere, regardless of adjudication, pursuant to Section 455.227(1)(t), F.S., if the licensee self reports after 30 days from the date of conviction or plea but within one (1) year after the date of the conviction or plea.

(e) Failure to complete a Board approved Advanced Building Code course as required by subsection 61G15-22.001(3), F.A.C., prior to submission of engineering documents in connection with buildings, structures, or facilities and systems covered by the Florida Building Code to an Authority Having Jurisdiction.

(f) Failure to produce documentation of compliance with continuing education requirements within sixty (60) days of notification to the licensee of the requirement to produce said documentation – paragraph 61G15-22.006(2)(b), F.A.C.

(g) Failure to comply with the location, content, or formatting requirements of paragraphs 61G15-23.004(3)(a)-(d) or 61G15-23.005(4)(a)-(d), F.A.C.

(h) Failure to properly utilize a Title Block as required by paragraph61G15-23.001(4)(a), F.A.C.

(2) A second offense shall result in issuance of a citation pursuant to Rule 61G15-19.0071, F.A.C.

(3) No later than December 31, 2024, the Board shall review and consider amendment, modification, or repeal of this rule if review determines this rule creates barriers to entry for private business competition, is duplicative, outdated, obsolete, overly burdensome, or imposes excessive costs.

*Rulemaking Authority 455.225 FS. Law Implemented 455.224 FS. History–New 4-2-00, Amended 5-5-10, 8-26-13, 12-31-17, 5-8-18, 12-29-19, 5-17-20.*

**61G15-19.006 Mediation.**

Pursuant to Section 455.2235, F.S., the Board designates the following areas as appropriate for mediation for a first offense:

(1) Practice with an improper seal. (See Rule 61G15-23.001, F.A.C.).

(2) Failure to date documents when affixing signature and seal.

*Rulemaking Authority 455.2235 FS. Law Implemented 455.2235 FS. History–New 2-20-95, Amended 10-20-96, 4-2-00.*

**61G15-19.0071 Citations.**

(1) As used in this rule, "citation" means an instrument which meets the requirements set forth in Section 455.224, F.S., and which is served upon a licensee or qualified business organization for the purpose of assessing a penalty in an amount established by this rule.

(2) In lieu of the disciplinary procedures contained in Section 455.225, F.S., FEMC is hereby authorized to dispose of any violation designated herein by issuing a citation to the subject within six months after the filing of the complaint that is the basis for the citation. If a violation for which a citation may be issued is discovered during the course of an investigation for an unrelated violation, the citation must be issued within 6 months from the discovery of the violation and filing of the uniform complaint form by the investigator.

(3) The following violations with accompanying fines may be disposed of by citation:

(a) An engineer who has practiced or offered to practice engineering through a corporation, partnership, or fictitious name which has not been properly qualified with the board. The fine shall be $100 for each month or fraction thereof of said activity, up to a maximum of $5,000. (See Sections 455.227(1)(j), 471.023, and 471.033(1)(a), F.S.)

(b) Practice with an inactive or delinquent license more than one month or if a Notice of Noncompliance has previously been issued for the same offense. The fine shall be $100 for each month or fraction thereof. (See Section 471.033(1)(i), F.S.)

(c) Business organization practicing without being properly qualified with the board more than one month or if a Notice of Noncompliance has previously been issued for the same offense. The fine shall be $100 for each month or fraction thereof. (See Section 471.023, F.S.)

(d) Failure to notify the Board of a change in the principal officer of the corporation or partner in a partnership who is the qualifying professional engineer for said corporation or partnership within one month of such change. The fine shall be $500. (See Section 471.023(4), F.S.)

(e) Unlicensed practice of engineering. The fine shall be up to $250 for each month depending on the severity of the infraction practice, up to a maximum of $5,000.00. (See Section 455.228(3)(a), F.S.)

(f) Failure to properly utilize a Title Block as required by paragraph 61G15-23.001(4)(a), F.A.C., if a Notice of Noncompliance has previously been issued for the same offense. The fine shall be $500.

(4) If the subject does not dispute the matter in the citation in writing within 30 days after the citation is served by personal service or within 30 days after receipt by certified mail, the citation shall become a final order of the Board of Professional Engineers. The subject has 30 days from the date the citation becomes a final order to pay the fine and costs. Failure to pay the fine and costs within the prescribed

time period constitutes a violation of Section 471.033(1)(k), F.S., which will result in further disciplinary action. All fines and costs are to be made payable to "Florida Engineers Management Corporation – Citation."

(5) Prior to issuance of the citation, the investigator must confirm that the violation has been corrected or is in the process of being corrected.

(6) Once the citation becomes a final order, the citation and complaint become a public record pursuant to Chapter 119, F.S., unless otherwise exempt from the provisions of chapter 119, F.S. The citation and complaint may be considered as aggravating circumstances in future disciplinary actions pursuant to Rule 61G15-19.004, F.A.C.

(7) Subsequent violation(s) of the same rule or statute shall require the procedure of Section 455.225, F.S., to be followed. In addition, should the offense for which a citation could be issued occur in conjunction with violations not described herein, then the procedures of Section 455.255, F.S., shall apply.

(8) No later than December 31, 2024, the Board shall review and consider amendment, modification, or repeal of this rule if review determines this rule creates barriers to entry for private business competition, is duplicative, outdated, obsolete, overly burdensome, or imposes excessive costs.

*Rulemaking Authority 455.224, 455.225, 455.228(3)(a) FS. Law Implemented 455.224, 455.227, 455.228(3)(a), 471.023, 471.033 FS. History–New 4-2-00, Amended 9-26-05, 8-26-13, 12-29-19, 5-17-20.*

**61G15-19.008 Confidentiality of Investigations.**

The following violations have been deemed to involve the potential for substantial physical or financial harm to the public:

Negligence, as defined in subsection 61G15-19.001(4), F.A.C., or misconduct, as defined in subsection 61G15-19.001(6), F.A.C., involving threshold buildings as defined in Section 553.71(7), F.S.

*Rulemaking Authority 471.038(7) FS. Law Implemented 471.038(7) FS. History–New 5-20-02, Amended 6-5-12.*

**CHAPTER 61G15-30**
**RESPONSIBILITY RULES COMMON TO ALL ENGINEERS**



**61G15-30.001 Purpose.**

(1) The Board has adopted these responsibility rules pursuant to section 471.033(2), F.S., to safeguard the life, health, property and welfare of the public by promoting proper conduct in the practice of engineering and due care and regard for acceptable engineering principles and standards. The Board considers that professional engineers may avoid disciplinary actions by observing the procedures set forth herein. Failure to comply with these rules may be considered as noncompliance with subsection 61G15-19.001(4), F.A.C., unless the deviation or departure therefrom is justified by the specific circumstances of the project in question. Furthermore, these rules are intended to apply as general guidelines where no contractual relationship exists between the parties addressed herein. These rules are not intended to take precedence over contractual relationships developed between the parties addressed herein, so long as those contractual relationships do not violate Chapter 471, F.S., or the stated purpose of these responsibility rules. These responsibility rules shall apply to every person holding a license as a professional engineer, and every qualified engineering business organization, as appropriate. A professional engineer's practices, education, training, experience, qualifications, technical competence, conduct, and responsibilities in connection with his authorized engineering practice, services, and creative work are subject to regulation solely by the Board of professional engineers, the courts, and local jurisdictions.

(2) No later than December 31, 2024, the Board shall review and consider amendment, modification, or repeal of this rule if review determines this rule creates barriers to entry for private business competition, is duplicative, outdated, obsolete, overly burdensome, or imposes excessive costs.

*Rulemaking Authority 471.033(2), 471.008 FS. Law Implemented 471.033(1) FS. History–New 1-26-93, Formerly 21H-30.001, Amended 11-13-08, 5-14-20.*

**61G15-30.002 Definitions Common to All Engineer's Responsibility Rules.**

(1) Engineer of Record. A Florida professional engineer who is in responsible charge for the preparation, signing, dating, sealing and issuing of any engineering document(s) for any engineering service or creative work.

(2) Prime Professional. A Florida professional engineer or a duly qualified engineering corporation or partnership, who is engaged by the client to provide any planning, design, coordination, arrangement and permitting for the project and for construction observations in connection with any engineering project, service or creative work. The prime professional engineer may also be an engineer of record on the same project.

(3) Delegated Engineer. A Florida professional engineer who undertakes a specialty service and provides services or creative work (delegated engineering document) regarding a portion of the engineering project. The delegated engineer is the engineer of record for that portion of the engineering project. A delegated engineer usually falls into one of the following categories:

(a) An independent consultant.

(b) An employee or officer of an entity supplying components to a fabricator or contractor, so long as the engineer acts as an independent consultant or through a duly qualified engineering corporation.
(c) An employee or officer of a fabricator or contractor, so long as the engineer acts as an independent consultant or through a duly qualified engineering corporation.
(4) Engineering Documents. Engineering documents are designs, plans, specifications, drawings, prints, reports, or similar instruments of service in connection with engineering services or creative work that have been prepared and issued by the professional engineer or under his responsible supervision, direction or control.
(5) Delegated Engineering Documents. Delegated engineering documents are those engineering documents that are prepared by a delegated engineer.
(6) Public Record. An engineering document is "filed for public record" when said document is presented with the engineer of record's knowledge and consent to any federal, state, county, district, authority, municipal or other governmental agency in connection with the transaction of official business with said agency.
(7) "Engineering Documents Prepared for Public Record" are those documents filed for public record with the Authority Having Jurisdiction (AHJ) to determine compliance with Codes and Standards and to be used for execution of the project. These documents are required to be signed and sealed.
(8) Shop Drawings: Drawings depicting installation means and methods, catalog information on standard products, prepared by a contractor, manufacturers, or professional engineers for incorporation into the project which are prepared based on engineering direction contained in Engineering Documents. Shop drawings do not require the signature, date and seal of a professional engineer.
(9) Record Documents: Documents that are a compiled representation of the constructed project. If the engineer is relying on information provided by others not under the direct supervision and control of the engineer, then the engineer shall not be required to sign, date and seal these Documents. If relying on information by others, as a minimum, the following shall be included on the Documents:
(a) Statement that the documents are a compiled representation of the constructed project.
(b) Listing of the sources and basis of information used in the preparation of the Documents.
(c) Statement that the Documents are believed to be correct to the best of the engineer's knowledge, and that the accuracy of the information cannot be guaranteed.
*Rulemaking Authority 471.033(2), 471.008 FS. Law Implemented 471.033(1), 471.023, 471.025 FS. History–New 1-26-93, Formerly 21H-30.002, Amended 11-13-08.*

**61G15-30.003 Minimum Requirements for Engineering Documents.**
(1) Engineering Documents are prepared in the course of performing engineering services. When prepared for inclusion with an application for a general building permit, the Documents shall meet all Engineer's Responsibility Rules, set forth in Chapters 61G15-31, 61G15-32, 61G15-33, and 61G15-34, F.A.C., and be of sufficient clarity to indicate the location, nature and extent of the work proposed and show in detail that the proposed work will conform to all applicable standards, codes, laws, ordinances, rules and regulations in effect at the time the Documents are sealed, signed and dated, as determined by the AHJ. The Documents shall include:
(a) Information that provides material specifications required for the safe operation of the system that is a result of engineering calculations, knowledge and experience.
(b) If the Engineering Documents are intended to comply with requirements of any edition of federal, state, municipal, or county standards, codes, ordinances, laws, or rules, other than those currently in effect, the Engineering Documents must clearly state the edition and effective dates the Documents are intended to conform to.
(c) Information, as determined by the Engineer of Record, needed for the safe and efficient operation of the system.

(d) List engineering design criteria; reference project specific studies, reports, and delegated Engineering Documents.
(e) Identify clearly elements of the design that vary from the governing standards and depict/identify the alternate method used to ensure compliance with the stated purpose of these Responsibility Rules.

(2) Engineers shall legibly indicate their name and business address on Engineering Documents. Engineering Documents which are issued for preliminary or conceptual use shall clearly note the intended purpose of such Documents.
(3) When elements of the project are shown on an Engineering Document only for information or clarification and the Engineer does not intend to accept responsibility for the elements, the engineer shall clearly note on the Documents the extent of his responsibility.
(4) Engineering Documents shall be legible and clearly define and delineate the work in the project. They must also comply with the requirements of Chapter 61G15-23, F.A.C., Seals.
(5) Engineers shall clearly note on any preliminary Engineering Documents that such Documents are not in final form, but are being transmitted to the AHJ to receive agency reviews, comments and interpretations. The Documents may subsequently be revised by the engineer to reflect resolution of issues with the AHJ prior to final action by the AHJ. Changes, revisions and modifications to a project may prompt additional Document submittal for AHJ approval action on the same project. *Rulemaking Authority 471.033(2), 471.008 FS. Law Implemented 471.033(1)(g), 471.025(3) FS. History–New 1-26-93, Formerly 21H-30.003, Amended 11-13-08, 12-11-16.*

**61G15-30.004 Engineering Document Submittal to Public Agencies.**
*Rulemaking Authority 471.033(2), 471.008 FS. Law Implemented 471.033(1)(g), 471.025 FS. History–New 1-26-93, Formerly 21H-30.004, Repealed 2-11-08.*

**61G15-30.005 Delegation of Engineering Documents: Obligations of the Engineer of Record.**
(1) An engineer of record who delegates a portion of his responsibility to a delegated engineer is obligated to communicate in writing his engineering requirements to the delegated engineer.
(2) An engineer of record who delegates a portion of his design responsibility to a delegated engineer shall require submission of delegated engineering documents prepared by the delegated engineer and shall review those documents for compliance with his written engineering requirements and to confirm the following:
(a) That the delegated engineering documents have been prepared by an engineer.
(b) That the delegated engineering documents of the delegated engineer conform with the intent of the engineer of record and meet the written criteria.
(c) That the effect of the delegated engineer's work on the overall project generally conforms with the intent of the engineer of record.
*Rulemaking Authority 471.033(2), 471.008 FS. Law Implemented 471.033(1)(g) FS. History–New 1-26-93, Formerly 21H-30.005.*

**61G15-30.006 Delegation of Engineering Documents: Obligations of the Delegated Engineer of Record.**
(1) It is the delegated engineer's responsibility to review the Engineer of Record's written engineering requirements and authorization for the delegated engineering document to determine the appropriate scope of engineering.
(2) The delegated engineering document shall comply with the written engineering requirements received from the engineer of record. They shall include the project identification and the criteria used as a basis for its preparation. If a delegated engineer determines there are details, features or unanticipated project limits which conflict with the written engineering requirements provided by the engineer of record, the delegated engineer shall timely contact the engineer of record for resolution of conflicts.

(3) The delegated engineer shall forward the delegated engineering document to the engineer of record for review. All final delegated engineering documents require the impressed seal and signature of the delegated engineer and include:
(a) Drawings introducing engineering input such as defining the configuration and structural capacity of structural components and/or their assembly into structural systems.
(b) Calculations.
(c) Computer printouts which are an acceptable substitute for manual calculations provided they are accompanied by sufficient design assumptions and identified input and output information to permit their proper evaluation. Such information shall bear the impressed seal and signature of the delegated engineer as an indication that said engineer has accepted responsibility for the results.
*Rulemaking Authority 471.033(2), 471.008 FS. Law Implemented 471.033(1)(g) FS. History–New 1-26-93, Formerly 21H-30.006.*

**61G15-30.007 Prime Professional's Responsibility.**
It is the responsibility of the prime professional engineer, where one exists, to retain and coordinate the services of such other professionals as needed to complete the services contracted for the project.
*Rulemaking Authority 471.033(2), 471.008 FS. Law Implemented 471.033(1)(g) FS. History–New 1-26-93, Formerly 21H-30.007, Amended 11-13-08.*

**61G15-30.008 Use of Computer Software and Hardware.**
The engineer shall be responsible for the results generated by any computer software and hardware that he or she uses in providing engineering services.
*Rulemaking Authority 471.033(2), 471.008 FS. Law Implemented 471.033(1)(g) FS. History–New 1-26-93, Formerly 21H-30.008.*

**61G15-30.009 Retention of Engineering Documents.**
At least one copy of all documents displaying the licensee's signature, seal, which is legible to the reader, date and all related calculations shall be retained by the licensee or the licensee's employer for a minimum of three years from the date the documents were sealed. These documents shall be maintained in hardcopy or electronic format.
*Rulemaking Authority 471.008, 471.033(2) FS. Law Implemented 471.033(1)(g), (j) FS. History–New 5-9-04, Amended 11-13-08, 8-26-13.*

**61G15-30.010 Energy Conservation Compliance.**
The engineer who prepares the compliance calculations, and certifies the accuracy thereof, shall verify that the building construction documents conform to compliance calculations. Data used in calculations shall be under the signature, date and seal of the responsible design professionals. The Engineer of Record for energy conservation compliance calculations shall retain the signed, dated and sealed data as provided for in Rule 61G15-30.009, F.A.C., Retention of Engineering Documents.
*Rulemaking Authority 471.008, 471.033(2) FS. Law Implemented 471.033(1)(g), (j) FS History–New 11-13-08.*

**CHAPTER 61G15-31**
**RESPONSIBILITY RULES OF PROFESSIONAL ENGINEERS CONCERNING THE DESIGN OF STRUCTURES**



**61G15-31.001 General Responsibility.**
The Engineer of Record is responsible for all structural aspects of the design of the structure including the design of all of the structure's systems and components. As noted herein the engineer of record may delegate responsibility for the design of a system or component part of the structure to a delegated engineer. In either case the structural engineering documents shall address, as a minimum, the items noted in the following subsections covering specific structural systems or components. The Engineer of Record's structural engineering documents shall identify delegated systems and components. Both the Engineer of Record for the structure and the delegated engineer, if utilized, shall comply with the requirements of the general responsibility rules, Chapter 61G15-30, F.A.C., and with the requirements of the more specific structural responsibility rules contained herein. The Engineer of Record for the Structural System(s) shall provide design requirements in writing to the delegated engineer if one is used and shall review the design documents of the delegated engineer for conformance with his written instructions in accordance with Rule 61G15-30.005, F.A.C. When information collected from the engineer or the engineer's authorized representative from a site visit is part of the engineer's deliverative process, the engineer is responsible for the accuracy of such information.
*Rulemaking Authority 471.033(2), 471.008 FS. Law Implemented 471.033(1)(g) FS. History–New 1-26-93, Formerly21H-31.001, Amended 9-28-10.*

**61G15-31.002 Definitions.**
(1) Engineer of Record. The Florida licensed professional engineer who develops the overall structural design and the structural design criteria for the structure, and is responsible for the preparation of the structural engineering documents.
(2) Structural Component. An individual structural member or element designed to be part of the structure or structural system. This definition of component should not be confused with any other published definitions.
(3) Structure. The entity to be built.
(4) Structural System. A portion of a structure comprising an assembly of structural components which carry and transmit loads.
(5) Structural Engineering Documents. The structural drawings, specifications and other documents setting forth the overall design and requirements for the construction, alteration, repair, removal, demolition, arrangement and/or use of the structure, prepared by and signed and sealed by the engineer of record for the structure. Structural engineering documents shall identify the project and specify design criteria both for the overall structure and for structural components and structural systems. The drawings shall identify the nature, magnitude and location of all design loads to be imposed on the structure. The structural engineering documents shall provide construction requirements to indicate the nature and

character of the work and to describe, detail, label and define the structure's components, systems, materials, assemblies, and equipment.
(6) Structural Submittals. Submittals required by the structural engineering documents which do not require the seal of a professional engineer, such as:
(a) Drawings prepared solely to serve as a guide for fabrication and installation and requiring no engineering input such as reinforcing steel shop drawings, and structural steel, steel joist and joist girder erection drawings.
(b) Catalog information on standard products not fabricated for a specific project.
(7) Structural Delegated Engineering Documents. Documents prepared by a delegated engineer to whom the engineer of record for the structure has delegated responsibility for the design of a structural component or system.
(8) Specialty Engineer. A licensed professional engineer, who is not the structural engineer of record, who provides engineering criteria or designs necessary for the structure to be completed. The specialty engineer may be a delegated engineer.
*Rulemaking Authority 471.033(2), 471.008 FS. Law Implemented 471.033(1)(g), (j) FS. History–New 1-26-93, Formerly 21H-31.002, Amended 10-19-97, 9-28-10.*

**61G15-31.003 Design of Structures Utilizing Prefabricated Wood Trusses.**
(1) When a Structural Engineer of Record and a Delegated Engineer exist as may be determined by applicable Florida law, the apportionment of responsibilities between the Structural Engineer of Record and a Delegated Engineer shall be as set forth in Chapter 2 of ANSI/TPI 1-1995, wherein the Structural Engineer of Record is the Building Designer and the Delegated Engineer is the Truss Designer as those terms are defined in said standard.
(2) The Structural Engineer of Record shall provide design requirements in writing to the Delegated Engineer and shall review the design documents of the delegated engineer for conformance to his written instructions in accordance with Rule 61G15-30.005, F.A.C.
(3) For the purposes of this rule, the following definitions shall apply:
(a) "Truss System" shall mean an assemblage of trusses and truss girders, together with all bracing, connections, and other structural elements and all spacing and locational criteria, that, in combination, function to support the dead, live and wind loads applicable to the roof of a structure with respect to a Truss System for the roof, and the floor of a structure with respect to a Truss System for the floor. A Truss System does not include walls, foundations, or any other structural support systems.
(b) "Truss System Engineer" shall mean an engineer who designs a Truss System.
(c) "Truss Design Engineer" shall mean an engineer who designs individual trusses, but does not design a Truss System.
(4) An engineer is a Truss System Engineer if he designs a Truss System. Each of the drawings in the Truss System design package for the Truss System shall include a title block bearing the printed name, address, and license number of the Truss System Engineer and the date of the drawing. The design documentation prepared by the Truss System Engineer shall also include a truss placement plan for the Truss System, showing the location and designation of each truss. Said design documentation for the Truss System shall be signed and sealed by the Truss System Engineer. The cover or index sheet of the Truss System design package may be signed and sealed in lieu of signing and sealing each individual sheet, provided that the cover or index sheet contains the following information:
(a) The name, address and license number of the Structural Engineer of Record, if there is one, and the name, address and license number of the Truss System Engineer.
(b) Identification of the project, by address or by lot number, block number, section or subdivision and city or county.
(c) Identification of the applicable building code and chapter(s) that the Truss System design is intended to meet, the engineering design criteria relied upon in designing the Truss System and the truss design loading.

(d) Identification of any computer program used for engineering the Truss System.
(e) An index of the attached Truss System design drawings. The naming and numbering system utilized for the drawings shall be clear as to how many drawings there are in the set and the date and sequence number of each of these drawings shall be included.
(5) An engineer is a Truss Design Engineer if he designs individual trusses, but does not design the Truss System. Each of the drawings in the truss design package for individual trusses shall include a title block bearing the printed name, address, and license number of the Truss Design Engineer and the date of the drawing. The Truss Design documents prepared by the Truss Design Engineer shall be signed and sealed by the Truss Design Engineer. The cover or index sheet of the truss design package may be signed and sealed in lieu of signing and sealing each individual sheet, provided that the cover or index sheet contains the following information:
(a) The name, address and license number of the Structural Engineer of Record, if there is one, and the name, address, and license number of the Truss Design Engineer.
(b) Identification of the project, by address or by lot number, block number, section or subdivision and city or county.
(c) Identification of the applicable building code and chapter(s) that the truss design is intended to meet, the engineering design criteria relied upon in designing the trusses and the truss design loading.
(d) Identification of any computer program used for engineering the trusses.
(e) An index of the attached truss design drawings. The naming and numbering system utilized for the drawings shall be clear as to how many drawings there are in the set and the date and sequence number of each of these drawings.
*Rulemaking Authority 471.008, 471.033(2) FS. Law Implemented 471.033(1)(g) FS. History–New 1-26-93, Formerly 21H-31.003, Amended 6-16-99, 3-21-01, 4-30-03.*

**61G15-31.004 Design of Cast-in-Place Post-Tensioned Concrete Structural Systems.**
(1) Structural engineering documents shall show the complete structural configuration and loading requirements of the post-tensioned system including: member sizes, type of post-tensioning system, location of all prestressing tendons (in plans and elevation), magnitude of all prestressing forces, and all design assumptions. Structural engineering documents shall also show all required non post-tensioned reinforcing steel including size, spacing, and lengths required for the post-tensioned system.
(2) If the engineer of record (EOR) elects to delegate the responsibility for preparation of calculations and installation drawings to a delegated engineer for the post-tensioning system, the EOR shall require the submission of installation drawings for review Calculations shall also be submitted by the delegated engineer which show sufficient information to document that the number and size of tendons provided are adequate to carry all loads-shown on the structural engineering documents. The member dimensions and tendon directions shall match those on the structural engineering documents, unless otherwise agreed to with the EOR, via modified structural engineering documents. Installation drawings shall include the following as a minimum: identification of all the structural elements designed by the delegated engineer, all details of post-tensioned and non post-tensioned materials to be used including necessary accessories, and instructions for construction. If the delegated engineer utilizes or requires any additional reinforcing to maintain the member sizes shown on the structural engineering documents, the delegated engineer shall inform the EOR. If any moments, shears or axial loads are required for the lateral force resisting system the EOR shall provide them to the delegated engineer for inclusion in the preparation of the delegated engineering documents. All forces imposed on the load supporting members from the post-tensioned system shall be reported to the EOR. The installation drawings and calculations shall bear the seal, date, and signature of the delegated engineer who prepared them and shall be reviewed by the EOR for the structure.

(3) It is the responsibility of the EOR-for the structure to review the post-tensioning system installation drawings together with the shop drawings of all required reinforcing steel needed for a complete structural design.

(4) The effect of post-tensioning on other parts of the structure is the responsibility of the EOR
*Rulemaking Authority 471.033(2), 471.008 FS. Law Implemented 471.033(1)(g), (j) FS. History–New 1-26-93, Formerly 21H-31.004, Amended 9-28-10, 2-28-16.*

**61G15-31.005 Design of Structures Utilizing Precast and Prestressed Concrete Components.**
(1) Structural engineering documents shall indicate the configuration of precast and prestressed components and shall include details of supports, anchors and connections for those components.
(2) If the engineer of record elects to delegate responsibility for the design of precast or prestressed concrete components, or structural systems utilizing those components, to a delegated engineer, the engineer of record shall require structural delegated engineering documents for review. Structural delegated engineering documents shall bear the impressed seal, date, and signature of the delegated engineer and shall be reviewed by the Engineer of Record as an indication that the intent has been understood and that the specified criteria have been used.
(3) Structural delegated engineering documents shall include component details, calculations, and fabrications and erection drawings. All such submittals shall identify the specific project. The effect of precast and prestressed concrete members on other parts of the building is the responsibility of the engineer of record.
*Rulemaking Authority 471.033(2), 471.008 FS. Law Implemented 471.033(1)(g) FS. History–New 1-26-93, Formerly 21H-31.005, Amended 9-28-10.*

**61G15-31.006 Design of Structural Systems Utilizing Open Web Steel Joists and Joist Girders.**
(1) The Engineer of Record shall indicate on the Structural Engineering Documents the steel joist and joist girder designations as required in Section 2207 of the Florida Building Code, Building, 5th Edition (2014), which is herein incorporated by reference, and shall indicate the appropriate standards for joist and joist girder design, layout, end supports, anchorage, bridging requirements, etc., including connections to walls. These documents shall indicate special requirements for concentrated loads, non-uniform loads, openings, extended ends, and resistance to uplift loads. At the time of adoption, the copyrighted incorporated material will be available for public inspection and examination, but may not be copied, at the Department of State, Administrative Code and Register Section, Room 701, The Capitol, Tallahassee, Florida 32399-0250, and at the Office of Codes and Standards, 1940 North Monroe Street, Room 90, Tallahassee, Florida 32399-0772.
(2) The Engineer of Record is responsible for reviewing the steel joist and joist girder manufacturer's designs, as required in subsection (1), above, per the Engineer of Record's specified joist and joist girder designations and/or special loading diagrams, as set forth in Structural Engineering Documents. The Engineer of Record may require the submission of the steel joist and joist girder design calculations as an indication of compliance. When required to submit the steel joist and joist girder calculations, the Engineer of Record shall require the steel joist and joist girder manufacturer to submit a cover letter along with the steel joist and joist girder design calculations. The cover letter shall bear the seal and signature of a Florida registered professional engineer responsible for design of the steel joist and joist girders.
*Rulemaking Authority 471.033(2), 471.008 FS. Law Implemented 471.033(1)(g), (j) FS. History–New 1-26-93, Formerly 21H-31.006, Amended 10-19-97, 1-4-16.*

**61G15-31.007 Design of Metal Building Systems.**
(1) A metal building system is defined as an integrated set of components and assemblies that are specifically designed to form a complete structural system. This typically includes primary framing comprised of constant depth or web-tapered structural steel frames, secondary members that are cold-

formed steel or steel joists, a metal panel roof system and exterior wall cladding. These components and assemblies are manufactured in a manner that permits plant and/or field inspection prior to assembly or erection.
(2) Structural engineering documents prepared by the engineer of record shall reflect the design criteria for the metal building system as required in subsection 61G15-31.002(5), F.A.C. They shall indicate all openings, concentrated loads and other special requirements. Foundation conditions assumed in the design shall be indicated as well as the location and magnitude of building reactions on that foundation under all design conditions.
(3) The engineer of record may delegate responsibility of the design of the metal building system to a delegated engineer requiring submittal of structural delegated engineering documents.
(4) Structural delegated engineering documents shall identify the project and list loading and other design criteria. Structural delegated engineering documents shall include erection drawings which indicate in detail the construction of the structure used for the specific project. The structural delegated engineering documents shall indicate all connection details, openings and other special details. They shall show the magnitude and location of building reactions on the foundation under all design conditions. Calculations shall be provided, if requested by the engineer of record, to prove the design is in compliance with the written engineering requirements for the specific project. Structural delegated engineering documents shall bear the signature, date, and impressed seal of the Florida licensed delegated engineer.
*Rulemaking Authority 471.033(2), 471.008 FS. Law Implemented 471.033(1)(g) FS. History–New 1-26-93, Formerly 21H-31.007, Amended 9-28-10.*

**61G15-31.008 Design of Foundations.**
(1) The structural engineering documents shall designate the foundation capacity used as the basis of design and shall include data indicating the nature of the foundation and sub-grade material.
(2) Site and sub-grade preparation requirements, necessary to provide the foundation capacity, shall be specified in the structural engineering document(s).
(3) The foundation capacity and site preparation requirements shall be determined on the basis of scientific analysis utilizing investigations, tests or studies conducted for or provided by the engineer of record for the structure or by a licensed professional engineer, in accordance with code procedures.
(4) The engineer of record is responsible for the design of foundation components and shall take into account anticipated loads and load paths along with the evaluation of any existing structural conditions.
(5) The engineer of record may delegate the design of certain components of the foundation, such as piles and retaining walls, to a delegated engineer. Structural delegated engineering documents for these components, signed, sealed and dated by the delegated licensed professional engineer, shall be submitted to the engineer of record.
*Rulemaking Authority 471.033(2), 471.008 FS. Law Implemented 471.033(1)(g) FS. History–New 1-26-93, Formerly 21H-31.008, Amended 9-28-10.*

**61G15-31.009 Design of Structural Steel Systems.**
(1) The engineer of record is responsible for all aspects of the structure's design including the design of components and connections.
(2) The engineer of record may detail all structural connections on the structural engineering documents and require fabrication and erection in accordance with these details.
(3) Alternately, the engineer of record may specify criteria for the design of the structural connections and identify the nature, magnitude, and location of all design loads to be supported by the connections in the structural engineering documents. The engineer of record may then delegate design responsibility for the selection or modification of the structural connections to a delegated engineer and require delegated engineering documents, which the engineer of record may require to be signed, sealed and dated by the delegated licensed professional engineer.

(4) The structural engineering documents may assign to the fabricator responsibility for implementing the design as specified and for maintaining fabrication and erection tolerances and for ensuring the fit and erectability of the structure.
(5) The fabricator shall forward fabrication and erection drawings for review by the engineer of record.
*Rulemaking Authority 471.033(2), 471.008 FS. Law Implemented 471.033(1)(g) FS. History–New 1-26-93, Formerly 21H-31.009, Amended 9-28-10.*

# Part III
## Course Exam

## Chapter 16, Building Structural Design

1. Information related to wind loads shall be shown on the construction documents as follows:
   a. Ultimate design wind speed
   b. Risk category of structure
   c. Applicable exposure category classification
   d. All of the above

2. A risk category assigned to a building or structure is based on:
   a. The net floor area of a building
   b. The nature of the occupancy of the building
   c. The total building occupant load
   d. Surrounding topographic features

3. Anchorage of a building is required to resist
   a. Uplift
   b. Sliding forces
   c. Wind Loads
   d. Both A and B

4. Whenever there is reason to question the safety of the construction of a building for the intended occupancy, an engineering analysis or load test, or both, may be required by:
   a. The lender
   b. The client
   c. The permitting agency or agencies
   d. The building official

5. Buildings and other structures that are intended to remain operational in the event of extreme environmental loading from flood, wind, snow or earthquakes are known as:
   a. Risk category III structures
   b. Essential facilities
   c. Buildings that represent a substantial hazard to human life in the event of failure
   d. Designated emergency shelters

6. The load combinations to be investigated when designing a building or structure:
   a. Depend on the design method being utilized
   b. Are based on the nature of the occupancy
   c. Are at the discretion of the designer
   d. Are mandated by the building official

7. In the absence of definitive information, values for dead loads shall be:
   a. The value published by the manufacturer of the material
   b. Approved by the building official
   c. Taken from ASCE 7

d. Taken from the Civil Engineers Handbook

8. The uniform live loads used to design buildings and other structures shall be:
   a. Those shown in table 1607.1
   b. Determined by the design professional
   c. The maximum loads expected by the intended use or occupancy
   d. Approved by the building official

9. Provisions for partition weight shall be made whether or not partitions are shown on the construction documents:
   a. Unless the specified live load exceeds 80 PSF
   b. Unless the specified concentrated load exceeds 2000 lbs.
   c. Provided partition weights do not exceed 15 PSF
   d. Unless partitions are fixed in place and not subject to change.

10. Offices in office buildings shall be designed for a minimum uniform distributed live load of ___ PSF:
   a. 80
   b. 100
   c. 40
   d. 50

11. Handrails and guards shall be designed to resist:
   a. A minimum load of 20 lbs / ft.
   b. A linear load of 50 lbs. / ft.
   c. A concentrated load of 200 lbs.
   d. Both B and C

12. The code permits uniform live loads to be reduced subject to certain limitation described in the code. Which of the following statements are correct?
   a. The methodology for both floor and roof loading reductions is similar
   b. The methodology for floor and roof loading reduction differs and each is described in the code
   c. Live loads may be reduced in passenger vehicle garages
   d. Heavy live loads may be reduced.

13. The Miami-Dade County, Risk I, 3-second gust wind velocity used in structural calculations shall be:
   a. 165 mph
   b. 175 mph
   c. 186 mph
   d. Mandated by the building official

14. Wind loads on every building or structure shall be based on wind speeds:
   a. Prevalent in the geographical area of the state in which the building or structure is located
   b. Determined by the risk category of the building or structure
   c. After considering the exposure category
   d. All of the above

15. Glazed openings in buildings or structures located in wind borne debris regions shall be:
   a. Located more than 30 feet above grade
   b. Protected
   c. Are not permitted

d. Are permitted in partially enclosed structures

16. For a structure to be designed in Ft. Pierce, FL an ultimate design wind speed of 150 MPH is selected from Figure 1609.3. The nominal design wind speed is:
    a. 150 MPH
    b. 124 MPH
    c. 116 MPH
    d. 108 MPH

17. The ultimate design wind speed for a risk category III building located in central Orange County, FL. is:
    a. 140 MPH
    b. 145 MPH
    c. 150 MPH
    d. 130 MPH

18. Exposure categories are determined based on:
    a. The characteristics of ground surface irregularities for the site at which the building or structure is situated.
    b. The risk category of the building or structure
    c. The intensity of the wind speed
    d. The wind direction being considered

19. In order to meet the structural stability requirements of Section 706.02 where the structure on either side of the wall has collapsed, fire walls and their supports shall be designed to withstand a minimum horizontal allowable stress load of:
    a. 10 psf
    b. 15 psf
    c. 5 psf
    d. 8 psf

20. Structures with open-grid framing and no roof deck or sheathing supporting photovoltaic panel systems shall be designed to support the uniform and concentrated roof live loads specified in Section 1607.12.5.1, except that the uniform roof live load shall be permitted to be reduced to:
    a. 12 psf
    b. 10 psf
    c. 8 psf
    d. 6 psf

21. Minimum uniformly distributed live loads for balconies and decks shall be:
    a. 8 PSF
    b. 16 PSF
    c. There is no minimum
    d. 1.5 times the live load for the area served. Not required to exceed 100 psf.

22. Foundation walls and retaining walls shall be designed to resist
    a. The vertical loads from the superstructure
    b. Lateral soil loads
    c. Surcharge loads
    d. B and C

23. A foundation wall extending 6 feet below grade and laterally supported at the top is situated in an area of well graded clean sand. If the exception is not considered, it should be designed to resist lateral soil load of:
    a. 60 PSF per foot of depth
    b. 45 PSF per foot of depth
    c. 30 PSF per foot of depth
    d. 180 pounds per LF of wall

24. Each portion of a roof shall be designed to sustain the load of rainwater that will accumulate on it:
    a. From a 100 year hourly rain event
    b. If the primary drainage system for that portion is blocked
    c. From the uniform load caused by water that rises above the inlet of the secondary drainage system at its design flow
    d. B plus C

25. The 100-year, 1-hour rainfall for Orange County, Florida is"
    a. A rate determined from approved local weather data
    b. Obtained by contacting the National Weather Service
    c. Obtained by contacting the water management district
    d. Approximately 4.5 inches

26. Who is responsible for establishing flood hazard areas?
    a. Federal Emergency Management Agency (FEMA)
    b. Water Management Districts
    c. Applicable governing authority
    d. Licensed design professionals

27. Where design flood elevations are not included in the flood hazard area shown on the flood hazard map, the applicant may be required to:
    a. Design the building or structure to be anchored to resist flotation, collapse, or lateral movement due to the effects of flood loads.
    b. Obtain and utilize any design flood elevation and floodway data available from a federal, state or local source.
    c. Determine the design flood elevation and / or the floodway in accordance with accepted hydrologic and hydraulic engineering practices used to define flood hazard areas.
    d. Either B or C

28. Documentation required for construction in flood hazard areas other than coastal high hazard areas includes:
    a. The elevation of the lowest floor, including basement
    b. A statement that the design will provide equalization of hydrostatic flood forces
    c. A statement that the breakaway wall is designed in accordance with ASCE 24
    d. A and B

29. In High Velocity Hurricane Zones computations for overturning moment and uplift shall be based on:
    a. Florida Building Commission
    b. ASCE 7
    c. Florida Building Code

d. International Building Code

30. Fences not exceeding 6 feet in height from grade may be designed for:
    a. 75 mph fastest mile wind speed or 115 mph 3-second gust
    b. 100 mph 3-second gust
    c. Based on site soil properties
    d. Not applicable to Florida Building Code

31. The allowable deflection of floor members when subjected to live, wind and other superimposed load shall not exceed:
    a. L/360
    b. L/240
    c. L/80
    d. L/180

32. Bearing wall structures shall have ___ ties in all load bearing walls.
    a. Longitudinal
    b. Transverse
    c. Vertical
    d. Perimeter

33. Ties around the perimeter of each floor and roof shall be located within _____feet of the edge.
    a. 0.5
    b. 1.0
    c. 2.0
    d. 4.0

34. In high velocity hurricane zones, 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 the forces to:
    a. The foundation
    b. The bearing walls
    c. The building columns
    d. The building frame

35. The sway force applied to seats in stadiums, grandstands, bleachers, and reviewing stands shall be not less than ____ lbs/l.f.
    a. 12
    b. 24
    c. 36
    d. Mandated by the building official

36. For a Risk Category II building located in Miami-Dade County the wind velocity to be used in structural calculations is ___ MPH
    a. 165 MPH
    b. 170 MPH
    c. 175 MPH
    d. 186 MPH

37. Building Structures and parts thereof shall be designed in accordance with:
    a. Strength design
    b. Load and resistance factor design
    c. Allowable stress design
    d. Any of the above methods

38. The maximum weight of the vehicles allowed into or on a garage or other structure shall be:
    a. Determined by the design professional
    b. Posted by the owner
    c. Established by the building official
    d. None of the above

39. Wind loads on every building or structure shall be determined in accordance with chapters 26-30 of ASCE 7. There are ___ exceptions to this requirement:
    a. 5
    b. 6
    c. 7
    d. 8

40. Louvers required to be open for life safety purposes such as providing a breathable atmosphere that are located on the building envelope and are within 30 feet (9144 mm) of grade shall meet the impact requirements of AMCA 540 or TAS 201 (large missile test).
    a. AMCA 540
    b. TAS 201
    c. A or B
    d. None of the Above