Part III—Building Planning and Construction

Chapter 3:
Building Planning

General Comments

Chapter 3 is a compilation of the code requirements specific to the building planning sector of the design and construction process. The provisions address a wide variety of issues important to designing a building that is both safe and usable. The limitations placed on the materials and methods of construction contribute to the development of a structurally sound building. Snow, wind and seismic design and flood-resistant construction are regulated, as are the live and dead loads, in Chapter 3.

Fire-resistance-rated assemblies are necessary under two different conditions: where a building is situated very close to a property line, the code addresses the concern for radiant heat exposure in a fire; and where two or more dwelling units are housed in a single structure, the code mandates a minimum level of fire separation between units, with exceptions under certain conditions. Other concerns related to fires include the limitations on wall and ceiling finishes, the requirement for emergency escape and rescue openings, the required installation of smoke alarms throughout the dwelling unit and limitations on the use of foam plastics and other insulation materials. In addition, the specific construction requirements for the common wall between the house and garage and the ceiling assembly between the garage and habitable space are addressed in Chapter 3.

This chapter sets forth traditional code requirements dealing with light, ventilation, sanitation, room size, ceiling height and environmental comfort. Life-safety provisions include limitations on glazing used in hazardous areas, specifications on the use of guards at elevated surfaces, fall protection for open windows, and basic rules for the egress system. This chapter also contains most of the regulations found in the code that deal with the planning and design of dwelling units.

- Section R301 establishes the design criteria, including dead loads, live loads, roof loads, floor loads, snow loads, wind loads and seismic loads.
- Section R302 identifies the requirements for the fire-resistant construction for residential buildings.
- Section R303 establishes the light, ventilation and heating requirements for dwelling units.
- Section R304 establishes the minimum requirements for room areas in dwelling units.
- Section R305 establishes the ceiling height requirements for dwelling units.
- Section R306 contains requirements for sanitation.
- Section R307 contains requirements for toilets and bath and shower spaces.
- Section R308 contains requirements for glazing, hazardous locations of glazing, site-built windows and skylights.
- Section R309 contains provisions for garages and carports.
- Section R310 contains provisions for emergency escape and rescue openings.
- Section R311 establishes the means of egress requirements, including provisions for egress doors, hallways, stairways and ramps.
- Section R312 addresses guards and fall prevention for openable windows.
- Section R313 provides requirements for an automatic sprinkler system with the option of complying with NFPA 13D or Section P2904.
- Section R314 contains the requirements for smoke alarms.
- Section R315 provides criteria for the installation and location of carbon monoxide (CO) alarms.
- Section R316 addresses the use of foam plastic.
- Section R317 contains requirements for decay protection for wood and wood-based products.
- Section R318 contains requirements for termite protection.
- Section R319 provides the requirements for premises identification (site address).
- Section R320 provides a reference to the *International Building Code®* (IBC®) for accessibility requirements.
- Section R321 addresses elevators and platform lifts.
- Section R322 establishes flood-resistant construction provisions.
- Section R323 references ICC/NSSA 500 for the construction of storm shelters in dwellings and accessory structures.
- Section R324 provides requirements for solar energy systems. It primarily covers photovoltaic systems and references Chapter 23 and the *International Fire Code®* (IFC®) for solar thermal energy systems.
- Section R325 contains requirements for mezzanines.
- Section R326 references the *International Swimming Pool and Spa Code®* (ISPSC®) for the design and construction of pools and spas.
- Section R327 addresses stationary storage battery systems.

Purpose

Chapter 3 provides guidelines for a minimum level of structural integrity, life safety, fire safety and livability for inhabitants of dwelling units regulated by the code. The chapter sets forth the requirements that affect the most basic planning and design aspects of dwelling construction. It identifies the various structural loads that are imposed on a building, and it establishes criteria that address each of the imposed loads. In the design of residential structures scoped by the code, there are many climatic and geographical issues that must be considered. This chapter provides guidance in the determination of all appropriate design criteria. In addition, it sets forth the limiting conditions under which a building may be designed and constructed using the code.

Fundamental issues of livability and sanitation are satisfied through the regulation of minimum room sizes and ceiling heights, as well as basic requirements for toilet rooms, kitchens, swimming pools, spas and hot tubs. Life safety concerns are addressed in a number of areas, including provisions regulating emergency escape and rescue openings, glazing in areas subject to human impact and exiting. The chapter establishes minimum specifications for a number of different building components and systems, including stairways, ramps, landings, handrails, guards, mezzanines, solar energy systems, stationary storage battery systems and fall protection for open windows. It deals with fire-safety issues, such as automatic sprinkler systems, early fire detection by smoke alarms, exterior wall protection for proximity to property lines, separation of dwelling units in multiple-family buildings, and control of fire spread across wall and ceiling finishes. Other life safety concerns are dealt with by requirements for CO detectors and guidance for the design of storm shelters. Property protection is also a concern, with provisions established for protection against decay and termites.

SECTION R301
DESIGN CRITERIA

R301.1 Application. Buildings and structures, and parts thereof, shall be constructed to safely support all loads, including dead loads, live loads, roof loads, flood loads, snow loads, wind loads and seismic loads as prescribed by this code. The construction of buildings and structures in accordance with the provisions of this code shall result in a system that provides a complete load path that meets the requirements for the transfer of loads from their point of origin through the load-resisting elements to the foundation. Buildings and structures constructed as prescribed by this code are deemed to comply with the requirements of this section.

❖ This section specifies the minimum design loads required for structures built in accordance with the provisions of the code. In structural design, loads are generally divided into two categories: gravity loads, which act vertically; and lateral loads, which act horizontally. Lateral loads typically result from wind (see Section R301.2.1), earthquakes (see Section R301.2.2) or flood loads (see Section R301.2.4). Although wind, flood and earthquake design are concerned with lateral loads, there are also vertical force components that must be considered.

All structures must be designed to support these loads and provide a complete load path capable of transferring these loads from their points of origin through the appropriate load-resisting elements and foundation and, ultimately, to the supporting soil. The charging statement makes clear that any building or structure built in strict compliance with the code will provide a complete load path that meets all requirements for load transfer from the point of origin to the foundation. A load path that is either incomplete or inadequate will expose the structure to damage just as surely as an undersized structural member will. The concept of a complete load path is a fundamental principle in structural engineering, and the code makes it clear that a complete load path must be provided.

R301.1.1 Alternative provisions. As an alternative to the requirements in Section R301.1, the following standards are permitted subject to the limitations of this code and the limitations therein. Where engineered design is used in conjunction with these standards, the design shall comply with the *International Building Code*.

1. AWC *Wood Frame Construction Manual* (WFCM).
2. AISI *Standard for Cold-Formed Steel Framing—Prescriptive Method for One- and Two-Family Dwellings* (AISI S230).
3. ICC *Standard on the Design and Construction of Log Structures* (ICC 400).

❖ This section permits the use of alternative prescriptive framing methods. Wood framing is permitted to comply with the provisions of the American Forest and Paper Association's (AF&PA) WFCM, *Wood Frame Construction Manual for One- and Two-family Dwellings*. Cold-formed steel framing is permitted to comply with American Iron and Steel Institute's (AISI) S230, *Standard for Cold-formed Steel Framing-prescriptive Method for One- and Two-family Dwellings*. Log homes can be constructed using ICC 400, *Standard on the Design and Construction of Log Structures*. Engineered design in accordance with the IBC is required where a building is beyond (or exceeds) the applicability limits of these standards.

R301.1.2 Construction systems. The requirements of this code are based on platform and balloon-frame construction for light-frame buildings. The requirements for concrete and masonry buildings are based on a balloon framing system. Other framing systems must have equivalent detailing to ensure force transfer, continuity and compatible deformations.

❖ The requirements of the code are based on platform or balloon-frame construction for light-frame buildings (see the definitions of "Platform construction" and "Light-frame construction" in Chapter 2) and on a balloon-framing system for concrete and masonry buildings.

R301.1.3 Engineered design. Where a building of otherwise conventional construction contains structural elements exceeding the limits of Section R301 or otherwise not conforming to this code, these elements shall be designed in accordance with accepted engineering practice. The extent of such design need only demonstrate compliance of nonconventional elements with other applicable provisions and shall be compatible with the performance of the conventional framed system. Engineered design in accordance with the *International Building Code* is permitted for buildings and structures, and parts thereof, included in the scope of this code.

❖ Generally, proper application of the code requires a clear understanding of and adherence to its prescriptive limitations, which are based on conventional construction. However, a building may contain structural elements that are either unconventional or exceed the prescriptive limitations of the code. This is acceptable, if these elements are designed in accordance with accepted engineering practice by a design professional.

R301.2 Climatic and geographic design criteria. Buildings shall be constructed in accordance with the provisions of this code as limited by the provisions of this section. Additional criteria shall be established by the local *jurisdiction* and set forth in Table R301.2(1).

❖ This section establishes the design criteria that vary based on location and/or climate. Some of the criteria reflect loading, such as earthquake, flood and wind; others reflect susceptibility to damage from hazards, such as weather exposure or termites. Additional criteria may be established by local jurisdictions as necessary. These would include, for example, whether a site is within a windborne debris region as described in Section R301.2.1.2, of this commentary. Table R301.2(1) lists the criteria that must be established within each jurisdiction for any project constructed under the code. The table must be filled in by the jurisdiction adopting the code for their particular area. In reality, the information required to be inserted into the table is typically included in the adopting ordinance, and may not actually appear in the code. For this reason, it may be wise for designers, contractors, manufacturers and other code users to acquire a copy of the adopting ordinance for the code for each jurisdiction in which they do business.

Note that some of these criteria (e.g., wind exposure category or flood hazard) can vary within a given jurisdiction and may need to be established on a site-by-site (or project-by-project) basis. The table serves as a useful reminder for code enforcement personnel, builders, designers and owners. Verifying this information up front aids compliance with the code. Also see the commentary to Table R301.2(1).

TABLE R301.2(1). See page 3-8.

❖ Table R301.2(1) is designed so that jurisdictions recognize certain climatic and geographic design criteria that vary from location to location. Communities are directed to complete the table with a variety of factors. See the table footnotes for the sources of the information to be determined by the local jurisdiction to complete the table.

The required information includes the date of the jurisdiction's entry into the National Flood Insurance Program (NFIP), which is typically the date of adoption of the first code or ordinance for management of flood hazard areas. With respect to the official map that shows flood hazard areas, the community inserts the date of the currently effective Flood Insurance Study and the panel numbers and dates of all currently effective Flood Insurance Rate Maps (FIRM) [and Flood Boundary and Floodway Maps (FBFM), if applicable] or the date of other maps that are adopted. Another flood hazard map may be specified if it shows flood hazard areas that are larger than those shown on the FIRM, as may be the case if a community elects to define its flood plains based on higher standards, such as the "flood of record," "ultimate development" of an upstream watershed, or "no-rise" rules to define the floodway.

From time to time, the Federal Emergency Management Agency (FEMA) may revise and republish Federal Insurance Studies (FISs) and FIRMs. In recent years, revised FIRMs have been produced in a digital format for some communities. Communities that prefer to cite the digital data should obtain a legal opinion whether such maps and data are acceptable. Digital map products are registered to the primary coordinate system of the state or community. FEMA advises that the horizontal location of flood hazard areas relative to specific sites should be determined using the coordinate grid, rather than planimetric base map features, such as streets.

When maps are revised and flood hazard areas are changed, FEMA involves the community and provides a formal opportunity to review the documents. Once the revisions are finalized, FEMA requires adoption of the new maps by the community. Communities may be able to minimize having to adopt each revision by referencing the date of the map and study, as amended or revised. This is a method by which subsequent revisions to flood maps and studies may be automatically adopted administratively without requiring legislative action on the part of the community. Communities will need to determine whether this automatic adoption-by-reference approach is allowed under their state's enabling authority and due process requirements. If not allowed, communities are to follow their state's requirements, which normally require public notices, hearings and specific adoption of revised maps by the community's legislative body.

Table R301.2(1) requires the local municipality or code user to insert a frost line depth entry for the particular geographical area they are located in. Commentary Figure R301.2(9) provides some guidance to do this more accurately based on the US Weather Bureau information. Since elevation above sea level may increase frost depth, another local resource for frost depth can be local graveyard owners.

In Table R301.2(1), under the title of Wind Design, Topographic effects, a jurisdiction must enter “yes” or “no.” This is in consideration of historical information indicating unusually high wind speeds due to local topography (see commentary, Section R301.2.1.5).

In the 2018 code, Table R301.2(1) was revised to add criteria related to ACCA Manual J for HVAC equipment sizing, which jurisdictions must designate based on Table 1a or 1b of Manual J and local conditions.

TABLE R301.2(2). See page 3-9.

❖ This table lists wind pressures for components or cladding building elements. For the 2015 edition, the table was revised to reflect ultimate design wind speed basis, as opposed to the basic wind speed basis used in previous editions.

The term “Cladding” is defined in Section R202. Although the ultimate design wind speed from Figure R301.2(5)A is applicable to the structure as a whole, this table applies to elements of the building that typically are not part of the wind-force-resisting system. Wind pressures on these elements vary depending on the tributary area, the location/orientation (i.e., a wall that is typically vertical versus a roof and its slope), the region or zone, as well as the ultimate design wind speed.

“Zones” refer to various portions of a structure as illustrated in Figure R301.2(9). Some zones, such as at roof edges and the ends of a wall, represent discontinuities in the exterior building surfaces. Discontinuities interrupt the flow of wind and result in higher wind pressures at these locations. How to determine the appropriate “effective wind area” is defined in Note a. This approach is taken from ASCE 7 and modified editorially to fit the table.

For each combination of these various factors there are two entries in the table, one positive and one negative. The positive number denotes the pressure acting inward, or toward the exterior surface of the building; the negative number denotes the pressure acting outward, or away from the building surface. The latter is of interest in designing roof elements and their hold-downs that must resist wind uplift.

Unlike the *International Building Code*® (IBC®), this code does not elaborate on the distinctions between wind loads on the main wind-force-resisting system versus components and cladding wind loads. Instead, compliance with the components and cladding pressures is necessary only where code provisions explicitly refer to this table. This occurs in the establishment of design wind loads for skylights, exterior windows, doors, walls, wall coverings, soffits, SIP headers, and rooftop-mounted photovoltaic panel or module systems (see Sections R301.2.1, R301.2.1.2, R602.3, R607.4.2, R609.2, R609.6.2 and R703.3.2, and Tables R610.8, R703.11.2 and R905.1).

TABLE R301.2(3). See page 3-10.

❖ This table provides adjustment factors for the components and cladding wind pressure of Table R301.2(2), which are based on a mean roof height of 30 feet (9144 mm) and wind Exposure Category B (see the commentary to Section R301.2.1.4 for a discussion of exposure). For mean roof heights and exposure categories that vary from those assumed in Table R301.2(2), the resulting pressure will change accordingly. Thus, adjustments to the pressures are required by the factors given in this table.

FIGURE R301.2(1). See page 3-10.

❖ This figure establishes the winter design temperature, which is a criteria for determining the need for dwelling unit heating (see Section R303.10), as well as determining the need for freeze protection of piping (see Sections M2301.2.6, P2603.5 and P3001.3).

FIGURE R301.2(2). See page 3-11

❖ This figure establishes the seismic design category for a site as presented in Section R301.2.2.1. It provides the most direct determination of the seismic design category in the code. The earthquake-related provisions of the code state requirements as a function of the seismic design category.

This figure reflects seismic hazard data developed by the U.S. Geological Survey (USGS) as part of its National Seismic Hazard Mapping Project, and related technical changes developed by the Building Seismic Safety Council’s (BSSC) Seismic Design Procedures Reassessment Group (SDPRG) as part of its work for the Federal Emergency Management Agency (FEMA).

The USGS and the FEMA-funded SDPRG worked together to update the seismic design maps and procedures for the 2009 edition of the *NEHRP* (National Earthquake Hazards Reduction Program) *Recommended Seismic Provisions for New Buildings and Other Structures*. The design maps are based on USGS updates to their seismic hazard data and ground motion attenuation formulas as well as the SDPRG’s use of risk-targeted ground motions, maximum direction ground motions, and near-source 84th percentile ground motions.

These IRC maps are different from earlier versions in that the division between Seismic Design Categories D2 and E has been changed from 118 percent g to 125 percent g. The 125 percent g contour would have been used in earlier maps but the mapping technology then available for drawing the IRC maps did not permit this to be done. The result of this change and the improved seismic hazard data generated by the USGS over the years is that the geographic region affected by the Seismic Design Category E designation is smaller. This occurs primarily in the region around Charleston, South Carolina, but is also evident in Seismic Design Category E regions in other parts of the United States. Maps developed on the same basis have been incorporated into the IBC which will allow engineers to design components of the building that are outside of the scope of the IRC with compatible seismic loads.

FIGURE R301.2(3). See page 3-16.

❖ See the commentary to Section R301.2 and Table R301.2(1).

FIGURE R301.2(4). See page 3-21.

❖ See the commentary to Section R301.2 and Table R301.2(1).

FIGURE R301.2(5)A. See page 3-22.

❖ See the commentary to Section R301.2.1.

FIGURE R301.2(5)B. See page 3-23.

❖ See the commentary to Section R301.2.1.

FIGURE R301.2(6). See pages 3-24.

❖ The ground snow-load map is taken from the ASCE 7 snow-load provisions and is based on statistical analysis of ground snow data. This map provides ground snow loads for direct use in the prescriptive provisions and tables of the code. Snow loads may increase due to lake effect or elevations. Check with local authorities for more refined snow-load maps.

FIGURE R301.2(7). See page 3-26.

❖ This figure establishes the potential for termite damage in areas of the continental United States. The boundaries for the various classifications are approximate, and local experience should be relied on either to affirm or to modify the classification determined from this map.

FIGURE R301.2(8). See page 3-27.

This figure depicts the zones for the components and cladding wind pressures that are given in Table R301.2(2). See the commentary to this table for a discussion of components and cladding.

R301.2.1 Wind design criteria. Buildings and portions thereof shall be constructed in accordance with the wind provisions of this code using the ultimate design wind speed in Table R301.2(1) as determined from Figure R301.2(5)A. The structural provisions of this code for wind loads are not permitted where wind design is required as specified in Section R301.2.1.1. Where different construction methods and structural materials are used for various portions of a building, the applicable requirements of this section for each portion shall apply. Where not otherwise specified, the wind loads listed in Table R301.2(2) adjusted for height and exposure using Table R301.2(3) shall be used to determine design load performance requirements for wall coverings, curtain walls, roof coverings, exterior windows, skylights, garage doors and exterior doors. Asphalt shingles shall be designed for wind speeds in accordance with Section R905.2.4. A continuous load path shall be provided to transmit the applicable uplift forces in Section R802.11.1 from the roof assembly to the foundation.

❖ Buildings must be capable of withstanding the wind loads based on the wind speed specified in Table R301.2(1). Jurisdictions determine the wind speeds used for entry in the table by the application of Figure R301.2(5)A. The structural provisions in the code are limited, however, and do not apply where wind design or structural engineering is required in accordance with Section R301.2.1.1. As buildings typically contain multiple construction methods and structural materials, the code's wind criteria applicable to each of the methods and materials that are incorporated in a building must be complied with. Wall coverings, curtain walls, roof coverings, exterior windows, skylights, garage doors and exterior doors must be capable of withstanding the component and cladding wind pressures of Table R301.2(2), as adjusted by the height and exposure coefficients given in Table R301.2(3).

Section R905.2.6 addresses the attachment details for asphalt shingles. Roofs with higher slopes or in areas subject to higher wind speeds may require special methods of attachment (see commentary, Section R905.2.6).

Wind loads are a major consideration in designing a structure's lateral-force-resisting system. See Commentary Figure R301.2.1 for a schematic representation of the lateral component of wind loading on a building. Wind loads affect more than the lateral load system, as evidenced by provisions such as the roof tie-down requirements of Section R802.11. A continuous load path must be provided to transmit the roof uplift forces to the foundation.

For the 2015 edition, the wind design provisions of this code were brought in line with the 2012 IBC and ASCE 7-10. New maps based on the ASCE 7-10 ultimate wind speed data, but converted back down to nominal (ASD) basis, were provided in previous editions of this code, which led to some confusion among those stakeholders who work with both this code and the IBC.

A working group of stakeholders including the National Association of Home Builders (NAHB), the major material associations, the American Society of Civil Engineers (ASCE), and the Insurance Institute for Business and Home Safety developed the ultimate wind speed basis for design. Thus the Chapter 3 wind design criteria and the corresponding definitions (see the definitions for "Hurricane-prone regions" and "Windborne debris region" in Section R202) were also updated. Further 2015 updates included:

- A new ultimate wind speed map [Figure R301.2(5)A in the 2018 code].
- A new map of the regions where special high-wind design is required [Figure R301.2(5)B in the 2018 code].
- Revisions to Table R301.2.1.3 for conversion of ultimate design wind speeds to nominal design

(ASD) wind speeds, for use with those standards that have not updated their provisions.

- Revisions to Table R301.2(2) for component and cladding pressures.
- The addition of Section R301.2.1.2.1 for substitutions and modifications to ASTM E1886.
- Revisions to Table R301.2.1.5.1 to reflect the change to the ultimate design basis, including the addition of a footnote indicating that buildings must be considered as “wind design required” where the ultimate design wind speed, as modified by the table, is 140 mph or more, as also required by Section R301.2.1.1.

One should take note of the areas identified as “special wind regions” in the ultimate wind speed map Figure R301.2(5)A, as well as other areas, described in the footnotes to the figure, where wind anomalies are observed. As the footnotes explain, these areas must be examined for unusual wind conditions. ASCE 7 discusses the use of regional climatic data in these areas. Section R301.2.1.5 provides greater detail for scenarios where topography causes a wind speed-up effect, which may overlap some of the special wind region considerations.

Figure R301.2(5)B defines the region where the use of alternate prescriptive high-wind standards or engineered design is required using the 130-mph contour along the Gulf Coast and along the southern portions of the Atlantic coast from Florida up to North Carolina. The 140-mph contour is used for the northern portions of the Atlantic coast from Virginia up to Maine, and for Alaska. A 130-mph trigger is also used for assorted Caribbean and Pacific islands that are considered part of the “hurricane-prone” region. This creates a region that approximately equals the region defined by the 110-mph contour under the wind map used in the 2000 through 2009 IRC, maintains areas of Florida and the Gulf Coast traditionally outside of the prescriptive limits of the IRC, and maintains areas of New England traditionally included within the prescriptive limits of the IRC.

Code users desiring a more accurate determination in areas near or along a particular contour (or in general) can make use of the Applied Technology Council’s (ATC) Windspeed by Location web site (http://www.atcouncil.org/windspeed/) to obtain site-specific wind speeds using latitude/longitude or site address. This site was developed by ATC using the same data used to develop the wind maps for ASCE 7, the IBC and the IRC.

Note that component and cladding pressure Table R301.2(2) uses ultimate design wind speed, but reports pressures at an ASD level. That is, the listed pressures incorporate the 0.6 multiplier on wind loads per the allowable stress design load combinations shown in Section 1605.3 of the IBC and Section 2.3.2 of ASCE 7-10. This is done here and throughout the updated code requirements to allow for easy adaptation of existing stock designs, construction documents and guidelines to the 2015 and 2018 IRC, as the loads and pressures will be comparable to previous editions of the code for most sites.

For the 2018 code, new seismic and alternative seismic design maps were included. [see Figures R301.2(2) and R301.2(3)].

R301.2.1.1 Wind limitations and wind design required. The wind provisions of this code shall not apply to the design of buildings where wind design is required in accordance with Figure R301.2(5)B.

Exceptions:

1. For concrete construction, the wind provisions of this code shall apply in accordance with the limitations of Sections R404 and R608.
2. For structural insulated panels, the wind provisions of this code shall apply in accordance with the limitations of Section R610.
3. For cold-formed steel light-frame construction, the wind provisions of this code shall apply in accordance with the limitations of Sections R505, R603 and R804.

In regions where wind design is required in accordance with Figure R301.2(5)B, the design of buildings for wind loads shall be in accordance with one or more of the following methods:

1. AWC *Wood Frame Construction Manual* (WFCM).
2. ICC *Standard for Residential Construction in High-Wind Regions* (ICC 600).
3. ASCE *Minimum Design Loads for Buildings and Other Structures* (ASCE 7).
4. AISI *Standard for Cold-Formed Steel Framing—Prescriptive Method For One- and Two-Family Dwellings* (AISI S230).
5. *International Building Code.*

The elements of design not addressed by the methods in Items 1 through 5 shall be in accordance with the provisions of this code.

Where ASCE 7 or the *International Building Code* is used for the design of the building, the wind speed map and exposure category requirements as specified in ASCE 7 and the *International Building Code* shall be used.

❖ With the exception of concrete construction, structural insulated panel (SIP) construction and cold-formed steel light-frame construction, the prescriptive structural provisions in the code do not apply where wind design is required in accordance with Figure R301.2(5)B. The prescriptive provisions for concrete exterior walls are applicable in regions with design wind speeds up to 160 mph (72 m/s), where the site is classified as Exposure B, 136 mph (61 m/s) for Exposure C and 125 mph (56 m/s) for Exposure D (see commentary, Section R608.2). The prescriptive SIP provisions are applicable in regions with ultimate design wind speeds of less than or equal to 155 mph (69 m/s), where the site is classified as Exposure B and 140 mph (63 m/s) where the site is classified as

Exposure C (see commentary, Section R610.2).

Where the ultimate design wind speed exceeds the limitations given in the code, the prescriptive provisions of the code are not applicable. In such regions, structures must be designed or engineered for wind loads. For this purpose, the code expressly allows the use of AF&PA WFCM; ICC 600, *Standard for Residential Construction in High-Wind Regions*; ASCE 7, *Minimum Design Loads for Buildings and Other Structures*; and AISI S230, *Standard for Cold-Formed Steel Framing—Prescriptive Method for One- and Two-Family Dwellings*. Some of these referenced standards have prescriptive provisions for regions that the code does not.

The building elements not addressed by Methods 1 through 5 must be in accordance with the provisions of the code. Only the structural design of the building to resist wind loads or seismic loads, and the selection of certain critical components such as window or roofing that is prone to wind damage, must be performed in accordance with Methods 1 through 5. The remaining provisions of the code including, but not limited to, architectural, mechanical, electrical and plumbing still apply to the building (see also the commentary to Section R301.2.1).

R301.2.1.1.1 Sunrooms. *Sunrooms* shall comply with AAMA/NPEA/NSA 2100. For the purpose of applying the criteria of AAMA/NPEA/NSA 2100 based on the intended use, *sunrooms* shall be identified as one of the following categories by the permit applicant, design professional or the property owner or owner's agent in the construction documents. Component and cladding pressures shall be used for the design of elements that do not qualify as main windforce-resisting systems. Main windforce-resisting system pressures shall be used for the design of elements assigned to provide support and stability for the overall *sunroom*.

Category I: A thermally isolated *sunroom* with walls that are open or enclosed with insect screening or 0.5 mm (20 mil) maximum thickness plastic film. The space is nonhabitable and unconditioned.

Category II: A thermally isolated *sunroom* with enclosed walls. The openings are enclosed with translucent or transparent plastic or glass. The space is nonhabitable and unconditioned.

Category III: A thermally isolated *sunroom* with enclosed walls. The openings are enclosed with translucent or transparent plastic or glass. The sunroom fenestration complies with additional requirements for air infiltration resistance and water penetration resistance. The space is nonhabitable and unconditioned.

Category IV: A thermally isolated *sunroom* with enclosed walls. The sunroom is designed to be heated or cooled by a separate temperature control or system and is thermally isolated from the primary structure. The *sunroom* fenestration complies with additional requirements for water penetration resistance, air infiltration resistance and thermal performance. The space is nonhabitable and conditioned.

Category V: A *sunroom* with enclosed walls. The sunroom is designed to be heated or cooled and is open to the main structure. The *sunroom* fenestration complies with additional requirements for water penetration resistance, air infiltration resistance and thermal performance. The space is habitable and conditioned.

❖ The code defines a sunroom in Section R202 as "A one-story structure attached to a dwelling with a glazing area in excess of 40 percent of the gross area of the structure's exterior walls and roof." These structures are typically constructed using either typical wood framing techniques or a stick system that consists of prefabricated framing of aluminum, fiberglass, wood or other materials, with glass or opaque wall or roof panels, and steel or aluminum connections.

The first technique can be done in accordance with the provisions of the IRC for wood-framed construction. This section addresses the second method of constructing a sunroom. The provisions clarify the requirements for such sunrooms by referencing the provisions of AAMA/NPEA/NSA 2100-12, Specifications for Sunrooms. Sunrooms designed and constructed in accordance with AAMA/NPEA/NSA 2100 are required in the standard to meet the structural provisions of the IRC or the IBC; therefore, the appropriate engineering analysis has already been conducted for these structures. In addition, the standard establishes the specific requirements for these unique structures based on one of five designated categories. The intended category must be indicated in the construction documents. Those portions of the sunroom that are not part of the main wind-force-resisting system must be designed using component and cladding pressures. Main windforce-resisting-system pressures must be considered in the design of the structural elements of the sunroom.

In 2002 the American Architectural Manufacturers Association (AAMA), the National Sunroom Association (NSA) and the National Patio Enclosure Association (NPEA) published the first U.S. standard for the design and specification of sunrooms—AAMA/NPEA/NSA 2100–02. The standard established five categories of sunrooms based on the intended use of the space, and established specific design and performance criteria for them based on the end use.

As the document began to be used and referenced in various local codes (such as the *Florida Building Code*) the members of the AAMA Sunroom Council and NSA became aware that improvements and updates were needed. These improvements included revisions that would bring the document in line with the requirements of AAMA/WDMA/CSA 101/I.S.2/A440 for the design, testing and labeling of windows, glass doors and skylights, and revisions that would bring the foundation requirements more closely in line with the requirements of the IRC.

Commentary Figure R301.2.1.1.1 provides an overview of the requirements of AAMA/NPEA/NSA 2100 as they apply to the various categories of sunrooms.

TABLE R301.2(1)
CLIMATIC AND GEOGRAPHIC DESIGN CRITERIA

GROUND SNOW LOAD[o]	WIND DESIGN				SEISMIC DESIGN CATEGORY[f]	SUBJECT TO DAMAGE FROM			WINTER DESIGN TEMP[e]	ICE BARRIER UNDERLAYMENT REQUIRED[h]	FLOOD HAZARDS[g]	AIR FREEZING INDEX[i]	MEAN ANNUAL TEMP[j]
	Speed[d] (mph)	Topographic effects[k]	Special wind region[l]	Windborne debris zone[m]		Weathering[a]	Frost line depth[b]	Termite[c]					
—	—	—	—	—	—	—	—	—	—	—	—	—	—

MANUAL J DESIGN CRITERIA[n]

Elevation	Latitude	Winter heating	Summer cooling	Altitude correction factor	Indoor design temperature	Design temperature cooling	Heating temperature difference
—	—	—	—	—	—	—	—
Cooling temperature difference	**Wind velocity heating**	**Wind velocity cooling**	**Coincident wet bulb**	**Daily range**	**Winter humidity**	**Summer humidity**	—
—	—	—	—	—	—	—	—

For SI: 1 pound per square foot = 0.0479 kPa, 1 mile per hour = 0.447 m/s.

a. Where weathering requires a higher strength concrete or grade of masonry than necessary to satisfy the structural requirements of this code, the frost line depth strength required for weathering shall govern. The weathering column shall be filled in with the weathering index, "negligible," "moderate" or "severe" for concrete as determined from Figure R301.2(4). The grade of masonry units shall be determined from ASTM C34, C55, C62, C73, C90, C129, C145, C216 or C652.

b. Where the frost line depth requires deeper footings than indicated in Figure R403.1(1), the frost line depth strength required for weathering shall govern. The jurisdiction shall fill in the frost line depth column with the minimum depth of footing below finish grade.

c. The jurisdiction shall fill in this part of the table to indicate the need for protection depending on whether there has been a history of local subterranean termite damage.

d. The jurisdiction shall fill in this part of the table with the wind speed from the basic wind speed map [Figure R301.2(5)A]. Wind exposure category shall be determined on a site-specific basis in accordance with Section R301.2.1.4.

e. The outdoor design dry-bulb temperature shall be selected from the columns of $97^1/_2$-percent values for winter from Appendix D of the *International Plumbing Code*. Deviations from the Appendix D temperatures shall be permitted to reflect local climates or local weather experience as determined by the building official. [Also see Figure R301.2(1).]

f. The jurisdiction shall fill in this part of the table with the seismic design category determined from Section R301.2.2.1.

g. The jurisdiction shall fill in this part of the table with (a) the date of the jurisdiction's entry into the National Flood Insurance Program (date of adoption of the first code or ordinance for management of flood hazard areas), (b) the date(s) of the Flood Insurance Study and (c) the panel numbers and dates of the currently effective FIRMs and FBFMs or other flood hazard map adopted by the authority having jurisdiction, as amended.

h. In accordance with Sections R905.1.2, R905.4.3.1, R905.5.3.1, R905.6.3.1, R905.7.3.1 and R905.8.3.1, where there has been a history of local damage from the effects of ice damming, the jurisdiction shall fill in this part of the table with "YES." Otherwise, the jurisdiction shall fill in this part of the table with "NO."

i. The jurisdiction shall fill in this part of the table with the 100-year return period air freezing index (BF-days) from Figure R403.3(2) or from the 100-year (99 percent) value on the National Climatic Data Center data table "Air Freezing Index-USA Method (Base 32°F)."

j. The jurisdiction shall fill in this part of the table with the mean annual temperature from the National Climatic Data Center data table "Air Freezing Index-USA Method (Base 32°F)."

k. In accordance with Section R301.2.1.5, where there is local historical data documenting structural damage to buildings due to topographic wind speed-up effects, the jurisdiction shall fill in this part of the table with "YES." Otherwise, the jurisdiction shall indicate "NO" in this part of the table.

l. In accordance with Figure R301.2(5)A, where there is local historical data documenting unusual wind conditions, the jurisdiction shall fill in this part of the table with "YES" and identify any specific requirements. Otherwise, the jurisdiction shall indicate "NO" in this part of the table.

m. In accordance with Section R301.2.1.2 the jurisdiction shall indicate the wind-borne debris wind zone(s). Otherwise, the jurisdiction shall indicate "NO" in this part of the table.

n. The jurisdiction shall fill in these sections of the table to establish the design criteria using Table 1a or 1b from ACCA Manual J or established criteria determined by the jurisdiction.

o. The jurisdiction shall fill in this section of the table using the Ground Snow Loads in Figure R301.2(6).