

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.

**R301.2.1.2 Protection of openings.** Exterior glazing in buildings located in windborne debris regions shall be protected from windborne debris. Glazed opening protection for windborne debris shall meet the requirements of the Large Missile Test of ASTM E1996 and ASTM E1886 as modified in Section 301.2.1.2.1. Garage door glazed opening protection for windborne debris shall meet the requirements of an *approved* impact-resisting standard or ANSI/DASMA 115.

**Exception:** Wood structural panels with a thickness of not less than  $\frac{7}{16}$  inch (11 mm) and a span of not more than 8 feet (2438 mm) shall be permitted for opening protection. Panels shall be precut and attached to the framing surrounding the opening containing the product with the glazed opening. Panels shall be predrilled as required for the anchorage method and shall be secured with the attachment hardware provided. Attachments shall be designed to resist the component and cladding loads determined in accordance with either Table R301.2(2) or ASCE 7, with the permanent corrosion-resistant attachment hardware provided and anchors permanently installed on the building. Attachment in accordance with Table R301.2.1.2 is permitted for buildings with a *mean roof height* of 45 feet (13 728 mm) or less where the ultimate design wind speed,  $V_{ult}$ , is 180 mph (290 kph) or less.

**R301.2.1.2.1 Application of ASTM E1996.** The text of Section 2.2 of ASTM E1996 shall be substituted as follows:

2.2 ASCE Standard:

ASCE 7-10 American Society of Civil Engineers *Minimum Design Loads for Buildings and Other Structures*

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

6.2.2 Unless otherwise specified, select the wind zone based on the ultimate design wind speed,  $V_{ult}$ , as follows:

6.2.2.1 Wind Zone 1–130 mph  $\leq$  ultimate design wind speed,  $V_{ult} < 140$  mph.

6.2.2.2 Wind Zone 2–140 mph  $\leq$  ultimate design wind speed,  $V_{ult} < 150$  mph at greater than 1 mile (1.6 km) from the coastline. The coastline shall be measured from the mean high-water mark.

6.2.2.3 Wind Zone 3–150 mph (58 m/s)  $\leq$  ultimate design wind speed,  $V_{ult} \leq 170$  mph (76 m/s), or 140 mph (54 m/s)  $\leq$  ultimate design wind speed,  $V_{ult} \leq 170$  mph (76 m/s) and within 1 mile (1.6 km) of the coastline. The coastline shall be measured from the mean high-water mark.

6.2.2.4 Wind Zone 4–ultimate design wind speed,  $V_{ult} > 170$  mph (76 m/s).

**TABLE R301.2.1.2  
WINDBORNE DEBRIS PROTECTION FASTENING  
SCHEDULE FOR WOOD STRUCTURAL PANELS<sup>a, b, c, d</sup>**

FASTENER TYPE	FASTENER SPACING (inches) <sup>a, b</sup>		
	Panel span $\leq$ 4 feet	4 feet < panel span $\leq$ 6 feet	6 feet < panel span $\leq$ 8 feet
No. 8 wood-screw-based anchor with 2-inch embedment length	16	10	8
No. 10 wood-screw-based anchor with 2-inch embedment length	16	12	9
$\frac{1}{4}$ -inch lag-screw-based anchor with 2-inch embedment length	16	16	16

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound = 4.448 N, 1 mile per hour = 0.447 m/s.

- a. This table is based on 180 mph ultimate design wind speeds,  $V_{ult}$ , and a 45-foot mean roof height.
- b. Fasteners shall be installed at opposing ends of the wood structural panel. Fasteners shall be located not less than 1 inch from the edge of the panel.
- c. Anchors shall penetrate through the exterior wall covering with an embedment length of not less than 2 inches into the building frame. Fasteners shall be located not less than  $2\frac{1}{2}$  inches from the edge of concrete block or concrete.
- d. Panels attached to masonry or masonry/stucco shall be attached using vibration-resistant anchors having an ultimate withdrawal capacity of not less than 1,500 pounds.

**R301.2.1.3 Wind speed conversion.** Where referenced documents are based on nominal design wind speeds and do not provide the means for conversion between ultimate design wind speeds and nominal design wind speeds, the ultimate design wind speeds,  $V_{ult}$ , of Figure R301.2(5)A shall be converted to nominal design wind speeds,  $V_{asd}$ , using Table R301.2.1.3.

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

GROUND SNOW LOAD <sup>o</sup>	WIND DESIGN			SEISMIC DESIGN CATEGORY <sup>f</sup>	SUBJECT TO DAMAGE FROM			WINTER DESIGN TEMP <sup>g</sup>	ICE BARRIER UNDERLAYMENT REQUIRED <sup>h</sup>	FLOOD HAZARDS <sup>g</sup>	AIR FREEZING INDEX <sup>i</sup>	MEAN ANNUAL TEMP <sup>j</sup>
	Speed <sup>d</sup> (mph)	Topographic effects <sup>k</sup>	Special wind region <sup>l</sup>		Windborne debris zone <sup>m</sup>	Weathering <sup>a</sup>	Frost line depth <sup>b</sup>					
See Bulletin 19-1	N/A	N/A	N/A	N/A	Severe	2'6" SNJ; 3'0" NNJ	Moderate to Heavy	13°F	See Bulletin 07-3	LFLPA	1500 or less	See Note j
<b>MANUAL J DESIGN CRITERIA<sup>n</sup></b> (see Table 1a from ACCA Manual J; fill in criteria from the closest municipality)												
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.

N/A = Not applicable.

- 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. New Jersey is divided into two zones: SNJ consists of Monmouth and Burlington Counties and all counties to the south; NNJ consists of Mercer and Middlesex Counties and all counties to the north. 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. See the local floodplain administrator (LFLPA). 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).

**R318.1.1 Quality mark.** Lumber and plywood required to be pressure-preservative treated in accordance with Section R318.1 shall bear the quality *mark* of an *approved* inspection agency that maintains continuing supervision, testing and inspection over the quality of the product and that has been *approved* by an accreditation body that complies with the requirements of the American Lumber Standard Committee treated wood program.

**R318.1.2 Field treatment.** Field-cut ends, notches and drilled holes of pressure-preservative-treated wood shall be retreated in the field in accordance with AWP A M4.

**R318.2 Chemical termiticide treatment.** Chemical termiticide treatment shall include soil treatment or field-applied wood treatment. The concentration, rate of application and method of treatment of the chemical termiticide shall be in strict accordance with the termiticide *label*.

**R318.3 Barriers.** *Approved* physical barriers, such as metal or plastic sheeting or collars specifically designed for termite prevention, shall be installed in a manner to prevent termites from entering the structure. Shields placed on top of an exterior foundation wall shall be used only if in combination with another method of protection.

**R318.4 Foam plastic protection.** In areas where the probability of termite infestation is “very heavy” as indicated in Figure R301.2(7), extruded and expanded polystyrene, polyisocyanurate and other foam plastics shall not be installed on the exterior face or under interior or exterior foundation walls or slab foundations located below *grade*. The clearance between foam plastics installed above *grade* and exposed earth shall be not less than 6 inches (152 mm).

**Exceptions:**

1. Buildings where the structural members of walls, floors, ceilings and roofs are entirely of noncombustible materials or pressure-preservative-treated wood.
2. Where in *addition* to the requirements of Section R318.1, an *approved* method of protecting the foam plastic and structure from subterranean termite damage is used.
3. On the interior side of *basement walls*.

**SECTION R319  
SITE ADDRESS**

**R319.1 Address identification.** Buildings shall be provided with *approved* address identification. The address identification shall be legible and placed in a position that is visible from the street or road fronting the property. Address identification characters shall contrast with their background. Each character shall be not less than 4 inches (102 mm) in height with a stroke width of not less than 0.5 inch (12.7 mm). Where required by the fire protection subcode official, address identification shall be provided in additional *approved* locations to facilitate emergency response. Where access is by means of a private road and the building address cannot be viewed from the public way, a monument, pole or other sign or means shall be used to identify the structure.

**SECTION R320  
ACCESSIBILITY**

Deleted.

**SECTION R321  
ELEVATORS AND PLATFORM LIFTS**

Deleted.

**SECTION R322  
FLOOD-RESISTANT CONSTRUCTION**

**R322.1 General.** Buildings and structures constructed in whole or in part in flood hazard areas, including A or V Zones and Coastal A Zones, as established in Table R301.2(1), and substantial improvement and restoration of substantial damage of buildings and structures in flood hazard areas, shall be designed and constructed in accordance with the provisions contained in this section. Buildings and structures that are located in more than one flood hazard area shall comply with the provisions associated with the most restrictive flood hazard area. Buildings and structures located in whole or in part in identified floodways shall be designed and constructed in accordance with ASCE 24.

**R322.1.1 Alternative provisions.** Deleted.

**R322.1.2 Structural systems.** Structural systems of buildings and structures shall be designed, connected and anchored to resist flotation, collapse or permanent lateral movement due to structural loads and stresses from flooding equal to the design flood elevation.

**R322.1.3 Flood-resistant construction.** Buildings and structures erected in areas prone to flooding shall be constructed by methods and practices that minimize flood damage.

**R322.1.4 Establishing the design flood elevation.** The design flood elevation shall be used to define flood hazard areas. At a minimum, the design flood elevation shall be the higher of the following:

1. The base flood elevation at the depth of peak elevation of flooding, including wave height, that has a 1-percent (100-year flood) or greater chance of being equaled or exceeded in any given year.
2. The elevation of the design flood associated with the area designated on a flood hazard map adopted by the community, or otherwise legally designated.

**R322.1.4.1 Determination of design flood elevations.** If design flood elevations are not specified, the *building official* is authorized to require the applicant to comply with either of the following:

1. Obtain and reasonably use data available from a federal, state or other source.
2. Determine the design flood elevation 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. Studies, analyses and computations shall be submitted in sufficient detail to allow thorough review and approval.

**R322.1.4.2 Determination of impacts.** In riverine flood hazard areas where design flood elevations are specified but floodways have not been designated, the applicant shall demonstrate that the effect of the proposed buildings and structures on design flood elevations, including fill, when combined with other existing and anticipated flood hazard area encroachments, will not increase the design flood elevation more than 1 foot (305 mm) at any point within the *jurisdiction*.

**R322.1.5 Lowest floor.** The lowest floor shall be the lowest floor of the lowest enclosed area, including *basement*, and excluding any unfinished flood-resistant enclosure that is useable solely for vehicle parking, building access or limited storage provided that such enclosure is not built so as to render the building or structure in violation of this section.

**R322.1.6 Protection of mechanical, plumbing and electrical systems.** Electrical systems, *equipment* and components; heating, ventilating, air-conditioning; plumbing *appliances* and plumbing fixtures; *duct systems*; and other service *equipment* shall be located at or above the elevation required in Section R322.2 or R322.3. Systems, fixtures, and *equipment* and components shall not be mounted on or penetrate through walls intended to break away under flood loads.

**Exception:** Locating electrical systems, *equipment* and components; heating, ventilating, air-conditioning; plumbing *appliances* and plumbing fixtures; *duct systems*; and other service *equipment* is permitted below the elevation required in Section R322.2 or R322.3 provided that they are designed and installed to prevent water from entering or accumulating within the components and to resist hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding to the design flood elevation in accordance with ASCE 24. Electrical wiring systems are permitted to be located below the required elevation provided that they conform to the provisions of the electrical part of this code for wet locations.

**R322.1.7 Protection of water supply and sanitary sewage systems.** New water supply systems shall be designed to minimize or eliminate infiltration of flood waters into the systems in accordance with the plumbing provisions of this code. New sanitary sewage systems shall be designed to minimize or eliminate infiltration of floodwaters into systems and discharges from systems into floodwaters in accordance with the plumbing subcode (*N.J.A.C. 5:23-3.15*).

**R322.1.8 Flood-resistant materials.** Building materials and installation methods used for flooring and interior and exterior walls and wall coverings below the elevation required in Section R322.2 or R322.3 shall be flood damage-resistant materials that conform to the provisions of FEMA TB-2.

**R322.1.9 Manufactured homes.** The bottom of the frame of **relocated** *manufactured homes* on foundations that conform to the requirements of Section R322.2 or R322.3, as applicable, shall be elevated to or above the elevations specified in Section R322.2 (flood hazard areas including A Zones) or R322.3 in coastal high-hazard areas (V Zones and Coastal A Zones). The anchor and tie-down requirements of the applicable state or federal requirements shall apply. The foundation and anchorage of *manufactured homes* to be located in identified floodways shall be designed and constructed in accordance with ASCE 24.

**R322.1.10 As-built elevation documentation.** A registered *design professional* shall prepare and seal documentation of the elevations specified in Section R322.2 or R322.3.

**R322.2 Flood hazard areas (including A Zones).** Areas that have been determined to be prone to flooding and that are not subject to high-velocity wave action shall be designated as flood hazard areas. Flood hazard areas that have been delineated as subject to wave heights between 1½ feet (457 mm) and 3 feet (914 mm) or otherwise designated by the jurisdiction shall be designated as Coastal A Zones and are subject to the requirements of Section R322.3. Buildings and structures constructed in whole or in part in flood hazard areas shall be designed and constructed in accordance with Sections R322.2.1 through R322.2.3.

#### R322.2.1 Elevation requirements.

1. Buildings and structures in flood hazard areas, including flood hazard areas designated as Coastal A Zones, shall have the lowest floors elevated to or above the base flood elevation plus 1 foot (305 mm), or the design flood elevation, whichever is higher.
2. In areas of shallow flooding (AO Zones), buildings and structures shall have the lowest floor (including *basement*) elevated to a height above the highest adjacent *grade* of not less than the depth number specified in feet (mm) on the FIRM plus 1 foot (305 mm), or not less than 3 feet (915 mm) if a depth number is not specified.
3. Basement floors that are below *grade* on all sides shall be elevated to or above base flood elevation plus 1 foot (305 mm), or the design flood elevation, whichever is higher.

**Exception:** Enclosed areas below the design flood elevation, including *basements* with floors that are not below *grade* on all sides, shall meet the requirements of Section R322.2.2.

**R322.2.2 Enclosed area below design flood elevation.** Enclosed areas, including crawl spaces, that are below the design flood elevation shall:

1. Be used solely for parking of vehicles, building access or storage.
2. Be provided with flood openings that meet the following criteria and are installed in accordance with Section R322.2.2.1:

tem in accordance with Section P2904 shall not be greater than one-half of the floor area of the room, provided that the mezzanine meets all of the following requirements:

1. Except for enclosed closets and bathrooms, the mezzanine is open to the room in which such mezzanine is located.
2. The opening to the room is unobstructed except for walls not more than 42 inches (1067 mm) in height, columns and posts.
3. The exceptions to Section R325.5 are not applied.

**R325.4 Means of egress.** The means of egress for mezzanines shall comply with the applicable provisions of Section R311.

**R325.5 Openness.** Mezzanines shall be open and unobstructed to the room in which they are located except for walls not more than 36 inches (914 mm) in height, columns and posts.

**Exceptions:**

1. Mezzanines or portions thereof are not required to be open to the room in which they are located, provided that the aggregate floor area of the enclosed space is not greater than 10 percent of the mezzanine area.
2. In buildings that are not more than two stories above *grade plane* and equipped throughout with an automatic sprinkler system in accordance with Section R313, a mezzanine shall not be required to be open to the room in which the mezzanine is located.

**R325.6 Habitable attic.** Deleted.

**SECTION R326  
SWIMMING POOLS, SPAS AND HOT TUBS**

**R326.1 General.** The design and construction of pools and spas and enclosures shall comply with the *International Swimming Pool and Spa Code*. Amendments to the ISPSC shall be as follows:

1. Chapter 1, Scope and Administration, shall be deleted in its entirety and “See the administrative provisions of *N.J.A.C. 5:23*.” shall be inserted. In addition, any referenced section of Chapter 1 shall be deleted throughout the code and “the administrative provisions of the Uniform Construction Code (*N.J.A.C. 5:23*)” shall be inserted.
2. Chapter 2, Definitions, shall be amended as follows:
  - 2.1. In Section 201.3, Terms defined in other codes, “*International Plumbing Code*” shall be deleted and “plumbing subcode (*N.J.A.C. 5:23-3.15*)” shall be inserted.
  - 2.2. In Section 202, Definitions:
    - 2.2.1. The definition of “alteration” shall be deleted.
    - 2.2.2. The definition of “code official” shall be deleted and the following shall be inserted: “Construction Official. A qualified person appointed by the

municipal appointing authority or the commissioner pursuant to the act and the regulations to enforce and administer the regulations within the jurisdiction of the enforcing agency.”

- 2.2.3. The definition of “existing pool or spa” shall be deleted.
- 2.2.4. The definition of “owner” shall be deleted and the following shall be inserted: “Owner. The owner or owners in fee of the property of a lesser estate therein, a mortgagee or vendee in possession, an assignee of rents, receiver, executor, trustee, lessee or any other person, firm or corporation, directly or indirectly in control of a building, structure or real property, and shall include any subdivision thereof of the State.”
- 2.2.5. The definitions of “permit” and “repair” shall be deleted.

3. Chapter 3, General Compliance, shall be amended as follows:

- 3.1. In Section 302.1, Electrical, “or the *International Residential Code*, as applicable in accordance with Section 102.7.1” shall be deleted.
- 3.2. In Section 302.2, Water service drainage, “*International Plumbing Code*” shall be deleted and “plumbing subcode (*N.J.A.C. 5:23-3.15*)” shall be inserted.
- 3.3. In Sections 302.5, Backflow prevention, and 302.6, Waste-water discharge, “*International Plumbing Code* or the *International Residential Code*, as applicable in accordance with Section 102.7.1” shall be deleted and “plumbing subcode (*N.J.A.C. 5:23-3.15*)” shall be inserted.
- 3.4. Section 305, Barrier requirements, shall be amended as follows:
  - 3.4.1. In Section 305.1, General, in the second sentence, “and swimming pools are equipped with a powered safety cover that complies with ASTM F1346” shall be deleted. Also in the second sentence, “, hot tubs or pools” shall be replaced with “or hot tubs.”
  - 3.4.2. Section 305.4, Structure wall as a barrier, shall be deleted.
  - 3.4.3. In Section 305.5, On ground residential pool structure as a barrier, in Item 3, “capable of being secured, locked or removed to prevent access except where the ladder or steps are” shall be deleted.

- 3.5. In Section 306.1, General, “in accordance with Section 102.7” shall be deleted.
- 3.6. Sections 306.3, Step risers and treads, and 306.4, Deck steps handrail required, shall be deleted.
- 3.7. In Section 306.9.1, Hose bibbs, “*International Plumbing Code* or the *International Residential Code*, as applicable in accordance with Section 102.7.1” shall be deleted and “plumbing subcode (*N.J.A.C. 5:23-3.15*)” shall be inserted.
- 3.8. In Sections 307.1.1, Glazing in hazardous locations, 307.2.2, Materials and structural design, 307.1.3, Roofs or canopies, 316.4, Installation, and 316.6.1, Installation, “in accordance with Section 102.7.1” shall be deleted.
- 3.9. In Section 318.2, Protection of potable water supply, “*International Residential Code* or the *International Plumbing Code* or, as applicable in accordance with Section 102.7.1” shall be deleted and “plumbing subcode (*N.J.A.C. 5:23-3.15*)” shall be inserted.
- 3.10. In Section 321.4, Residential pool and deck illumination, “or the *International Residential Code*, as applicable in accordance with Section 102.7.1” shall be deleted.
4. Chapter 4, Public swimming pools, shall be amended as follows:
- 4.1. In Section 410.1, Dressing and sanitary facilities, “*International Plumbing Code*” shall be deleted and “plumbing subcode (*N.J.A.C. 5:23-3.15*)” shall be inserted.
5. Amendments to Chapter 6, Aquatic recreation facilities, shall be amended as follows:
- 5.1. In Section 601.1, Scope, the following sentence shall be added to the end of the paragraph, “For purposes of enforcement, Class D-2 and Class D-6 public pools shall be regulated by this chapter and *N.J.A.C. 5:23*; all other Class D public pools shall be regulated by *N.J.A.C. 5:14A*.”
- 5.2. In Section 609.1, General, “Section 609.2 through 609.9” shall be deleted and “the plumbing subcode (*N.J.A.C. 5:23-3.15*)” shall be inserted.
- 5.3. Sections 609.2, Number of fixtures, 609.3, Showers, 609.4, Soap dispensers, 609.5, Toilet tissue holder, 609.6, Lavatory mirror, 609.7, Sanitary napkin receptacles, 609.8, Sanitary napkin dispensers, and 609.9, Infant Care, shall be deleted.

## SECTION R327 STATIONARY STORAGE BATTERY SYSTEMS

**R327.1 General.** *Stationary storage battery system* shall comply with the provisions of this section.

**R327.2 Equipment listings.** *Stationary storage battery systems* shall be *listed* and *labeled* for residential use in accordance with UL 9540.

### Exceptions:

1. Where *approved*, repurposed unlisted battery systems from electric vehicles are allowed to be installed outdoors or in detached sheds located not less than 5 feet (1524 mm) from exterior walls, property lines and public ways.
2. *Battery systems* that are an integral part of an electric vehicle are allowed provided that the installation complies with Section 625.48 of NFPA 70.
3. Battery systems less than 1 kWh (3.6 megajoules).

**R327.3 Installation.** *Stationary storage battery systems* shall be installed in accordance with the manufacturer’s instructions and their *listing*, if applicable, and shall not be installed within the habitable space of a dwelling unit.

**R327.4 Electrical installation.** *Stationary storage battery systems* shall be installed in accordance with NFPA 70. Inverters shall be *listed* and *labeled* in accordance with UL 1741 or provided as part of the UL 9540 listing. Systems connected to the utility grid shall use inverters listed for utility interaction.

**R327.5 Ventilation.** Indoor installations of *stationary storage battery systems* that include batteries that produce hydrogen or other flammable gases during charging shall be provided with ventilation in accordance with Section M1307.4.

**R327.6 Protection from impact.** *Stationary storage battery systems* installed in a location subject to vehicle damage shall be protected by approved barriers.

## SECTION G2412 (401) GENERAL

**G2412.1 (401.1) Scope.** This section shall govern the design, installation, modification and maintenance of *piping systems*. The applicability of this *code* to *piping systems* extends from the *point of delivery* to the connections with the *appliances* and includes the design, materials, components, fabrication, assembly, installation, testing, inspection, operation and maintenance of such *piping systems*.

**G2412.1.1 (401.1.1) Utility piping systems located within buildings.** Utility service *piping* located within buildings shall be installed in accordance with the structural safety and fire protection provisions of this code.

**G2412.2 (401.2) Liquefied petroleum gas storage.** The storage system for liquefied petroleum gas shall be designed and installed in accordance with the International Fire Code and NFPA 58. Notwithstanding the provisions contained in NFPA 58, the installation of LP-gas containers on roofs of buildings shall be strictly prohibited

**G2412.3 (401.3) Modifications to existing systems.** Deleted.

**G2412.4 (401.4) Additional appliances.** Where an additional *appliance* is to be served, the existing *piping* shall be checked to determine if it has adequate capacity for all *appliances* served. If inadequate, the existing system shall be enlarged as required or separate *piping* of adequate capacity shall be provided.

**G2412.5 (401.5) Identification.** For other than steel *pipe*, exposed *piping* shall be identified by a yellow label marked "Gas" in black letters. The marking shall be spaced at intervals not exceeding 5 feet (1524 mm). The marking shall not be required on *pipe* located in the same room as the *appliance* served.

**G2412.6 (401.6) Interconnections.** Where two or more *meters* are installed on the same premises but supply separate consumers, the *piping systems* shall not be interconnected on the outlet side of the *meters*.

**G2412.7 (401.7) Piping meter identification.** *Piping* from multiple *meter* installations shall be marked with an *approved* permanent identification by the installer so that the *piping system* supplied by each *meter* is readily identifiable.

**G2412.8 (401.8) Minimum sizes.** *Pipe* utilized for the installation, extension and *alteration* of any *piping system* shall be sized to supply the full number of outlets for the intended purpose and shall be sized in accordance with Section G2413.

**G2412.9 (401.9) Identification.** Each length of pipe and tubing and each pipe fitting, utilized in a fuel gas system, shall bear the identification of the manufacturer.

### Exceptions:

1. Steel pipe sections that are 2 feet (610 mm) and less in length and are cut from longer sections of pipe.
2. Steel pipe fittings 2 inches and less in size.
3. Where identification is provided on the product packaging or crating.
4. Where other approved documentation is provided.

**G2412.10 (401.10) Piping materials standards.** Piping, tubing and fittings shall be manufactured to the applicable referenced standards, specifications and performance criteria listed in Section G2414 and shall be identified in accordance with Section G2412.9.

**G2412.11 (401.9) Protection from vehicle impact.** Gas meters, related regulators and piping that are installed indoors or outdoors and are subject to vehicle impact shall be protected by barriers meeting the requirements of Section 312 of the *International Fire Code*. For the purpose of applying this provision, "subject to vehicle impact" shall mean located within 3 feet (914 mm) of any garage door opening, driveway or designated parking area and not separated by a building wall from the space where a vehicle may be operated.

**Exception:** If verification of the installation of an excess flow valve is provided by the gas utility, vehicle impact barriers shall not be required.

## SECTION G2413 (402) PIPE SIZING

**G2413.1 (402.1) General considerations.** *Piping systems* shall be of such size and so installed as to provide a supply of gas sufficient to meet the maximum *demand* and supply gas to each *appliance* inlet at not less than the minimum supply pressure required by the *appliance*.

**G2413.2 (402.2) Maximum gas demand.** The volumetric flow rate of gas to be provided shall be the sum of the maximum input of the *appliances* served.

The total connected hourly load shall be used as the basis for pipe sizing, assuming that all appliances could be operating at full capacity simultaneously. Where a diversity of load can be established, pipe sizing shall be permitted to be based on such loads.

The volumetric flow rate of gas to be provided shall be adjusted for altitude where the installation is above 2,000 feet (610 m) in elevation.

**G2413.3 (402.3) Sizing.** *Gas piping* shall be sized in accordance with one of the following:

1. *Pipe* sizing tables or sizing equations in accordance with Section G2413.4 or G2413.5, as applicable.
2. The sizing tables included in a *listed piping system's* manufacturer's installation instructions.
3. Other *approved* engineering methods.

**G2413.4 (402.4) Sizing tables and equations.** This section applies to piping materials other than noncorrugated stainless steel tubing. Where Tables G2413.4(1) through G2413.4(21) are used to size *piping* or *tubing*, the *pipe* length shall be determined in accordance with Section G2413.4.1, G2413.4.2 or G2413.4.3.

Where Equations 24-3 and 24-4 are used to size *piping* or *tubing*, the *pipe* or *tubing* shall have smooth inside walls and the pipe length shall be determined in accordance with Section G2413.4.1, G2413.4.2 or G2413.4.3.

1. Low-pressure gas equation [Less than 1½ pounds per square inch (psi) (10.3 kPa)]:

$$D = \frac{Q^{0.381}}{19.17 \left( \frac{\Delta H}{C_r \times L} \right)^{0.206}} \quad \text{(Equation 24-3)}$$

2. High-pressure gas equation [ $1\frac{1}{2}$  psi (10.3 kPa) and above]:

$$D = \frac{Q^{0.381}}{18.93 \left[ \frac{(P_1^2 - P_2^2) \times Y}{C_r \times L} \right]^{0.206}} \quad \text{(Equation 24-4)}$$

where:

- $D$  = Inside diameter of *pipe*, inches (mm).
- $Q$  = Input rate *appliance(s)*, cubic feet per hour at 60°F (16°C) and 30-inch mercury column.
- $P_1$  = Upstream pressure, psia ( $P_1 + 14.7$ ).
- $P_2$  = Downstream pressure, psia ( $P_2 + 14.7$ ).
- $L$  = Equivalent length of *pipe*, feet.
- $\Delta H$  = *Pressure drop*, inch water column (27.7-inch water column = 1 psi).

**TABLE G2413.4 (402.4)**  
 **$C_r$  AND  $Y$  VALUES FOR NATURAL GAS AND**  
**UNDILUTED PROPANE AT STANDARD CONDITIONS**

GAS	EQUATION FACTORS	
	$C_r$	$Y$
Natural gas	0.6094	0.9992
Undiluted propane	1.2462	0.9910

For SI: 1 cubic foot = 0.028 m<sup>3</sup>, 1 foot = 305 mm,  
 1-inch water column = 0.249 kPa,  
 1 pound per square inch = 6.895 kPa,  
 1 British thermal unit per hour = 0.293 W.

**G2413.4.1 (402.4.1) Longest length method.** The *pipe* size of each section of *gas piping* shall be determined using the longest length of *piping* from the *point of delivery* to the most remote *outlet* and the load of the section.

**G2413.4.2 (402.4.2) Branch length method.** *Pipe* shall be sized as follows:

1. *Pipe* size of each section of the longest *pipe* run from the *point of delivery* to the most remote *outlet* shall be determined using the longest run of *piping* and the load of the section.
2. The *pipe* size of each section of branch *piping* not previously sized shall be determined using the length of *piping* from the *point of delivery* to the most remote *outlet* in each branch and the load of the section.

**G2413.4.3 (402.4.3) Hybrid pressure.** The *pipe* size for each section of higher pressure *gas piping* shall be determined using the longest length of *piping* from the *point of delivery* to the most remote line *pressure regulator*. The *pipe* size from the line *pressure regulator* to each *outlet* shall be determined using the length of *piping* from the *regulator* to the most remote outlet served by the *regulator*.

**G2413.5 (402.5) Noncorrugated stainless steel tubing.** Noncorrugated stainless steel tubing shall be sized in accordance with Equations 24-3 and 24-4 of Section 2413.4 in conjunction with Section 2413.4.1, 2413.4.2 or 2413.4.3.

**G2413.6 (402.6) Allowable pressure drop.** The design pressure loss in any *piping system* under maximum probable flow conditions, from the *point of delivery* to the inlet connection of the *appliance*, shall be such that the supply pressure at the *appliance* is greater than or equal to the minimum pressure required by the *appliance*.

**G2413.7 (402.7) Maximum operating pressure.** The maximum design operating pressure for *piping systems* located inside buildings shall not exceed 5 pounds per square inch gauge (psig) (34 kPa gauge) except where one or more of the following conditions are met:

1. The *piping* joints are welded or brazed.
2. The piping joints are flanged and pipe-to-flange connections are made by welding or brazing.
3. The *piping* is located in a ventilated chase or otherwise enclosed for protection against accidental gas accumulation.
4. The *piping* is a temporary installation for buildings under construction.

**G2413.7.1 (402.7.1) Operation below -5°F (-21°C).** The operating pressure for undiluted LP-gas systems shall not exceed 20 psig (140 kPa gauge). LP-gas systems designed to operate below -5°F (-21°C) or with butane or a propane-butane mix shall be designed to either accommodate liquid LP-gas or prevent LP-gas vapor from condensing into a liquid.

## SECTION G2414 (403)

### PIPING MATERIALS

**G2414.1 (403.1) General.** Materials used for *piping systems* shall comply with the requirements of this chapter or shall be *approved*.

**G2414.2 (403.2) Used materials.** *Pipe*, fittings, *valves* or other materials shall not be used again unless they are free from foreign materials and have been ascertained to be adequate for the service intended.

**G2414.3 (403.3) Other materials.** Deleted.

**G2414.4 (403.4) Metallic pipe.** Metallic *pipe* shall comply with Sections G2414.4.1 and G2414.4.2.

**G2414.4.1 (403.4.1) Cast iron.** Cast-iron *pipe* shall not be used.

**G2414.4.2 (403.4.2) Steel.** Steel, stainless steel and wrought-iron *pipe* shall not be lighter than Schedule 10 and shall comply with the dimensional standards of ASME B36.10, 10M and one of the following standards:

1. ASTM A53/A53M.
2. ASTM A106.
3. ASTM A312.